“That They May Become Efficient Agents, Under God.”: Antebellum Scientific Medical Education at the University of Michigan as Preparation for the Civil War.

A Dissertation Submitted

By: Jesse Roberts

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Doctoral Dissertation Committee:
Director: Dr. Larry Toll
Reader: Dr. Leah Tarwater
Reader: Dr. Troy Kickler

Abstract:

The following dissertation focuses on medical education at the University of Michigan before the Civil War and the graduate application of medical school lessons to the Civil War. Medical and Civil War Medical historians have overlooked the importance of medical education. The founding of the University of Michigan Department of Medicine and its position in Michigan's medical history and intellectual history is central to understanding the importance of the medical school. Chapters on the medical school show the valuable training Michigan medical school graduates received and how it was a scientific medical education superior to other contemporary medical schools. The University of Michigan Medical School graduates used their medical training to contribute to the significant scientific changes during the Civil War, drawing directly on the superior scientific and medical training they received at the university.

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Chapter One: Introduction

Introduction

The American Civil War was a conflict of unprecedented loss and carnage. Millions of sick and wounded flooded American military fields and general hospitals. The number of dead shocked the population, who saw the constant tallies of dead and wounded fill their newspapers and telegraph offices. The Union Army, as only one side of the conflict, treated an estimated 5,825,840 medical cases during the American Civil War.[1] The Civil War occurred within a growing shift toward a more scientific view of the medical field. Military medicine modernized quickly between 1860 and 1941 with America's entry into the Second World War. Disease deaths for the military fell from 10.2% for the entire Union Army during the Civil War to just .13% of deaths suffered by the American Army during World War II.[2] Structuring medical education and applying scientific medicine allowed soldiers a greater standard of living and a higher likelihood of survival. The Civil War stood as a chapter in this shift towards a more competent field of medicine.

Historically, war catalyzes great innovation. The Civil War was a grand avenue for advancing American medical care and science. Antebellum medical care left much to be desired. There was little organization in the field of medicine. The American Medical Association was founded in 1847 by Nathan Davis Smith to drive change in medicine. Smith's early efforts centered around changes in medical education, the regulation of pharmaceuticals, and the desire

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[1] The numbers represent recorded cases only. The early days of the Civil War saw a higher rate of unrecorded medical cases. By July 1863, the doctors of the Union Army kept detailed medical records for all medical cases. George Otis, D.L. Huntington, *Surgical History: Volume II,* pt. III, in *The Medical and Surgical History of the War of the Rebellion* (Washington D.C.: Government Printing Office, 1883): 899.

[2] 2.07% of soldiers who served in the Civil War died of combat-related causes such as trauma and infection from wounds. This number fell to .067% for the American military during World War II. Vincent Cirillo, "Two Faces of Death: Fatalities from Disease and Combat in America's Principal Wars, 1775 to present," *Perspectives in Biology and Medicine* 51, no.1 (Winter 2008), 123.

to legitimize the medical field. While members of the AMA agreed that change was needed on all levels of the medical field, the organization had no authority to interfere with medical practitioners nationally.[3] The eras of Thomas Jefferson and Andrew Jackson led to pushback on larger federal oversight and desires for deregulation reached all areas of American life. This was especially true in medicine, and the results were catastrophic. States gradually rescinded laws surrounding medical licensure as they were seen as an impediment to freedom. The free market became the focal point in pre-war America, and American doctors were led in that direction.

Antebellum doctors across all states received different levels of medical education. Most of the country's practicing doctors in the lead-up to war were the products of medical apprenticeships. The quality of their education was at the behest of their preceptors. The apprenticeship process had an exponential effect where poorly trained doctors tended to produce another generation of ill-prepared practitioners. A formal medical education was the alternative to an apprenticeship. Nearly fifty medical colleges existed by the outset of the Civil War, and just like the apprenticeship system, these schools varied in quality. Medical colleges were victims of an unregulated market. Most medical colleges were unaffiliated with universities and owned by professors with a financial stake in the institution. The attendees of medical colleges purchased admission tickets from each professor who pocketed the money. The financial incentives pushed the schools to compete for students, resulting in an era of declining medical school standards.[4]

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[3] The American Medical Association, *Proceedings of the National Medical Conventions, Held in New York, May, 1846, and in Philadelphia, May, 1847* (Philadelphia: T.K. & P.G. Collins, 1847): 79-91.

[4] Martin Kaufman, *American Medical Education: The Formative Years, 1765-1910* (Westport: Greenwood Press, 1976), 45-47.

Doctors or sporadic training quality filled the United States Army Medical Department ranks during the Civil War. At the outset of the Civil War, Surgeon General of the United States Army Thomas Lawson's medical department consisted of only one thousand medical personnel, with only thirty holding the rank of full surgeon.[5] Lawson, a veteran of the War of 1812, headed his antiquated medical department in the opening months of the war before his death in May 1861. Lawson's successor was hardly a modern improvement. Clement Finley had been an army physician since 1818 and was tied up in the politics of the war department. Finley, like Lawson, was committed to the medical techniques and theories of his early medical career, and the pair were incapable of preparing the Army Medical Department for America's bloodiest conflict.[6] The size and scope of the war forced the Medical Department to depend on volunteer and contract surgeons for much of the war. The ranks of the Medical Department swelled to over 12,175 throughout the conflict, with thousands more serving as civilian contract surgeons.[7]

Thousands of civilian doctors from all walks of life were commissioned as medical officers during the Civil War. In the first year of the war, state governments nominated regimental surgeons with no quality standards. Doctors with varying levels of education and experience were tasked with handling unprecedented levels of carnage and disease. The early ineffectiveness of the military surgeons created a basis for the perceived ineptitude of medical

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[5] During the American Civil War, the title of surgeon was one held by any military physician. Before the American Civil War, surgery was not a typical specialty, and very few physicians served exclusively as surgeons. For this paper, the terms surgeon and assistant surgeon refer to any military physician. Despite holding the title of surgeon, these physicians' medical capacity and requirements embodied the entire scope of human medicine, including surgery, pathology, general practice, epidemiology, trauma medicine, and all other forms of medicine.

[6] Ira Rutkow, *Bleeding Blue and Gray: Civil War Surgery and the Evolution of American Medicine* (New York: Random House, 2005), 25.

[7] Contract surgeons still served in a civilian capacity. The desperate need for additional physicians prompted the use of contract physicians who received the pay level of a first lieutenant. The Union Medical Department greatly expanded the number of general hospitals in Northern cities, and it is there that most contract or acting assistant surgeons are served. Rutkow, *Bleeding Blue and Gray,* 90.

officers that permeated American culture in perpetuity. Early perception of army surgeons circled the images of the Civil War's first battles. Thousands of men were wounded at the First Battle of Bull Run. Ambulances transported retreating Union forces while leaving wounded soldiers to suffer a slow demise in the sweltering heat of July.[8] Regiments from all areas of the Union merged into armies where they lived in squalid conditions. In the first year of the Civil War, the Union Army's largest organization, the Army of the Potomac, officially reported 308,027 cases of "sickness."[9]American doctors had little experience working with large numbers of patients, and many had little to no surgical experience. This amateur corps of medical officers was forced to learn on the job while inundated with overwhelming casualties and new ailments.

While the first year of the war presented new challenges for the Medical Department, many valuable lessons were learned. A large body of civilians, mostly women, were enraged enough by the horrific reports of camp conditions and the lack of medical treatment to organize. This group, later known as the United States Sanitary Commission (USSC), was officially organized in June of 1861 but did not gain traction until October 1861. The political implications of using a large volunteer force and American dollars to fund the war effort meant groups like the USSC had an opportunity to wield political power. The Sanitary Commission represented the soldiers' health and well-being on behalf of the civilian population. In the aftermath of the First Bull Run, a group of USSC inspectors determined the medical department's inadequacy. The USSC's historian Charles Stillé chronicled the rise of the commission as they gained greater

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[8] Frank Hamilton, "Battle of Bull Run: One Day's Experience on the Battle-field," *The American Medical Times* 3 (December 1861), 77-79.

[9] Sickness is the label for any ailment reported to the medical staff. This figure includes the number of wounds and other combat-related injuries. The first year of the war in the official medical history of the war begins in July of 1861 and concludes at the end of June 1862. Joseph Barnes, J.J. Woodward, *Medical History: Volume I,* pt. I, in *The Medical and Surgical History of the War of the Rebellion* (Washington D.C.: Government Printing Office, 1870), 30-33.

political capabilities.[10] The USSC Inspectors, being reputable physicians, searched for an ideal candidate to replace Clement Finley as Surgeon General of the United States Army. After months of resistance, their choice candidate, a University of Maryland Medical College professor named William Hammond, was chosen as Finley's replacement.[11]

William Hammond's appointment as Surgeon General represents an important shift in the Civil War and American medical history. Hammond was an assistant surgeon in the United States Army from 1849 to 1860 after graduating from New York University College of Medicine. His ensuing medical career reflects his passion for scientific medicine. Hammond spent years conducting medical research studying the tenets of nutrition and hygiene before he was awarded a position as a Professor of Anatomy and Physiology at the University of Maryland in 1860.[12] He was both passionate and experienced when it came to the study and practice of medicine.[13]Hammond was versed in hospital and military medicine as he had served on military

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[10] Charles Stillé, *History of the United States Sanitary Commission, Being the General Report of its Work During the War of the Rebellion* (Philadelphia: Lippincott, 1866), 112-128.

[11] Congress approved the formation of the United States Sanitary Commission (USSC) on June 18, 1861. The commission was led by Henry Whitney Bellows and Frederick Law Olmsted, activist women who drove to examine the living conditions of Union army soldiers. The commission grew out of the New York City of the Women's Central Relief Association of New York. These women were horrified by the reports of encampments riddled with disease and the terrible conditions of the field hospitals. Thousands of women volunteered to serve as nurses, thus getting first-hand views of these conditions. Tax dollars funded the Sanitary Commission that came into power, but the most significant outside contribution came from the women who worked in the USSC. The USSC collected donations, and the organization's women held Sanitary Fairs, which served as expositions of military and scientific technology, art, and food. The USSC selected the leadership necessary to organize a better-functioning medical department.

[12] Hammond was discharged from the United States Army in 1860, only to join again in May 1861. Hammond's research earned him recognition from the American Medical Association in 1857, with his work being selected as the top research paper for the year it was written. William Hammond, *Experimental Researches Relative to the Nutritive Value and Physiological Effects of Albumen, Starch, and Gum, when Singly and Excessively Used as Food* (Philadelphia: T.K. and P.G.Collins, 1857.

[13] Alfred Bollett, *Civil War Medicine: Challenges and Triumphs* (Tuscon: Galen Press, 2002), 20-21.

outposts and spent time at the Baltimore Infirmary.[14] Hammond's tenure as Surgeon General began on April 25, 1862, followed by the implementation of strict practicing guidelines for army surgeons and medical staff. Before his dismissal in 1864, Hammond had standardized the treatment for wounds, disease, and other ailments.

One of Hammond's greatest accomplishments centered on removing incompetent army surgeons. Volunteer and regular army surgeons were scrutinized to determine their capability as Union Army doctors.[15] Surgeons were required to take examinations to maintain their postings as army doctors and were required to provide medical records on their cases. Surgeons who remained were organized based on merit and capabilities. Many were given clerical duties, while others were assigned to work in field hospitals or general hospitals. In the Fall of 1862, Medical boards based on ability rather than rank and seniority were set up to determine the necessity of surgery or other medical treatments. The greatest contributions from Civil War medicine centered on the rise of clinical science. Hammond's tenure as Surgeon General ushered in the creation of general hospitals throughout the United States. Long-term care was provided at large hospitals that applied techniques focusing on hygiene and public health. Doctors could access many patients in these new hospitals for scientific and clinical research. The surgeons retained upon examination were the best candidates to adhere to new research methods.

William Hammond recognized the value presented by the Civil War. He had the largest unified group of American doctors, all directed by a centralized medical authority. There was no shortage of subjects to study. Before the Civil War, the public disliked the idea of cadaver dissection, making it hard for medical schools to obtain subjects, with some states making the

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[14] The Baltimore Infirmary later became known as the University of Maryland Medical Center. Hospital doctor positions were exceedingly rare and highly coveted before the Civil War. Hospital work offered great experience in various cases and allowed doctors to conduct clinical research.

[15] Bollet, *Civil War Medicine,* 32-33.

practice illegal. Union soldiers were the property of the United States Army, and upon a soldier's death, they were subject to post-mortem dissection and investigation. Surgeons across all conflict areas regularly attended to patients suffering from all possible ailments. Just one month after being appointed Surgeon General, on May 21, 1862, Hammond issued *Circular No. 2*, establishing both the Army Medical Museum and the directive that medical cases and specimens would be recorded or collected and sent to the new museum.[16]

The shift to scientific and clinical medicine shapes the legacy between the Civil War and American medical history. Hammond had managed to rid the medical ranks of the inept and poorly trained doctors. He was left with a body of medical practitioners who rapidly gained experience out of sheer necessity as the casualty and sick lists grew longer. American medicine had the best doctors grouped and controlled by a unifying authority. While Hammond and the Medical Department had command, the doctors were gifted with the freedom to conduct research, dissect bodies, question the established ideas, and fight diligently to save and improve soldiers' lives in the Union ranks. Surgeons collected case studies, examination notes, post-mortem reports, and medical specimens, which were then sent to a centralized bureau of medical knowledge. From there, the knowledge was dispersed to the country's farthest reaches, from east coast hospitals to the frontier fortresses of the American West.

While organizers and leaders like William Hammond and John H. Brinton were successful in their ability to rid the ranks of incompetent surgeons, the study of successful surgeons has been widely ignored by the historiography. While Hammond was a capable leader, and his tenure coincided with greater success in the hospital and less disease in Army encampments, the individual surgeons were forced to adapt to the new conditions. For the many Civil War surgeons who survived the war and continued their medical careers after, the war

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[16] Surgeon-General's Office, *Circular No. 2* (Washington City: Surgeon General's Office,1862)

served as a valuable experience to help them grow as physicians. Despite changes enacted by the military allowing for more organization and the retention of better surgeons, the surgeons who stayed brought valuable experience and a scientific mindset. These changes allowed them to learn medical treatments and surgeries they had never been exposed to before the Civil War. The war as a bridge for these surgeons between pre-war medicine and the advancement of medicine post-war has only recently been examined by historians like Shauna Devine of the National Museum of Civil War Medicine.[17]

While the Civil War stands as a landmark in the history of American Medicine, there has been little study on the pre-war training for military surgeons. The history of Civil War medicine, along with American Medical History, has been aptly studied in the years following the Civil War. Civil War medical historians have done little to understand pre-war American medical education's true structure and quality. Aside from medical education historians, no major studies have connected medical education to the Civil War. The same applies to education received at the various regional medical colleges and universities. Medical education, as Civil War medical historians refer to it, medical education is a blanket term that counts all education as the same. Like Civil War units, medical education was regionally different throughout the country.

Doctors educated in prestigious East Coast schools were sent to work in parts of the country heavily saturated with established medical practices. The medical schools that crowded into heavily populated states of the Union, like New York, Pennsylvania, and Massachusetts,

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[17] Medical education for students before the Civil War was completed in two years. Pre-war medical schools did not require courses like Gross Anatomy, in which students dissected and practiced procedures on dead bodies. American medicine by 1860 was considered to be behind that of Europe. Paris and Berlin were the epicenters of medical research and advancement. Medical students seeking to become the best physicians would study abroad in these countries. In her dissertation, Shauna Devine pinned the Civil War as an experience that allowed physicians to gain ample hands-on experience and served as a grand event in the modernization of American medicine. Shauna Devine, *Producing Knowledge: Civil War Bodies and the Development of Scientific Medicine* (London: The University of Western Ontario, 2010).

competed for students to fill their lecture halls, and this competitiveness led directly to a drop in quality. These students were familiar with the diseases and work settings that were common in their region. Western medical schools were often perceived as lesser in quality and prestige, but their graduates were more likely to practice in rural settings, removed from crowded cities. Students in southern medical schools would practice in a climate entirely different from their northern counterparts. Southern states had a different list of prominent diseases unfamiliar to the North. Each school differed in the quality of faculty, facilities, educational standards, acceptance policies, and the theories taught to medical students.

Doctors who served in the Union Army had to endure drastic changes in their field. The readiness to adapt was based on each surgeon's pre-war educational and medical experience. Contrary to the beliefs of many Civil War historians, not all medical schools were created equal. The same sentiment belongs to the working experiences of doctors from different states. Each state offered unique challenges, working environments, camaraderie, and experience. There is something to be gained by conducting a regional study of pre-war medical education and how it connects to the Civil War. From this study, we can glean whether there was value in formal medical education and how one particular state and its medical practitioners fared during the Civil War. This helps better understand the history of science, medicine, Civil War medicine, and the drastic post-war change in the medical field that drove America to the forefront of medical science.

The State of Michigan was unique to this story in every way. At the onset of the Civil War, Michigan was considered the “West” and was only recently moved from territorial to statehood status in 1837. It had one of the country's youngest medical schools, quickly becoming

the Midwest's premier medical school.[18] Consequently, many physicians trained at the University of Michigan and other Michigan-trained physicians served in various medical capacities during the Civil War. Michigan had over sixty large military units, each outfitted with two head surgeons, four assistant surgeons, and a shifting number of stewards, nurses, and stretcher-bearers.[19] Many physicians who served had extensive medical backgrounds, often working as the only physicians in small Michigan towns or villages. Of the seven hundred forty nine people who lived in Michigan, only twelve hundred sixty-six served as full-time practitioners of medicine in 1860.[20] Their abilities were highly coveted, and their experiences were instrumental in their adaptation to a larger, fast-growing field of medicine. The contribution of Michigan Civil War surgeons and Michigan-trained surgeons is the focus of this research. It adds to the historiography of Civil War medicine by providing a regional study of an advanced medical corps that honed their skills via the battlefield. Their experience altered medical practices during and after the war, establishing the basis for the professionalization and standardization of medicine in the nation by the late nineteenth century.

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[18] Medical education was loosely organized before the creation of the American Medical Association in 1847. Medical schooling was mixed between apprenticeships and other forms of training or the use of a medical school in 1851 N.S. Davis of the United States Bureau of Education published *Medical Education and Institutions in the United States, From the First Settlement of the British Colonies to the Year 1850* (Chicago: S.C. Griggs & Co., 1851). The official report from Davis listed only sixteen medical schools in the United States that allowed for adequate training and bedside experience as deemed necessary by the American Medical Association National Convention of 1847. Aside from the University of Pennsylvania, the University of Michigan Medical School was listed as the second-most advanced medical school. N.S. Davis, *Medical Education and the Institutions in the United States, From the First Settlement of the British Colonies to the Year 1850* (Chicago: S.C. Griggs & Co., 1851), 167.

[19] The post of surgeon and assistant surgeon was held exclusively by actual physicians within Michigan units. Physicians who did not hold positions of seniority served as stewards and nurses. Many young men who served in regimental medical units became physicians after the war, and their experience created a drive to continue their medical educations.

[20] Joseph Kennedy, *Population of the United States in 1860: Compiled from the Original Returns of the Eighth Census, Under the Direction of the Secretary of the Interior* (Washington: Government Printing Office, 1864), 248-249.

The men and women from Michigan who served as surgeons and medical personnel during the Civil War used their experiences to carry them into prominent medical careers. Physicians like Henry Le Hunte Lyster, a surgeon from the Second Michigan Infantry, are credited with eradicating Yellow Fever from Michigan.[21] Abiel Wood Andrews, a Michigan hospital steward, used his experience as a gateway to a career as a physician. Andrews studied the wounds and the onset of sepsis based on patients he treated during the war.[22] James Alexis Post, a Michigan Civil War surgeon and University of Michigan Medical School graduate, discovered the long-term complications of repeated shoulder dislocations.[23] Twenty-third Michigan Surgeon John Howard Bacheler recognized the dangers of standing water in field hospitals. They noted the water stood as a breeding ground for malarial mosquitoes.[24] First Michigan Infantry Surgeon William Fuller conducted some of the earliest studies on Post-Traumatic Stress while using his Civil War patients as subjects.

Civil War Surgeons trained at the University of Michigan received one of the most advanced medical educations of the era. The University of Michigan Department of Medicine and Surgery differed from other US Medical Schools in several ways. As the first state-funded and state-regulated medical school, the university was the first to employ full-time medical professors. University of Michigan Regent Zina Pitcher, one of Michigan's most prominent physicians, heavily influenced the school's foundation. Pitcher oversaw the creation of a faculty

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[21] Burke Hinsdale and Isaac Newton Demmon, *History of the University of Michigan* (Ann Arbor: University of Michigan Press, 1906), 280-281.

[22] Abiel Wood Kennedy Andrews, "Pyemia" [Thesis], (Ann Arbor: University of Michigan, 1865)

[23] Post took on his work before creating Orthopedic Surgery as a specialty. Post served as a physician in the Western Theater, where he used his experience to conduct medical research after the war. James Alexis Post, "Chronic Dislocations with a Case Reported," [Thesis] (Ann Arbor: University of Michigan, 1866).

[24] John Howard Bacheler, "Malaria, its Source, and Effects," [Graduate Thesis] (Ann Arbor: University of Michigan, 1872)

focused on innovation, research, and the modernization of medical education. While other medical schools were taught by those who practiced medicine, viewing medical education as a secondary vocation, Michigan professors were fully dedicated to the study and teaching of both science and medicine. The school was the first to have a laboratory focus and a dedicated chemistry department headed by Silas Douglass, a pioneer in chemistry education. The medical department found a great ally in University President Henry Tappan, a proponent of the German school of education and a purveyor of modern scientific ideas.

With the most modern antebellum medical school, the university and regional doctors benefited from the state's rich medical history. While the state played a major role in doctors' careers, doctors also played a major role in the state's history. With Michigan still a territory in 1838, Dr. William Beaumont made the region the focal point for one of the most influential research projects in medical history with groundbreaking work in the study of digestion.[25] Three Mayors of the territory's largest city, Detroit, were doctors who had a major influence on the expansion of Michigan.[26] Douglass Houghton, a physician who conducted the state's first geological survey, was a prominent physician and scientist in geology and botany. Among this medical leadership in the young state were reformers who recognized the downfalls of medical education in other parts of the country. This group sanctioned and oversaw the creation of the University of Michigan Department of Medicine and Surgery, which opened in 1850.

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[25] William Beaumont was an Army surgeon stationed at a frontier fort on Michigan's Mackinac Island in the 1820s. An American Fur Company employee named Alexis St. Martin was accidentally shot in his abdomen, and as the wound refused to close, Beaumont could observe the physiology of digestion. He published his research in 1838, making him the "Father of Gastric Physiology." William Beaumont, *Experiments and Observations on the Gastric Juice, and the Physiology of Digestion* (Edinburgh: MacLachlan & Stewart, 1838)

[26] Dr. Marshall Chapin served as Detroit's seventh Mayor in 1831. Zina Pitcher served two non-consecutive terms as Mayor in 1840 and 1843. Dr. Douglass Houghton served as Mayor of Detroit between Pitcher's first and second terms.

This history of Michigan's medical school and the medical field is an important marker for understanding preparations for medical practice during the Civil War. Michigan doctors educated at the University of Michigan experienced a different medical education type and focus. In this context, it is important to understand the university's founding, professors, and medical curriculum, the intellectual history of medicine in the pre-war era, and how the school differed. The school opened its doors in 1850 amid an upheaval in the medical field, just years after the American Medical Association made recommendations for medical schools. While most American Medical Schools were adherents of English Medicine and the Parisian Clinical Schools, the University of Michigan was one of the first proponents of the German Education Model. Students at Michigan were trained to treat patients and think scientifically as a catalyst for medical innovation.[27]

Civil War medical historians have generally ignored the value of medical education before the Civil War. Alfred Bollett, in *Civil War Medicine: Challenges and Triumphs,* gives a very brief overview of medical education before the Civil War, stating, "Admittedly, medical education was weak."[28] Bollet's take on medical education appears to be the norm among Civil War medical historians. In his book Bleeding Blue and Gray, Ira Rutkow analyzes medical education bestowed upon graduates who served in the Civil War. Rutkow's summary shows the disconnect between the history of medical education and Civil War medicine. Rutkow writes of

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[27] As discussed in Chapter 3, the English model of medical education focuses on rationalism. Rationalists were theoretical scientists who sought an overarching basis for all diseases. Examples of this school include the "Heroic Medicine" theories of the eighteenth and nineteenth centuries. Heroic Medicine saw an imbalance of the body's humors (phlegm, blood, yellow bile, and black bile) as the cause of disease. Proponents of this medical ideology prescribed drastic measures to balance the body, which often included bleeding, purging, sweating, and the use of diuretics. The Paris Clinical School was the complete opposite of rationalist medicine. The Paris School was quantitative and used scientific data to understand medical treatment. This meant a strict focus on what was observable and shied away from theory. The German Model used a combination of both rationalism and empiricism. The German idea centered on the scientific method using a hypothesis-driven approach that included laboratory study. This method is widely used today in medicine and medical education.

[28] Alfred Bollett, *Civil War Medicine*, 57-61.

medical students sitting, bored, in dark halls, listening to the drone of monotonous lectures.[29] Rutkow is direct in his feelings toward education by stating that ”there was no consideration of scientific research.”[30] While George Adams's *Doctors in Blue* was written decades before both stated authors, his 1952 book presents medical education as uniform across all schools.[31] He wrote, " judged by modern standards, the best of them were deplorably ignorant and badly trained.” The opinions of Bollett, Rutkow, and Adams carry similar connotations: Medical education was worthless as a preparation for the impending Civil War medical field.

From the perspective of medical historians, medical education’s impact on the Civil War and the relationship between the Civil War and medical education has been overridden. The most renowned medical education historians, William Rothstein, William Norwood, and Martin Kaufman, avoid the inclusion of medical education as a preparatory step for Civil War surgeons.[32] Rothstein’s book *American Medical Schools and the Practice of Medicine* covers the development of the medical systems that were present upon its publication in 1987, from 1750 to the present day. While Rothstein wrote of medical education changes after the Civil War, he does not detail the medical education that Civil War surgeons received. Frederick Norwood’s *Medical Education in the United States Before the Civil War* does include the Civil War in its title but offers little connection. Instead, Norwood traces the regional development of medical education and uses his book to outline each medical school’s establishment briefly. Norwood

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[29] Rutkow, *Bleeding Blue and Gray,* 36.

[30] Ibid, 36.

[31] Adams, *Doctors in Blue,* 49.

[32] Frederick Norwood, *Medical Education in the United States Before the Civil War* (Philadelphia: University of Pennsylvania Press, 1944); William Rothstein, *American Medical Schools and the Practice of Medicine: A History* (New York: Oxford University Press, 1987); Martin Kaufman, *American Medical Education: The Formative Years, 1765-1910* (Westport: Greenwood Press, 1976)

does generalize in writing about the development of medical education in antebellum America but does not connect the medical education of antebellum America to the abilities of surgeons.

In the writing of Civil War medical historians, the authors group medical school graduates as one. Contrary to ideas surrounding medical education, there was great variation during the pre-war era. There was no centralized director of medical education. The American Medical Association was founded as part of its mission to reform medical education. The early nineteenth century gave birth to sentiments of Jacksonian Democracy, which made distrust of federal oversight common. While medical regulation, at least on the state level, was common at the turn of the nineteenth century, the democratic movement resulted in less centralized oversight. Medical schools were then free to teach as they saw fit. Each school had various professors who originated from different eras of medicine and medical education. Professors were trained everywhere, from Europe to America. Each European school offered different medical theories and philosophical approaches that professors carried with them to the classroom. A region of aspect to medical education affected medical school graduates from different areas.

The history of medicine in the state of Michigan is a subject that was once an important area of focus for historians of the region. In 1933, C.B. Burr, the chairman of the Michigan State Medical Society, oversaw the collection of primary sources on the subject of Michigan's medical history. The two-volume set titled *Medical History of Michigan* was critical to researching this subject as hundreds of stories from Michigan doctors, educators, and citizens were collected in one place. The secondary sources on the subject appear to be lacking, but historians of the University of Michigan Medical School are numerous. Horace Davenport, a long-time University of Michigan Physiology professor, dedicated the latter part of his life to studying the history of the University of Michigan Medical School. While his most popular history on the

medical school highlights some of the early faculty members and the medical school's opening, it gives light coverage of the school's early curriculum and students with little mention of the Civil War.[33]Historian Dea Boster and Joel Howell, a science professor and historian with the University of Michigan, were selected to write a bicentennial history of the University of Michigan. Boster and Howell's work highlighted the many advancements in medical education that found footing at the University of Michigan, including the claim as America's first to be truly coeducational and the first to establish a university hospital.[34] Their work was highly laudatory of the university's medical school but still avoided an in-depth study of the education students received. William Hubbard, the former Dean of the University of Michigan Medical School and U of M History Professor Nicholas Steneck, worked to understand Michigan's rise in the health sciences, where they saw Michigan as a leader in health sciences. Zina Pitcher's connection to scientifically-minded men and a drive to work both basic and applied science into a medical school curriculum was central to Michigan's rise to prominence.[35] While Hubbard and Steneck give a broad view of the medical men who ran Michigan's medical school, the book hardly delves into the true nature of Michigan's medical school curriculum.

There is a disconnect across four subjects regarding understanding a nuanced aspect of medical history. Civil War historians have shown little interest in truly understanding the actual information and medical techniques learned by doctors who served as surgeons. American Medical Education historians tend to study medical education broadly, seeing medical education occurring in larger trends with no focus on individual institutions or the materials presented by

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[33] Horace Davenport, *Not Just Any Medical School: The Science, Practice, and Teaching of Medicine at the University of Michigan, 1850-1941* (Ann Arbor: The University of Michigan Press, 1999)

[34] Dea Boster and Joel Howell *Medicine at Michigan: A History of the University of Michigan Medical School at the Bicentennial* (Ann Arbor: University of Michigan Press, 2017), 29,40.

[35] William Hubbard and Nicholas Steneck, *The Origins of Michigan's Leadership in the Health Sciences* (Ann Arbor: University of Michigan Press, 1995), 24-43.

individual professors. Historians of the University of Michigan have yet to connect Civil War medicine to the education granted by the university. Finally, the historians of American Medicine have only recently begun to link the Civil War with advancements in medical science and technology. Still, nothing has been done to bridge the gap between medical education and the Civil War.

It is important to understand pre-war medical education as unique to the institution or region where it was gained. This regional aspect was apparent in doctors who earned medical degrees from the University of Michigan. Two-hundred and twenty-four of five hundred and one Michigan medical school graduates served in the Civil War. They received an education that was far from worthless. Historians have offered numerous sources to compare different medical schools.[36] The University of Michigan's medical school offered a thorough education in skills necessary to serve in the Union Army Medical Department. It was forced to utilize new methods of scientific empiricism and research. The University of Michigan's medical school and faculty revolutionized nineteenth-century medicine. Historians of the university have lauded the school's forward thinking.[37] Again, however, the connection between a University of Michigan medical education and the Civil War has been overlooked.

The University of Michigan and the state were relatively unknown by the start of hostilities. Graduates of America's more famous medical schools have since dominated the history of the conflict. William Hammond, the great innovator, graduated from the New York University Medical College. Jonathan Letterman, who revolutionized the ambulance system and

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[36] Henry Beecher, *Medicine at Harvard: The First Three Hundred Years* (Hanover: University Press of New England, 1977)

[37] Horace Davenport, *Not Just Any Medical School: The Science, Practice, and Teaching of Medicine at the University of Michigan, 1850-1941* (Ann Arbor: the University of Michigan Press, 1999); Dea Boster and Joel Howell, *Medicine, and Michigan: A History of the University of Michigan Medical School at the Bicentennial* (Ann Arbor: the University of Michigan Press, 2017)

now stands as one of the conflict's most famous surgeons, was a graduate of Jefferson Medical College in Philadelphia. Joseph Barnes, Hammond's successor as Surgeon General, was an alumnus of the University of Pennsylvania. William Williams Keen, later known as America's first true brain surgeon, graduated from Jefferson Medical College. These are just a sample of the renowned Civil War medical officers who received their educations at legacy medical schools.

America's oldest medical schools ran along the East Coast, including names like Jefferson Medical College, Harvard University Medical College, and the University of Pennsylvania. Many ingenious Civil War medical officers came from these institutions, but the older medical schools were built differently. These older schools were built around legacy more than anything. The great originators of American medical education passed the schools onto generations of educators. That also made these older schools stubborn in their refusal to change or update their educational methods. Graduates of these schools earned medical degrees and, often, without ever dissecting a cadaver, working in a chemistry lab, or witnessing surgery. These traditional medical schools usually operated short class terms with a two-year requirement where students would hear a repetition of the previous year's lectures. Medical professors often present their materials repetitiously by reading from a textbook, and the professor would perform any practical tasks in front of the class. The incentive was purely financial and reputational for the educators at these older schools.[38] Regardless of this "standard," the schools were still held in higher regard than their Western counterparts.

The University of Michigan was the most advanced medical school in the United States by the onset of and during the Civil War. Understanding the school's relevance in the altered

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[38] Early medical schools, dating back to the Colonial Era, were created by physicians who sought to garner a greater reputation. Medical school faculty members could draw in more patients due to their notoriety in the community. Teaching at a medical college conveyed expertise above all other physicians in the community.

medical landscape is crucial to knowing the differences that apply to an education at the University of Michigan. Shauna Devine connects America's rising medical science to the Civil War in *Learning from the Wounded: The Civil War and the Rise of American Medical Science.* Her book inspired this connection between medical education and the Civil War, especially with the University of Michigan Department of Medicine and Surgery. Doctors during the war were thrust into a new system that required acquiring and analyzing scientific data. For the first time in American history, on a large scale, doctors were required to solve problems through experimentation and critical thinking, and they were given the support and framework to do so.[39] Practitioners used technologically advanced methods of diagnosis, including microscopes, thermometers, stethoscopes, photography, and other means to understand and convey new medical information. Expectations included the questioning of medical norms and pushed doctors to challenge themselves to curb the suffering and reduce the mortality of Union soldiers.

While the Civil War was an event that exposed doctors to new ideas and practices in medicine, it required individual surgeons to adapt and succeed in this system. Doctors during the war were inundated with wards and field hospitals filled with patients, and their adaptation was required to be expedited. While they had no choice but to familiarize themselves with surgery and other medical treatments, they were forced to dig deep into their past experiences to survive the major change that occurred. Their only experiences came from their medical training and their lives as private physicians; some doctors were bound to be more aptly prepared than others. The aim of this study is to understand why some doctors could be prepared through educational and practical experience. Furthermore, some Civil War doctors were well-equipped through education to carry their scientific mindset beyond the Civil War and into the twentieth century.

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[39] Devine, *Learning from the Wounded,* 6-9.

The surgeons who graduated from the University of Michigan came from a premier institution that had them better prepared for changes during the Civil War. The University of Michigan's opening of its medical college in 1850 occurred at a major juncture in the history of medicine as the American Medical Association and other medical societies recognized the shortcomings of the medical education system. The medical history of Michigan is an important setting that made the pre-war medical experience advantageous and shaped the legacy and teaching of the young medical school. The medical school became one of the first to adopt the German laboratory and experimental study methods, giving students hands-on laboratory experience. The intellectual history of medicine saw a transition toward the German model of medical study as the University of Michigan medical school was beginning to grow. The medical school staff were geared differently as men who were profoundly interested in medical science over the pragmatic study of medicine that merely pressed students on how to treat patients. The students who graduated from the medical school were outfitted with modern, scientific thinking that gave them ample basis for a major change during the Civil War.

The experiences of Michigan surgeons have been widely ignored, and the large body of primary sources has gone unpublished. The historiography of Civil War medicine first revolved around the significant organizers and leaders and their subsequent organizations for the Confederacy and Union. The major figures of Civil War Medicine or topics within the discipline, such as the study of women or African Americans, have been the primary focus. Yet, few examine the surgeon's experience in Michigan, a state with an advanced medical training system in place before the war. Michigan physicians were trained at only one of two truly modernized

medical institutions at the start of the Civil War.[40] These Michigan-trained surgeons had the highest level of medical education, and their pre-war experiences prepared them to adapt their training to wartime demands, and, in turn, they gained valuable hands-on medical training. This expertise is evident in Michigan surgeons like John Bennitt, who used their prewar experience and training to adapt to the rapidly changing medical field during the war, where he successfully regularly treated those in his regiment.[41] The Civil War was an experience that allowed these surgeons to gain knowledge in medical specialties where they lacked training, and the chaotic and constant influx of patients and resources allowed these surgeons and medical personnel to sharpen their surgical and medical skills. The war served to gain experience in numerous fields that turned them into the most experienced physicians in the world. The wartime experience gave them a place in the post-war advancement of medicine. With these experiences, Michigan surgeons could perform advanced medical procedures, including Michigan's first successful hip replacement, eradicating yellow fever from Michigan, and connecting wartime trauma to post-war psychology.

The study of Civil War Medicine has a deep well of related scholarship in the historiography. George Worthington Adams wrote the first major history of the Union Army Medical Department in 1952. *Doctors in Blue: The Medical History of the Union Army of the*

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[40] Abraham Flexner, *Medical Education in the United States and Canada: A Report to the Carnegie Foundation for the Advancement of Teaching* (New York: Arno Press, 1910): 20-28. Davis, *History of Medical Education and Institutions in the United States,* 168.

[41] Bennitt, in letters to his wife, recounted the valuable experience he drew upon to treat his patients better. Bennitt had experience treating diseases like measles, dysentery, and stomach ailments. He recognized the value of proper water treatment, which helped his regiment combat the most common disease during the war: dysentery. He also drew on his experience in December of 1862, knowing that keeping patients isolated gave them more significant odds of surviving, and he made attempts to keep the hospitals less crowded. John Bennitt," I *Hope to Do My Country Service,"* 52.

Civil War covered the advancement of the Union Army Medical Corps.[42] Adams places the medical success the Union Army later experienced into the hands of the larger governing body, and he writes of the average surgeon as a poorly trained and ill-equipped practitioner. H.H. Cunningham wrote of the opposing side in *Doctors in Gray: The Confederate Medical Service,* in which he showed the evolution of the Confederate Medical Bureau.[43] Cunningham covers the Confederacy similarly to Adams, writing of the growing success of the Confederacy's medical capabilities. His work largely ignores the Civil War surgeon, and the little coverage he gives permeates the mythology surrounding the incompetent Civil War physician.

Historians next focused on the major organizers and movers advancing Union and Confederate medical capabilities. Jack Key attributed the growing survival rates among wounded and diseased Union soldiers to the organization of Surgeon General William Hammond.[44] According to Key, The positive changes in survival rates and the growing competence of physicians were due to Hammond's work. The Confederacy had similar leaders, including Samuel Stout, Surgeon General of the Army of the Tennessee. Stout, like Hammond, implemented better designs for military hospitals. Glenna Schroeder-Lein used the vast swath of primary sources left behind by Stout to write *Hospitals on the Move: Samuel H. Stout and Army of the Tennessee,* focusing on Stout's ability to modernize the medical facilities for the Army of the Tennessee.[45] The early, horrendous conditions of field and army hospitals were replaced later

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[42] George Adams, *Doctors in Blue: The Medical History of the Union Army of the Civil War* (New York: Henry Schuman, 1952): 42-59.

[43] H.H. Cunningham, *Doctors in Gray: The Confederate Medical Service* (Baton Rouge: Louisiana State University Press, 1958.)

[44] J.D. Key,"U.S. Army Medical Department and Civil War Medicine," *Military Medicine* 133, no. 3 (March 1968): 181-192.

[45] As the title states, Stout's significant contribution was the quick setup of successful open-air field hospitals. The Confederacy suffered from shrinking borders, forcing them to move their hospitals and patients. Stout was able to

by more federalized institutions.[46] This phase of the historiography aligns with the study of significant Civil War figures, including Civil War Generals and politicians. This area of the conversation has neglected the surgeons who served in the field and left out the story of Michigan surgeons.

Historians have produced scholarship about the scientific thought of the day and the standard medical procedures. Paul Steiner, a pathologist and historian at the University of Pennsylvania, argues that disease was the most significant Civil War killer. He focuses on disease pathology during the war and the most common ailments, including dysentery and foodborne illness, the two most common forms of Civil War disease.[47] Eric Dean compared Post-Traumatic Stress Disorder, seen in Vietnam War veterans, with the trauma experienced by Civil War veterans. Civil War-era standards of masculinity and honor forced many veterans to ignore the psychological manifestations of trauma.[48] War medical procedures, including Laurann Figg and Jane Farrell-Beck amputations, have been studied. Civil War surgeons, according to Figg and Farrell-Beck, were not quick to amputate as it was not part of 1860 medical practice

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improvise and better serve the Confederacy in this regard. Glenna Schroeder-Lein, *Confederate Hospitals on the Move: Samuel H. Stout and the Army of the Tennessee* (Columbia: University of South Carolina Press, 1994).

[46] Before William Hammond was appointed Surgeon General in 1862, most hospitals in the field were attached to each regiment. Regimental surgeons were initially tasked with treating the soldiers within their own units. In 1863, upon publication of Hammond's treatise on hygiene, the layout for hospitals owned by the federal government was followed by the creation of over 50 U.S. General Military Hospitals. These hospitals were run by surgeons who were transferred to the professional army. Running military hospitals was the work that many Michigan physicians did following their selection to the professional medical corps. For example, Cyrus Bacon was placed in charge of a General hospital in Chattanooga, Tennessee, where he oversaw a hospital filled with over 750 beds.

[47] Paul Steiner, *Disease in the Civil War: Natural Biological Warfare 1861-1865* (Springfield: Charles C. Thomas Publisher Ltd., 1968)

[48] Eric Dean, *Shook Over Hell: Post-Traumatic Stress, Vietnam and the Civil War* (New Haven: Yale University Press, 1997)

standards.[49] Since the publication of Steiner's book in 1968, an entire area of the historiography has been dedicated to Civil War ailments, science, and medical procedures. This area is essential concerning the study of individual surgeons as a means to understanding them but still largely neglects them as a subject.

African Americans, including black soldiers, formerly enslaved people, and black citizens in general, have a visible place in Civil War medical historiography. Frank Freemon, a physician and historian at Vanderbilt University, wrote of the racialized views of medicine in "The Health of the American Slave Examined by Means of Union Army Medical Statistics."[50] Physicians of the 1860s treated black patients differently, attributing different diseases and medical treatments to them. Freemon conducted research using the medical records of freed slaves and black Union soldiers. Margaret Humphreys continued the research started by Freemon in *Intensely Human: The Health of the Black Soldier in the American Civil War.*[51] Black soldiers were considered harder to treat as Civil War physicians often saw them as inferior biologically and less capable of self-healing. White and black soldiers were treated differently because of their perceived medical differences.

Women's contributions to the field of Civil War medicine have been an addition to the historiography. The United States Sanitary Commission, a group primarily consisting of women, drove the reorganization of the Union Medical Department. The group, sanctioned by the United States Federal Government, catered to the hire of William Hammond as Surgeon General of the

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[49] Laurann Figg and Jane Farrell-Beck, "Amputations in the Civil War: Physical and Social Dimensions," *Journal of the History of Medicine and Allied Sciences* 48, no. 4 (October 1993), 455-456.

[50] Frank Freemon, "The Health of the American Slave Examined by Means of Union Army Statistics," *Journal of the National Medical Association* 77, no. 1 (January 1977), 49-52.

[51] Margaret Humphreys, *Intensely Human: The Health of the Black Soldier in the American Civil War* (Baltimore: Johns Hopkins University Press, 1997)

United States Army. The history of women and the United States Sanitary Commission was covered by Judith Giesberg in *Civil War Sisterhood: The U.S. Sanitary Commission and Women's Politics in Transition.*[52] Libra Hilde examined the women of the Confederacy in *Worth a Dozen Men: Women and Nursing in the Civil War South.*[53] Women of the Antebellum southern aristocracy meshed with the soldiers of the Confederacy while serving as nurses. Their success as nurses shifted the stereotype of southern women from a privileged, delicate image to one of respect. Historians like Humphreys covered nurses during the war in *Marrow of Tragedy: The Health Crisis of the American Civil War.*[54] Humphreys said medical advancements did not occur without a working relationship between physicians and nurses.

The historiography has neglected the professional lives of the surgeons, and the state of Michigan, specifically, has been omitted. While historians like Shauna Devine have placed the American Civil War as a replacement for study abroad, the conduits for proving this thesis must come through the surgeons who served, with the war serving as a break between a more obsolete era of medicine and a more scientific one. From a medical standpoint, the individual experience of the Civil War needs to be accounted for.

This study of the University of Michigan as a conduit for Civil War Medical training shows that the medical school had superior methods for educating doctors. The school opened at the ideal time which was allowed advantageous usage of the widespread movement to change medical education. The professors at the University of Michigan were forward-thinking in their

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[52] Judith Giesberg, *Civil War Sisterhood: The U.S. Sanitary Commission and Women's Politics in Transition* (Boston: Northeastern University Press, 2000)

[53] Libra Hilde, *Worth a Dozen Men: Women and Nursing in the Civil War South* (Charlottesville: University of Virginia Press, 2012)

[54] Margaret Humphreys, *Marrow of Tragedy: The Health Crisis of the American Civil War* (Baltimore: Johns Hopkins University Press, 2013)

design of applied medical school courses which included chemistry, pathological anatomy, and clinical opportunities working alongside surgeon Moses Gunn. There was value to be discerned from the way the medical school professors taught at the University of Michigan. Students received a whole-body and scientifically interconnected reference frame for future research. The medical school education these doctors received was a crucial part of training them for the changes that occurred during the Civil War. The state of Michigan offered a unique opportunity in that it pushed for a state-run medical school that avoided the typical competition for students and money. The surgeons educated at the University of Michigan were better outfitted for the medical and scientific changes that occurred during the Civil War.

Methodology

The individual surgeon has often been neglected outside of published memoirs. The American Civil War is one of the most chronicled events in American history. A massive body of primary sources exists from those surgeons and doctors who lived through this grand moment. The legacy of the war has been left behind in countless libraries, collections, and archives. The United States government collected thousands of medical records and published them in the ensuing post-war years. However, the spread of personal accounts is scattered across the United States. The greatest challenge to the study of this subject is the accumulation of first-hand accounts and papers left behind by surgeons, physicians, and other medical personnel who served.

To properly understand the basis of the University of Michigan's medical school graduates first requires the study of human medicine during the nineteenth century. This investigation would begin by examining nineteenth-century medical school curricula, including medical textbooks and medical and scientific Journals. The University of Michigan has one of

the largest collections of historical papers and materials about medical education in the nineteenth century. The Taubman Health Sciences Library and Bentley Historical Library in Ann Arbor, Michigan, contain much of the material necessary to conduct this research. Monographs about medical education in early America are readily available to supplement this area of study. Medical journals from the nineteenth century are also available in digital archives. These sources will serve as the basis for studying medicine during this era of American history.

Michigan surgeons and medical school graduates left behind an abundance of unpublished papers, manuscripts, and letters, and these are spread throughout the United States. The Michigan History Center in East Lansing, the Bentley Historical Library in Ann Arbor, the Walter P. Reuther Library in Detroit, the Halle Library in Ypsilanti, and the Western Michigan University Library all contain archived sources left behind by surgeons of the Civil War. Local libraries carrying archives related to former residents have a large body of work available for study. The Bentley Historical Library at the University of Michigan has the largest body of work of Michigan medical school graduates, the Civil War, and scientific medicine. Collecting and analyzing these sources will account for the most significant means of conducting the research necessary to study this topic. The papers include extensive references related to the medical careers of Civil War physicians and have sources about their work before and after the Civil War. Sources set during the war are the most abundant and are readily available in many archives.

As the University of Michigan's medical education is the basis of this dissertation, the medical school records of the university are the most valuable resource. Records include official University of Michigan College of Medicine and Surgery papers. These include academic catalogs, textbooks, records, alum records, and faculty papers. The faculty papers from Michigan's pre-war medical educators, including Silas Douglass, Abram Sager, Moses Gunn,

Alonzo Palmer, and others, contain class notes, lecture outlines, letters, memoirs, and books the faculty wrote. These papers are used to understand better the medical school curriculum and the coursework taught to Michigan medical school students before the Civil War. Several student notebooks have been obtained; these are the most valuable resources for studying medical coursework at the university. Several years of notebooks are available, many of which are comprehensive of all the coursework and medical lessons learned during each student's time. These are used to cover the coursework and the impressions of the coursework on the students.

References to medical education outside of Michigan are needed to contrast different schools before the Civil War. School records from well-known medical schools, including Harvard, Yale, the College of Physicians and Surgeons of New York, and the University of Pennsylvania, are used. An excellent barometer for medical education and physician readiness comes from the American Medical Association. The National Library of Medicine contains all records from the AMA and numerous medical school publications and sources. The AMA records and outside medical school sources allow for comparing the schools. Sources include school lectures from professors of these outside colleges, published AMA meeting overviews, medical journals, newsletters, letters, and student papers in the National Library of Medicine and university archives. The records used to compare medical school graduates include the *Medical and Surgical History of the War of the Rebellion,* where recorded medical cases and procedures gauge the differences in readiness for the Civil War.

The medical history of Michigan is needed as a background to understand comparisons between medical apprentices and medical school graduates. The medical history of Michigan is also necessary to delve into the origins and success of the University of Michigan Medical School. Sources for this section come from the Michigan History Center-Lansing, the Bentley

Historical Library-Ann Arbor, the Michigan State University Archives, and the Burton Historical Collection-Detroit. Two of the most essential sources for this area are The Michigan Pioneer and Historical Commission, curated by the Michigan Historical Society from 1887 to 1929. These collections are solely composed of primary source accounts and documents. The *Medical History of Michigan* is the best collection of primary sources about Michigan's medical history. The two-volume book collected by the Michigan State Medical Society contains interviews, letters, documents, accounts, histories, and stories from Michigan doctors from the Michigan territorial era to the 1930s. Several Michigan-based medical journals include the *Medical Independent, The Peninsular Journal of Medicine,* and *The Peninsular Journal of Medicine and the Collateral Sciences*. These medical journals contain a primary source account of the evolution of Michigan's medical history and the theoretical basis of medicine.

This discourse includes an overview of intellectual history related to medical education with a connection to the University of Michigan Medical School. The most prominent medical thinkers of the modern era are used to show the evolution of medical theory in America and Michigan. Scientists, philosophers, and physicians such as Benjamin Rush, Elisha Bartlett, Benjamin Waterhouse, and John Coffin are some examples of influential medical thinkers of the eighteenth and nineteenth centuries. These authors published several essays, articles, and books on medical theory and medical education. The shift from rationalist medicine of the early-modern period to scientific empiricism in the nineteenth century is important to understand the founding principles and ideas of the University of Michigan's medical school that opened its doors in 1850. The medical faculty and leaders of the University of Michigan College of Medicine and Surgery are studied to promote the writing of this section. Professors, regents, and leaders like Moses Gunn, Zina Pitcher, Douglass Houghton, Alonzo Palmers, Henry Tappan, and

others have left published and archival sources for study included in the Bentley Historical Library.

The methodology studies social, cultural, military, and intellectual history. The social history is necessary to understand the differences between apprenticeship-trained doctors and medical school graduates. This school of history can serve as a means to research the regional aspects of medicine and changes in medical trends. Doctors are an essential part of grasping cultural history. The cultural aspect of treatment was a driver in sentiments surrounding treatment. The distrust of doctors during the nineteenth century forced the establishment of rival medical factions and the desire for doctors to do better. Military history is the component of this study that allows for a contrast with Civil War medicine. The Civil War was a significant event in the growing modernity of American medicine, and contrary to the belief of many Civil War medical historians, medical education did carry some value. The value of medical education appears to depend on the school where students study, but there is value nonetheless. Intellectual history serves as the tool for setting the background of changes in both medical education and medical history. The change from rationalism to scientific empiricism slowly infiltrated American medical schools. Scientific empiricism was an important mindset for Civil War surgeons. The greatest changes to the medical department were related to empirical studies and information recording.

Chapter Overview

Chapter Two is an overview of the medical history of Michigan. Michigan's medical history is unique in its historical placement and location. The most renowned medical professionals came from the New York and New England regions during the late eighteenth and early nineteenth centuries. The expansion of medical schools in these regions and the influx of

apprentice-trained doctors saturated the market, forcing young doctors to look elsewhere. In 1825, the opening of the Erie Canal made travel from New York to Michigan readily available, thus making Michigan a destination for new settlements. Doctors saw an opportunity in an unsaturated market offering movers cheap land. New towns needed doctors in the new American territory. The territorial years of Michigan brought new settlers to the harsh climates of Michigan. Those moving to the state needed to maintain a healthy and hardy body, making the demand for doctors high.

Michigan was settled during changes in medical theory and treatment. Heroic medicine methods were commonplace, including purging, bleeding, and blistering. The American public grew to distrust this dangerous and futile form of medicine. As Michigan settlement began and eventual statehood in 1837, doctors moved there during this era of medical mistrust. Rather than costing doctors business, many saw it as motivation to perform better and seek a solution to the medical problem. Zealous Michigan doctors founded medical journals and societies and conducted groundbreaking medical studies in the cases of doctors William Beaumont and Zina Pitcher. This same group of eager doctors was ardently supportive of the young state getting a medical university of its own. With Michigan being the first state to mandate a state-funded university, the medical school that opened didn't require student payments to keep the doors open. With this mindset, the University of Michigan Medical School that opened in 1850 differed with scientifically minded staff, regents, leaders, and supporters.

Michigan's opportunities for medical experience made the state an ideal source for medical innovation. The state was wide open, allowing doctors to settle and remain occupied with a large workload. Unfortunately, Michigan was the site of several costly epidemics that allowed doctors to study epidemiology, pathology, and medical treatments. The medical

establishment focused on economic gain and entrepreneurial independence in New England and New York. Doctors were hostile to new doctors moving in on their territory in these established states. Michigan doctors worked in a more accepting environment that allowed for greater collaboration. Doctors from Michigan were also eager to earn the recognition they deserved from the rest of the medical world, as the "western territories" were largely ignored.

This chapter covers the Michigan territorial era, using first-hand accounts and primary sources to understand the benefits of settling in Michigan as a doctor. It further covers the intellectual shifts in both medicine and medical education that made the opening of the Michigan Medical School an opportune time to do so. The working conditions and contributions of Michigan doctors are covered. This is an important step to set the stage for comparing the medical school graduates with apprenticeship-trained doctors of the nineteenth century who served in the Civil War. The medical leaders in Michigan's history were integral in making the state a major frontier in establishing modern medical ideas and education. By the end of the Civil War, Michigan became one of the most innovative and recognized states in the medical community due to the leadership, experience, and education granted.

Chapter Three explores the intellectual history of medicine and the effect the changes would have on medical education. Rationalist medical thinkers of the early modern period and up into the eighteenth century dominated the mindset of the educated medical class. Rationalism was largely a dogmatic commitment to medical theories to better understand science, nature, and the human body. The Enlightenment produced skeptics surrounding rationalism. Empiricism, a results-driven ideology, slowly became the normal approach to medicine by the start of the Civil War. American Medical schools and doctors adopted many ideas surrounding scientific empiricism from the dominant European medical establishments in Edinburgh, Paris, and Berlin.

Doctors recognized the merit of this new line of thinking as their ideas started to enter American medical schools. The University of Michigan's medical school adopted the empiricist model. Still, instead of using the commonplace French model, Michigan was the first major American school to adopt the German model of empiricism. This included the presentation of the hypothesis, a theoretical understanding of the disease, and a results-driven method for establishing scientific facts. Michigan headed a new generation of medical educators who would make the German model mainstream over the following century.

Chapter Four includes an overview of American medicine and medical education in Michigan before 1861. Medical education before the 1920s did not consist of four years of undergraduate education followed by four years of medical school, an internship, and residency. Instead, physicians earned their medical degrees by taking two-year courses about medicine, and if graduates wanted additional education, they could take the entire two-year period over again. Thirty-one university-based medical schools existed before the Civil War. The first half of the nineteenth century saw an explosion of medical diploma mills, known as for-profit medical schools. These schools offered rudimentary education and a diploma in exchange for high tuition.[55] The University of Michigan Medical School, established in 1850, was one of the first truly modernized scientific institutions for studying medicine.[56] The University of Michigan Medical School, one of the first major mid-western medical schools, produced prominent physicians who served in the Civil War.

The study of medical education will include the study of medical textbooks from the era and the study of scientific medical journals. Further, the study will examine the curriculum

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[55] Rosemary Stevens, *American Medicine and the Public Interest: A History of Specialization* (Berkely: University of California Press, 1971): 28-30.

[56] N.S. Davis, *Medical Education and Institutions in the United States, From the First Settlement of the British Colonies to the Year 1850* (Chicago: S.C. Griggs, 1850), 162.

applied at these schools, focusing heavily on the University of Michigan. To better situate the University of Michigan into the conversation, the curriculum there will be compared to other major medical schools of the era, including the University of Pennsylvania, Harvard Medical School, and the Jefferson Medical College as a frame of reference for comparison. The surgeons trained at the University of Michigan were retained at higher levels than graduates of other medical programs. The comparison of curriculum, textbooks, students, and professors will give ample evidence as to the reasons for retention among Michigan surgeons.

Included in this conversation is the study of European medicine. Medical students and physicians sought to better their educations by studying abroad at European hospitals and universities. The differences between these medical systems are essential to understanding the context of the medical field during the nineteenth century and contrast the two medical systems. According to the most recent research, the Civil War replaced this educational experience.[57] The skills learned abroad, and the scientific thought occurring within European medicine are necessary to understand why the Civil War replaced the need to study abroad. Numerous monographs and first-hand accounts of this aspect of the nineteenth century are available to understand this phenomenon. University of Michigan graduates partook in a higher quality education, and the likelihood they needed to study abroad is also a part of this area.

As the war served as a bridge between two eras of medicine, the understanding of pre-war medical procedures and medical thinking by Michigan surgeons is imperative. As proposed by the pre-war era's most popular and widely used medical textbooks and manuals, the study of medical procedures supplies the most remarkable insight. The lack of unified views on the field of pharmacology served as a hindrance early on in the war. Students at the University of Michigan were lightly trained in pharmacology and learned most of their preferred prescriptions

[57] Shauna Devine, *Learning from the Wounded,* 249-252.

while working first-hand. How these doctors obtained their preferences for medications, what medications they used, and what the consensus was during the pre-Civil War era is necessary to understand the practices of pre-war physicians.

Through considering these areas of medical thinking and training, this chapter showcases the superiority of an education received at the University of Michigan Medical School. Further, doctors who could not afford medical school and practiced in Michigan worked directly alongside these superior physicians. This working relationship served as a valuable learning experience. The educational background and first-hand exposure to the most recent scientific medical ideas allowed these Michigan surgeons to adapt to groundbreaking medical changes during the Civil War. The education gained at the University of Michigan Medical School gave surgeons the experience of practicing bedside manner and hands-on patient care. The state was sparsely populated pre-war; properly-trained physicians furthered their medical knowledge by working tirelessly as local physicians.

Chapter four is heavily focused on the leadership and faculty of the medical school. The school sought great men of science to head their medical school. They had famous educators and professors like Corydon Forinlonzo Palmer and Moses Gunn, renowned nationally for their teaching abilities and popularity. Scientific pioneers like Silas Douglas built the most advanced chemistry department in the country. Physicians like Zina Pitcher acknowledged the weaknesses in American medical education and sought the best facilities, faculty, and means to fix the problem. Michigan was fortunate to have leadership in their president, Henry Tappan, who was highly complementary to the German science and education system. He saw the importance of research, scientific study, a universal education, and high-quality professors. These all combined to make the medical school cutting edge during the nineteenth century.

Chapter five continues the trend of the University of Michigan but instead focuses on the students. The student experience drives the entire conversation surrounding medical education and the Civil War. Student notebooks are the cornerstone of this chapter. The coursework taught is deeply examined to understand the actual value of a Michigan medical education before the Civil War. This is followed by reviewing prominent students, especially those who later served in the Civil War. This shows that these Michigan graduates were eager to contribute to the medical field and modernize their industry. This includes revolutionary physicians like Edmund Andrews, Henry F. Lyster, Robert Kedzie, and William Brownell, who all contributed heavily to Civil War medical discourse, medical education, science, and medical advancements. Their papers, books, academic records, and graduate theses provide a background to understanding why their medical education was superior to most before the Civil War.

Chapter five has a secondary focus centers around the three topics that set the University of Michigan apart in medical education: chemistry, anatomy, and surgery. These areas, aptly labeled as the "big three," were modernized compared to the rest of America's medical students. The University of Michigan offered a full-scale laboratory and made the laboratory study of chemistry a requirement, a rarity in the nineteenth century. Professor Silas Douglas built the nation's first modern university chemistry laboratory, central to Michigan's scientific focus. Corydon Ford taught anatomy at the medical school. Students thoroughly enjoyed Ford's courses, which included presentations done through anatomical models, dissections, and specimens. Despite the difficulties in obtaining cadavers, Ford assured that each University of Michigan medical student received training through dissection and post-mortem examination. Moses Gunn taught his students through experience. Students accompanied Gunn in the school's surgical clinics and lectures, where he involved the students in performing surgical procedures.

Chapter five briefly covers the traditional medical courses of the medical school. Internal Medicine courses were the basis for training future physicians on the basics of clinical care. Through *Materia medica* courses, students learned all available therapies and their application to all known ailments. While Michigan graduates learned many of the standard harmful heroic therapies, this section aims to understand the value of these courses. Internal medicine courses taught in the "applied sciences" included Internal Medicine, Obstetrics, Women's Diseases, Children's Diseases, and Medical Jurisprudence, which was an early precursor to Psychology and Psychiatry. Students learned to understand physiology, pathology, chemistry, pharmacology, and other parts of medical science while learning how these parts came together. For graduates who would later serve in the Civil War and help modernize medical science, graduates learned the central tenets of medical science to think of medical science as an integrative study. This includes examples from University of Michigan medical theses, personal remembrances, notebooks, and letters to address this topic.

Chapter six covers the Civil War experience of many University of Michigan graduates. Chapter Six begins by covering the alterations made to the Army Medical Department and clinical science during the Civil War. These graduates, who served as surgeons, were, first and foremost, battlefield surgeons. The battlefield and field hospital experiences of Michigan graduate surgeons are included in the first section of this chapter. Most of Chapter Six relates the scientific changes during the Civil War to the University of Michigan's medical education. The coursework that set Michigan apart in chemistry, anatomy, and surgery was readily applied to the medical and scientific revolution that coincided with the Civil War. The Internal Medicine coursework is used in this chapter. It informs us of the importance of the scientific components of internal medicine as they are applied to the science of the new Army Medical Department.

This brief chapter serves as a basis to show the medical and scientific changes that forced surgeons to utilize their education and experience to adapt during the Civil War.

Chapter seven concludes this study on antebellum medical education, Michigan, and the Civil War. There was more significant value in the medical education at Michigan than was previously credited by historians. Historians often state that antebellum medical education was virtually worthless. The University of Michigan Medical School was forward-thinking as one of the preeminent medical schools of the nineteenth century. While other medical schools were less crucial in their training for Civil War surgeons, the University of Michigan was particularly valuable. This vital study allows historians to understand medical education during the Civil War better. It also shows a profound regional aspect to medical training based on regional history, the medical leaders and educators, medical theory, and the trajectory each medical school took in training its doctors.

Chapter Two:

The Medical History of Michigan and the Founding of the University of Michigan Department of Medicine and Surgery.

Michigan has a profound medical history dating back to the days of French and British settlers. From the state's 1837 admission to the United States to the mid-20th century, Michigan became a national leader in medicine, medical education, and medical science. The vast Michigan frontier offered fortuitous experiential opportunities that quickly put the frontier territory on the scientific map. Further, the state's late exploration and admittance to the union became advantageous for the eventual medical prowess. These factors all had a medical connection to the ensuing American Civil War that began in 1861. Doctors who left to serve in the Civil War benefited from this medical legacy, and their medical backgrounds allowed them to adapt to the swift and significant changes during the war.

Following its victory in the Revolutionary War, America gained the vast expanse of the former Northwest Territory, which included what is now known as Wisconsin, Ohio, Illinois, Indiana, and Michigan.[1] In response to Ohio's granting of statehood, the United States government established the Michigan Territory in 1805.[2] Though sparsely populated, with only 4,762 residents according to the 1810 census, the state experienced a population boom over the next half-century, creating opportunities for medical practitioners. The state's origins, coinciding with a social shift in the migration of doctors due to economic factors, profoundly impacted the development of medical practices in Michigan.

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[1] "An Ordinance for the Government of the Territory of the United States North-West of the River Ohio," July 13, 1787, National Archives.

[2] Michigan was granted territory status as a sort of retaliation to Ohio's statehood. Michiganders were residents of the Ohio Territory prior to Ohio's 1803 introduction to the Union. After Ohio gained statehood Michigan was lumped into the Indiana Territory without the consent of Michigan residents. Michigan's capital was moved from Cincinnati to Vincennes. Petitions from Detroiters pressured Congress enough to consider the idea of granting Michigan territory of their own. Thomas Jefferson agreed with the premise and admitted Michigan to territorial status in 1805.

It is challenging to ascribe medical proficiency to physicians from the nineteenth century. The field of medicine was not as advanced as it is in the present times. Dr. Benjamin Rush, considered one of the founders of medical theory, was influenced by procedures such as purging, bleeding, blistering, and inflicting pain. Dr. Rush rose to prominence during the Yellow Fever Epidemic of 1792, where he tirelessly served the citizens of Philadelphia.[3] During this period, he resorted to extreme methods of bleeding and purging, which yielded what he perceived to be positive outcomes. In his recollections, he wrote, "Never before did I experience such sublime joy as I now felt in contemplating the success of my remedies."[4] Despite the lack of scientific evidence to support such methods, heroic interventions continued to be commonplace until the beginning of the Civil War.

The confident Rush garnered a significant following and introduced radical medical practices that shaped the field. Even during the Civil War years, his heroic methods persisted to some extent. It's worth noting that most doctors in the nineteenth century did not adopt the modern germ theory until the 1880s.[5] Instead, they subscribed to the Miasmic Theory, which attributed disease to bad air and internal bodily processes. Although ideas around contagion were emerging, they were still in their infancy. Doctors of the nineteenth century regularly pushed

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[3] Paul Kopperman, "' Venerate the Lancet': Benjamin Rush's Yellow Fever Therapy in Context," Bulletin of the History of Medicine 78, no. 3 (Fall 2004): 539-540, https://www.proquest.com/docview/236633255/fulltextPDF/E88B5F249D1546E3PQ/1?accountid=12085 (accessed June 8, 2023).

[4] Benjamin Rush, *An Account of the Bilious Remitting Yellow Fever, As It Appeared In the City of Philadelphia, In the Year 1793* (Philadelphia: Thomas Dobson, 1794), 204.

[5] In the mid-1600s, the compound microscope was first built by Robert Hook, who later published the book Micrographia in 1665. Scientists and physicians were then aware of microorganisms but had little understanding of their function or consequence. Speculation grew as many suspected the microorganism's role in disease. On page 15 of John Snow's *On the Mode of Communication of Cholera* (1854), he suggests a cellular cause of Cholera. This theory was later studied by German scientist Robert Koch, who published his findings about what would be known as "Koch's Postulates" in 1884. His findings reverberated throughout science, immediately debunking the Miasmic Theory.

their patients to consume poisonous substances like Lead, Calomel, Mercury, Belladonna, and others. However, this was the reality for all physicians in the early nineteenth century.

Although early Michigan physicians held onto outdated medical practices, the state had several advantages that allowed a new generation of doctors to emerge and usher medicine into modern times. Michigan's medical history is unique due to its later development compared to other regions such as New England and New York. These areas were already saturated with established doctors, while Michigan's demand for physicians attracted many young, enthusiastic professionals. The Michigan medical establishment revolutionized public health, medical education, and the clash between traditional medicine and new theories, leading to a reevaluation of established science.

Early on, Michigan was recognized as a hub for medical advancements, thanks in part to military efforts. With miles of wild and untamed terrain, the region posed natural dangers and a constant threat from the native population, necessitating an ongoing military presence. The state's most extensive tribes, including the Huron, Ojibwa, Odawa, and Potawatomi, had aligned with the British during the American Revolution and were wary of the influx of new settlers into Michigan. Meanwhile, British forces loomed across the border in Canada, heightening tensions. The young Republic established numerous forts along the frontier, such as Fort Wayne, Shelby, Saginaw, Mackinac, Michilimackinac, and Brady, to address this threat. The medical personnel stationed at these isolated forts became the first practicing physicians in what would become Michigan.

During the early 1800s, the territory of Michigan had a scarcity of physicians, resulting in army surgeons - also known as fort surgeons - providing medical care to the local population. This group included not only American settlers but also neighboring Indian tribes. In 1832,

Secretary of War Lewis Cass passed the Indian Vaccination Act, and he tasked army doctors with administering smallpox vaccines to Michigan tribes who were particularly susceptible to the disease.[6] Dr. Douglass Houghton and other army surgeons worked tirelessly to vaccinate over 2,000 individuals in just two months.[7] In addition to the vaccination efforts, army surgeons treated the local population through various epidemics, injuries, and war.

Army surgeons found themselves confined to remote outposts in a roadless frontier. Military outposts sat along waterways, making the Great Lakes the only convenient mode of transportation. Military duty left surgeons stranded in secluded spots in places like Sault Ste— Marie, Mackinac, and up the Saginaw River, with constant conflict putting pressure on Army outposts. Supplies were often limited, and most garrisons only employed a single surgeon, opening the way for a disastrous outcome. Numerous epidemics swept garrisons, forcing surgeons to work endlessly, often contracting the disease themselves. A prominent Michigan medical figure, Zina Pitcher, was stationed at the burgeoning Fort Saginaw in 1822. With one hundred twenty men and thirty civilians when a wave of "intermittent aggravated fever" swept through the encampment in the summer of 1823. With every soul suffering from the disease, Dr. Pitcher was no exception, and he was required to be "carried from his quarters to the bedside of his patients, and for whom he was the only person to prescribe."[8]

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[6] Lewis Cass used fears and sympathies surrounding the smallpox epidemic in Indian tribes to a political end. He was able to manipulate the recipients of the vaccine. Tribes he saw as problematic did not receive the vaccine and were sometimes moved to reservations under the guise of safety. J. Diane Pearson, "Lewis Cass and the Politics of Disease: The Indian Vaccination Act of 1832." *Wicazo Sa Review* 18, no. 2 (2003), 17

[7] Smallpox Vaccination Records June 5- July 31, 1832, Douglass Houghton Papers, Bentley Historical Library- University of Michigan- Ann Arbor.

[8] J. L. Whiting, "A Historical Sketch: Given at the Annual Historical Society Meeting, 1878," in *Michigan Historical Collections*, vol. 2,(Lansing: Michigan Historical Commission, 1874), 460-462.

Pitcher's predicament was commonplace for army doctors, but medical breakthroughs came out of necessity, especially in the case of William Beaumont. Dr. Beaumont, born in 1785, was a New England native who found himself on a remote military outpost in 1820. The doctor was a War of 1812 veteran recently reenlisted after a hiatus where he practiced privately in Plattsburg, New York. When he took up a military post again in 1820, he was at Fort Michilimackinac to aid General Alexander Macomb on Mackinac Island. Fort Michilimackinac was a poorly designed fortification that the British easily captured during the War of 1812 before the British returned it to American hands in 1815. The fort was a symbolic guardian of the waterway between Lakes, Michigan, and Huron while serving as an essential region for the fur trade.

While stationed at Michilimackinac, the surgeon posting left William Beaumont tied up in the intersection between military and civilian events. John Jacob Astor's American Fur Company used Michilimackinac as a vital stop for trade.[9] William Beaumont rushed to the aid of an 18-year-old employee of the American Fur Company, whom a local trader accidentally shot on the morning of June 6, 1822. The wounded man, Alexis St. Martin, had a fist-sized hole torn into his abdomen by a shotgun filled with duck shot pellets. The wound was catastrophic, "carrying away the interior half of the sixth rib, fracturing the fifth, lacerating the lower portion of the left lobe of the lungs, the diaphragm, and perforating the stomach."[10] St. Martin was written off as dead after Beaumont pushed "a portion of the lung, as large as a Turkey's egg" back into the patient's chest cavity.[11] Miraculously, the young patient did not die but suffered

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[9] John Bailey, *Mackinac, formerly Michilimackinac* (Lansing: Darius D. Thorp & Son, 1896), 176-177.

[10] William Beaumont, *Experiments and Observations on the Gastric Juice, and the Physiology of Digestion* (Plattsburgh: F. P. Allen, 1833), 9.

[11] Beaumont, *Experiments and Observations on the Gastric Juice,* 10.

through a torturous recovery.

William Beaumont's treatments were far from revolutionary. Beaumont bled the patient and gave a cathartic to reduce "arterial excitement."[12] The doctor's prescriptions were excruciating as he smeared the wound with ammonia and vinegar and frequently removed pieces of bone and cartilage. It took the suffering man nearly one year to recover enough to regain some of his former strength. Beaumont's obsessive observation recorded each change in the health of the patient. The wound never truly healed, leaving a two-and-a-half-inch abdominal perforation. Even more problematic was the fistula in the stomach, which leaked fluid and any food the patient swallowed unless Beaumont covered the hole with a patch. The devastating wound and ensuing fistula led to a significant medical breakthrough in the study of scientific medicine.

Beaumont's experiments illuminated the area of digestion, which doctors and scientists had poorly understood before, by offering insight into St. Martin's plight. In 1752, Rene de Reaumur isolated gastric fluid from various bird species. Lazaro Spallanzani's 1780 publication showed that the stomach produced gastric juice. William Prout isolated hydrochloric acid from gastric juices in 1824, as Beaumont was isolated and conducting his study, but these medical discoveries lacked Beaumont's eventual impact.[13] Alexis St. Martin accepted long-term medical care in exchange for using his body in an experimental study. St. Martin was the subject of fascinating and unethical medical experiments for the next ten years.

Beaumont obsessed over his patient as St. Martin allowed him to observe the mechanism of the stomach. The fistula first allowed Beaumont to isolate gastric juices from a living human

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[12] Ibid, 12.

[13] Harold Ellis, "Alexis St. Martin, whose traumatic gastric fistula enabled William Beaumont to study the secretion of gastric juice in man," *Journal of Perioperative Practice* 31, no. 4 (March 2021): 163-164.

subject. The doctor inserted a "gum-elastic tube" into the hole below St. Martin's right pectoral.[14] Beaumont rolled the patient onto his side, and he collected the contents for study. Beaumont sent a sealed bottle of the liquid mixed with stomach mucus to University of Virginia professor Dr. Robley Dunglison, who segregated the juices into their parts.[15] Through Beaumont's work, physicians and scientists could identify gastric juices' importance in digestion.

St. Martin's health struggles sporadically made him Beaumont's companion for over a decade. At that time, the experiments were constant. Starting on August 1, 1825, Beaumont used food suspended from a string to study digestion. These pieces of food varied in type, size, texture, and preparation and were dropped into the fistula and examined as the body digested them. Beaumont used food items like "seasoned a la mode beef; a piece of raw, salted, fat pork; a piece of raw, salted, lean beef; a piece of boiled, salted beef," and other items like bread, cabbage, and liquids.[16] Other experiments included administering medicine directly to the opening. Beaumont used cathartics, a drug that caused a purgative effect, allowing him to examine the mechanism of action.[17]

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[14] Beaumont, *Experiments and Observations on the Gastric Juice,* 21

[15] Robley Duglison established that the vial contained a mixture of free Muriatic and Acetic acid, Phosphates and Muriates, bases of Potassa, Soda, Magnesia, and Lime. Duglison was hired for his university position by Thomas Jefferson in 1824. Duglison was one of the most critical medical educators and scientists. Simultaneously, he was the attending physician for four presidents, including Jefferson, James Madison, James Monroe, and Andrew Jackson. He was an inaugural chairholder at Jefferson Medical College after holding a similar position at the University of Maryland. His validation of Beaumont's findings gave credence to the experiments.
Robley Dunglison to William Beaumont, February 6, 1833, William Beaumont Correspondence, Digital Commons at Becker, Bernard Becker Medical Library. https://digitalcommons.wustl.edu/beaumont_1833_janjune/25/ (accessed June 3, 2023).

[16] Beaumont, *Experiments and Observations on the Gastric Juice,* 125.

[17] The use of cathartics was commonplace amongst the practitioners of heroic medicine. Cathartics involved laxatives and toxic substances like Calomel, a chloride form of mercury. The cause of disease was often attributed to an imbalance of the body's fluids. Doctors used bleeding and purging through laxatives or forced vomiting, blistering, sweating, diuretics, and other modes of suffering to reset the body.

The Beaumont experiments were finally compiled and printed in an 1833 book, *Experiments and Observations on the Gastric Juice, and the Physiology of Digestion.* Beaumont's findings have reverberated to the modern legacy of American medicine. Beaumont's contemporaries were not all as accommodating in accepting his conclusions. An 1835 review published in the *Medico-Chirurgical Review* was somewhat scathing as the anonymous author disagreed with Beaumont's findings concerning the invariability of the digestive juices. Still, the article recognizes the importance of the experiments.[18] The timing of Beaumont's posting at Michilimackinac allowed him to expose the realities of the digestive processes. Modern physicians incessantly praise Beaumont's findings as a genuine step in the modernization and professionalization of medicine. The *Journal of the American Medical Association* praised Beaumont, stating, "Beaumont literally opened the path for a field of study that continues to benefit humankind to the present day."[19] Others view him as the "father of modern Physiology" or the "father of modern Gastroenterology."[20]

Beaumont's foray into medical fame fits Michigan's extensive medical history. The timing was the ideal time for Beaumont to exceed all expectations. While the chances of any doctor finding a patient who survived over seven decades with a hole in their abdomen are slim, leaving Michigan's medical legacy to mere fate is hardly ideal. Instead, Beaumont came onto the stage during a rise in medical science and medical distrust. The desperate avoidance of doctors

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[18] "Experiments and Observations on the Gastric Juice, and the Physiology of Digestion," *Medico-Chirurgical Review* 22, no. 43 (January 1835): 49-69.

[19] Howard Markel. "Experiments and Observations: How William Beaumont and Alexis St. Martin Seized the Moment of Scientific Progress," *Journal of the American Medical Association* 302, no. 7 (2009): 804. https://web.s.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=0&sid=cff590c9-e284-4c76-abc4-a971c3058ce8%40redis. (Accessed May 7, 2023)

[20] Arthur Gale, "Dr. William Beaumont: Founding Father of Gastroenterology," *The Journal of the Missouri State Medical Association* 118, no. 6 (November-December 2021): 518-519.

was understandable, considering the medical standard of the day. Heroic medicine likely killed more than it healed, and patients who didn't die likely wished they had on numerous occasions. Beaumont's experiments set the medical profession on a path of scientific legitimacy. Beaumont broke the mold in experimentation. Beaumont's career certainly benefited from his newfound fame. He was a founding member of the St. Louis Medical Society and was sought out by patients throughout his medical career before he died in 1853. Beaumont's findings set a course for medical discovery in a young American frontier territory that would make significant strides in medical and scientific history.

Dr. Zina Pitcher, widely called the "father of Michigan Medicine," added to the military beginnings of Michigan's medical field. Pitcher's medical career route was typical for an early nineteenth-century doctor. In 1831, he was born in Washington County, New York, and at twenty-one, he started his path to a medical career. Pitcher first took an apprenticeship in a local doctor's office and followed that up with two courses of lectures at Castleton School of Medicine in Vermont before earning his MD in 1822 from Middlebury College.[21] Pitcher was granted a military commission in 1822 and was shipped off to the remote Great Lakes to perform his duties as an Assistant Surgeon.[22] Dr. Pitcher's medical career began in what Mary Gillet calls "the darkest in the history of medicine in the United States."[23]

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[21] Apprenticeships or medical schooling were the two pathways to learning the medical trade. M.D. requirements in the early to mid-1850s required two courses of lectures, with the second being a repeat of the first. This was usually done in conjunction with three years of preceptorship in a doctor's office. Graduates would then be required to recite lessons or present a medical school thesis to earn their medical degree. The M.D. was not required to practice medicine as anyone who wanted to call themselves a doctor could, depending on local or state restrictions. Some states did require licensing from state medical societies. The M.D. did carry an air of legitimacy and bolstered public confidence in their abilities.

[22] "Dr. Zina Pitcher," *College Courant* 10, no. 16 (April 20, 1872): 184. https://www.jstor.org/stable/44975989 (Accessed May 11, 2023).

[23] Mary Gillett, *The Army Medical Department 1818-1865* (Washington D.C.: Center of Military History for the United States Army, 1987), 3.

The young assistant surgeon, Pitcher, was thrust into a medical career during a growing mistrust in medicine. Military outposts were especially volatile as disease rampantly took down garrisons, with most doctors helpless regarding solutions. Dr. Pitcher showed feelings about the medicine of his day by remembering with embarrassment his unpreparedness and lack of skill, which he attributed to his poor medical education.[24] A deficiency of clinical education was all too common for medical school graduates of the era.[25] The surgeon's helplessness and unpreparedness drove his push to completely reform medical education and medical science. As he would show, the early experiences Pitcher underwent were only beneficial to someone with a sound, astute, scientific mind and a sense of ambition.

Zina Pitcher's appointment to assistant surgeon, while devoid of any real experience, is somewhat astounding. In 1821, Congress scaled back the army's medical department, allowing only fifty-three doctors for the entire U.S. Army, of which forty-five were assistant surgeons.[26] Despite Pitcher's lack of experience and proper training, President James Monroe selected him to serve as one of this tiny group of specialists. As Pitcher would quickly learn, the deficiency in army doctors left army surgeons practicing alone too often. The doctor's first military assignment saw him attached to Major Daniel Baker's expedition to erect a fort on the Saginaw River, Michigan Territory. Ojibwe Indians threatened treaties signed by the territorial

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[24] The two volumes of the Medical History of Michigan are compiled by primary sources pieced together by the Michigan State Medical Society. The source material comes mainly from first-hand accounts, interviews, and the Michigan Pioneer and Historical Society collection records. C.B. Burr, *Medical History of Michigan,* vol. I (Minneapolis: The Bruce Publishing Company, 1930), 196.

[25] Medical education primarily consisted of lectures with only a dusting of laboratory education. Laws concerning the use of cadavers gave little opportunity to learn human anatomy properly. Medical schools were independent of state universities and consisted of professors who sold tickets for lecture courses. Medical students failed to receive any real clinical experience until medical education started to reform in the 1850s. The dearth of medical facilities, including hospitals, made it difficult to find variation in cases to gain widespread experience.

[26] Mary Gillett, *The Army Medical Department,* 45.

government. In July 1822, the party shipped upriver to establish Fort Saginaw, surrounded by unforgiving wetlands. The first winter was bitterly cold, while the nearby Tittabawassee River flooded the following summer, bringing a massive wave of malaria.[27]

The 1823 summer floods also brought disease to Fort Saginaw. The 1823 "intermittent fever" epidemic was a crushing blow to the garrison at Fort Saginaw. Intermittent fever translates in modern medical terms to malaria, a mosquito-borne illness. The flooding of river tributaries near the newly built fort served as a breeding ground for mosquitoes during a hot summer. The Saginaw garrison, numbering one hundred twenty soldiers and thirty family members who joined the expedition, was hit heavily by the malaria epidemic. Dr. John L. Whiting, a colleague of Pitcher's who later relieved the surgeon, recalled that "only one of the officers and men escaped an attack of greater or less severity [with each being a five-year veteran of the army]."[28] Medical practice in 1823 offered three possible treatments for intermittent fever: bleeding, purging, or cinchona bark.[29] Pitcher was an ardent critic of both bleeding and most forms of purging, using quinine-containing Cinchona Bark as his treatment option.[30] Pitcher worked endlessly without considering the risk of contracting the disease himself. The doctor was

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[27] This recollection comes directly from Pitcher, who recounted his experience to the author. Pitcher was greatly involved in studying and preserving Michigan's history, even serving as the president of the Michigan Pioneer and Historical Society. Michael Leeson, *History of Saginaw County, Michigan; Together with Sketches of Its Cities, Villages and Townships, Educational, Religious, Civil, Military, and Political History; Portraits of Prominent Persons, and Biographies of Representative Citizens* (Chicago: C. C. Chapman & Co., 1881), 165.

[28] John L. Whiting, "A Historical Sketch: Dr. Zina Pitcher," in *Michigan Historical Collections,* vol. 2 (Lansing: Robert Smith Printing Co., 1901), 461.

[29] Cinchona bark contains the alkaloid known as quinine. Quinine Sulfate was isolated in 1820 and later surpassed Cinchona bark in its use as an antimalarial. Quinine is one of the most essential modern medicines. By the time of the Fort Saginaw malaria outbreak, Quinine Sulfate was just being introduced to the American market. Cinchona Bark would have been Pitcher's likely option to treat malaria, which had downfalls. Cinchona bark has small amounts of quinine in solid form, making large doses impossible without stomach upset. Studies show that high quinine doses equate to effective treatment. Pitcher's possible treatments would have done little to assuage the sickness at Fort Saginaw. Gillett, *The Army Medical Department 1818-1865,* 21.

[30] Burr, *Medical History of Michigan,* 198.

disabled with sickness, spending the summer of 1823 as a lone surgeon. Fort Saginaw Quartermaster Samuel Stanon sent for a replacement, bringing in civilian contractor Dr. John Whiting.

Zina Pitcher was not discouraged by his experience at Fort Saginaw, as his newfound knowledge created a basis for a medical career. The doctor made rounds through most of Michigan's major military outposts: Fort Saginaw from 1822-23, Fort Brady in Sault Ste. Marie 1828-29, Fort Gratiot in Detroit 1829-30, in addition to his stops at Saginaw and the city of Detroit. The doctor served briefly in Fort Monroe, Virginia, where he was selected to preside over the Army Medical Board in 1835 before settling permanently in Detroit.[31] His medical career showed a significant variation in his areas of interest. In 1832, *The American Journal of the Medical Sciences* published his report on an abdominal wound he treated in 1831.[32] According to Pitcher, a nineteen-year-old Cherokee man suffered an abdominal knife wound. Pitcher's patient recovered after twenty-eight days, but the doctor used the case as an opportunity to test the medical theories of German Dr. Johann Ramdohr. The stab wound left the patient's intestine damaged. Dr. Ramdohr's theory suggested doctors should avoid attempting to repair the intestine in cases similar to Pitchers. Pitcher's report showed the patient recovered and continued his life with a permanent abdominal hernia but no complications. He was one of the first in Michigan to experiment with anesthesia in 1849 following its 1846 discovery.[33]

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[31] Frederick Novy, "Zina Pitcher: An Address Delivered Before the Medical Department on Founder's Day, 1908," Bentley Historical Library, University of Michigan-Ann Arbor.

[32] Zina Pitcher, "A Case of Penetrating Wound of the Abdomen and Section of the Intestinal Canal, successfully treated up on the Plan of Ramdohr, with Remarks," *The American Journal of the Medical Sciences* 10, no. 19 (1832), 42.

[33] To treat a case of epilepsy, Dr. Pitcher tried an extremely risky procedure known as arterial ligation. Ligations were commonplace, especially after surgeries, but the place where Pitcher attempted it was high-risk, the patient's carotid artery. In this operation, the doctor makes an incision on the patient's neck and follows up by tying off the artery using wire, threat, or another type of suturing material. Pitcher worked directly on a patient while the patient

Pitcher's published case signals a growing medical prominence, considering only two American medical journals circulated in 1832; this was just a small example of his achievements.[34] Pitcher was renowned as a scientist in conjunction with his medical career. The doctor was known for his interest in botany. Doctors of Pitcher's era were well-versed in botany as many prescribed treatments involved plants, but Pitcher's studies in botany were renowned. Famous botanist, John Torrey read through Pitcher's field notes, later naming the *Cirsium pitcheri,* Pitcher's Thistle, after the doctor.[35] Dr. Pitcher's career as a civilian doctor coincided with a shift in medical science. The rising doubt in the medical community forced doctors to perform better. In a push to reinvigorate the profession, medical practitioners of the nineteenth century fostered a rise in medical societies, journals, and competing medical sciences. In 1847, several doctors founded the American Medical Association to set the standard for the profession. Zina Pitcher was elected its president in 1857.[36] He later co-founded Michigan's first major medical journal, the *Peninsular Journal of Medicine and the Collateral Sciences.* Dr. Pitcher was the chief physician of Detroit's first hospital, St. Mary's Hospital. Pitcher was one of Detroit's

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was undergoing anesthesia. He admitted his lack of experience and knowledge but powered through the operation. Burr, *Medical History of Michigan,* 667.

[34] *The Medical Repository* was the first American medical journal in print, starting in 1812. This was followed by *The New England Journal of Medicine* in 1812 and the *American Journal of the Medical Sciences* in 1820. The last edition of *The Medical Repository* was published in 1824 and was out of circulation by the time Pitcher started to publish articles regularly.

[35] The Pitcher's Thistle grows along the many Upper Michigan dunes. Zina Pitcher was stationed at Fort Brady when he collected specimens of Pitcher's Thistle and described them in his field notes. Fort Brady is in Sault. Ste. Marie, Upper Peninsula, Michigan (pronounced Soo Sainte Marie), along Lake Superior's shoreline, near the Grand Sable Dunes where Pitcher found the plant. Fort Brady is now the site of my undergraduate alma mater, Lake Superior State University, and the barracks where Pitcher lived are now the men's freshman dormitory. Edward Voss, *Botanical Beachcombers, and Explorers: Pioneers of the 19th Century in the Upper Great Lakes* (Ann Arbor: The University of Michigan Herbarium, 1978), 13

[36] *Transactions of the American Medical Association,* vol. X (Philadelphia: Collins Printer, 1857), 18

most famous physicians, represented by two elections to Detroit mayor and a close second-place finish during the 1843 governor election.[37]

Pitcher's life experiences helped him have his most significant impact on Medical Education. As a young military surgeon, Pitcher recognized his greatest downfall was a lack of experience. His clinical deficiencies made learning on the job his only option, and his first post at Fort Saginaw had overwhelmed his abilities. Dr. Pitcher made his feelings toward his medical education clear. He disparaged the lack of clinical education and remembered that his experience having personal patient contact out of medical school was "practically nil."[38] Pitcher showed his scientific drive through his botany studies and his motivation to take risks and question the medical consensus. His storied career, scientific forward-thinking, willingness to take risks, social status, and position as a medical leader made him the ideal frontman for creating a state medical school. Pitcher's commitment to opening the University of Michigan School of Medicine and Surgery became the focus of his life.

Zina Pitcher moved back to Detroit in 1836, one year before Michigan gained statehood, making it the ideal moment for a shift in the future of medical education. Michigan's new constitution outlined a state-funded university managed by a board of regents. Pitcher was well-known for his medical career and intellectual feats, and Michigan's government added Pitcher to the first Board of Regents. He focused on a scientific study path for university students as an alternative route when most universities focused on the arts and the classics. The doctor was tenacious and fought hard to include a medical school, but the early state government rejected his plan several times. Regardless, he attracted tremendous scientists to take up university posts,

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[37] "County Canvasser's Statement of Votes Given for Governor and Lieutenant Governor," *Pontiac Jacksonian,* November 24, 1843.

[38] Burr, *Medical History of Michigan,* 465.

including Douglass Houghton, Abram Sager, Silas Douglas, and Asa Gray.[39] Setbacks constantly mired Pitcher's plans to bolster the science program at the university and start a medical program. Pitcher moved forward by continually fighting for his educational plans.

Medical education was Zina Pitchers' priority. In 1839, he founded a medical school in his home, and his work involved dissecting cadavers.[40] Doctor Pitcher sought to break the medical education mold by changing how the new medical school would conduct medical teaching. The ever-lingering memory of his lack of early clinical education made the hands-on experience a priority. Laboratory study was to be taken from its rudimentary form and became a significant focus at the University of Michigan medical school that opened in 1850. Pitcher's numerous addresses on education to the Michigan and American Medical Associations drive home the importance of clinical experience.[41] Zina Pitcher created a new idea for the medical education process that would ripple throughout the history of medical education. The school started in 1850 and had a colossal effect on the rise of Michigan as a state of medical strength.

The experiences of leading medical men during the Pioneer and early-statehood eras of Michigan's history were vital in the placement of Michigan in the direction of medical modernity. Doctors like William Beaumont entered medical history while Michigan was a territory, creating a legacy for the state. Later doctors, like Douglass Houghton and Zina Pitcher, made

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[39] Dr. Douglass Houghton was one of the first scientists selected to conduct a geological study of Michigan upon receiving statehood. Houghton was granted a position as Professor of Chemistry at the University of Michigan but died tragically at 36 in 1845. Sager held various positions at the University of Michigan throughout his career, from 1850-1875. Silas Douglas was Houghton's cousin, and Douglas carried on his cousin's scientific legacy. Asa Gray's hiring fell through when the university went bankrupt in 1839. These hirings show Pitcher's important scientific connections. When the university rebounded in the early 1840s, scientifically minded professors became a target for teaching positions. William Hubbard and Nicholas Stenek, *The Origins of Michigan's Leadership in the Health Sciences* (Ann Arbor: Historical Center for the Health Sciences-University of Michigan, 1995), 25-27.

[40] Hubbard, *Michigan's Origins in the Leadership of Health Sciences,* 26

[41] Zina Pitcher, "On Clinical Instruction: Report of Z. Pitcher, M.D., to the Regents of the University, December 30, 1857," *The Peninsular Journal of Medicine and the Collateral Sciences* 5, no. 8 (February 1858), 393-428.

contributions that continued in the state as they chose to reside there. An oddity was Michigan's attraction to the scientific community, which drew in many of Michigan's early science educators. The public trusted these scientific doctors, as shown by the six doctors elected mayor of Michigan's largest city, Detroit.[42] These men were vital in legitimizing the profession of both science and medicine.

Following the American post-revolutionary occupation of the Michigan Territory, the population increased, drawing in a crowd of doctors. The state went through a short period of population stagnation after Michigan was first granted territorial status in 1805. Aside from the five hundredDetroit residents, only a little over four thousand more residents lived scattered throughout the state. Michigan bore the brunt of heavy fighting during the War of 1812, which caused a slump in population growth. Settlers trickled into the state after the war, nearly doubling the population by 1820.[43] The 1820s sparked a wave of settlement that would see the state's population rise to almost sixty thousand by 1834.[44] Michigan had surpassed the fifty thousand-resident threshold for state consideration, gaining statehood in 1837. This "Michigan

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[42] Dr. Marshall Chapin (1798-1836) was elected mayor twice, in 1829 and 1831. Chapin was an army doctor stationed in Detroit's Fort Shelby before beginning a civilian medical career. Chapin was elected to oversee the medical care of Detroit during the two major cholera outbreaks of 1832 and 1834. Zina Pitcher was a three-time mayor of Detroit, getting elected in 1840-41 and 1843. Douglass Houghton, a scientist and physician, was elected in 1842.

[43] Michigan's shared border with Canada made the region a target during the War of 1812. On July 17, 1812, a British force under the command of Charles Roberts captured the Fort Mackinac garrison on Mackinac Island. Detroit fell to a British assault on August 16, 1812. The bloodiest land battle of the war took place outside of Detroit at the settlement of Frenchtown on the River Raisin. 1,300 British soldiers handily defeated 1,000 American soldiers under the command of James Winchester. Of Winchester's forces, the British killed two hundred and twenty, wounded eighty and captured at least five hundred Americans. The Americans left sixty wounded behind in Frenchtown, and Indian forces massacred the wounded men. American forces later regained all lost territory, but the land was left in ruin in Michigan's most populated region by Detroit. Roger Rosentreter, *Michigan: A History of Explorers, Entrepreneurs, and Everyday People* (Ann Arbor: University of Michigan Press, 2014), 56-66.

[44] The *Northwest Ordinance of 1787* set the population requirement for statehood at 60,000 citizens.

Fever" came about due to incredibly cheap land in conjunction with the opening of the Erie Canal in 1825, and with it came a wave of doctors to settle in the new land.

Michigan ties its medical legacy to this opportune moment in the region's history. New England and New York were home to the largest population of trained physicians. Further, these areas offered the best medical education opportunities and apprenticeships with renowned and experienced doctors. Young medical school or apprentice graduates found the region saturated with practicing physicians. Established doctors in some of the oldest parts of the United States did not readily accept new competition. Regional saturation in places like New England forced doctors to clamor for patients. A *Boston Medical and Surgical Journal* contributor wrote, "there are dozens of doctors in all great towns, who scarcely see a patient from Christmas-time to Christmas-coming."[45] A young doctor arriving in Leominster, Massachusetts, was told by an innkeeper about the number of doctors in town. "Well, we have not yet so many that we begin to feed the hogs with them, but I don't know how soon we may have."[46]

Between 1800 and the start of the Civil War, the growth of doctors in America was exponential. The restrictions to practice were lacking. Some states and territorial Michigan did have some medical licensing regulations, but most states slowly dropped them by the first quarter of the nineteenth century. Apprenticeships were the most common step toward practice, but anybody wanting to call themselves "doctor" could.[47] Educators saw an economic

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[45] "Medical Matters," *The Boston Medical and Surgical Journal* 15, no. 27 (November 1836), 273

[46] Barnes Riznik, "The Professional Lives of Nineteenth-Century New England Doctors," *The Journal of the History of Medicine and Allied Sciences* 19, no. 1 (January 1964), 3.

[47] The term doctor differed from the term "physician." "Only those who attended medical school were truly "physicians" and could go by that term. Martin Kaufman, *American Medical Education: The Formative Years, 1765-1910* (Westport: Greenwood Press, 1976), 6.

opportunity, and medical and proprietary medical schools emerged nationwide.[48] From 1782 to 1827, New England established nine new medical schools, continuing an American trend. These schools rarely forced entrance examinations and accepted anyone willing to pay the fees. Young doctors filled areas like New England and New York in the first half of the nineteenth century. For instance, between 1830-1840, 1,800 New England medical school graduates received their MDs before moving into the region to work. This large number of graduates and the fact that only 20 to 35% of New England doctors had medical degrees shows a lack of demand burdened the market.[49]

Medical histories of various regions have not readily been a modern undertaking. Historians conducted regional studies of medical history during an era where the burgeoning medical industry drew vital interest between 1900 and the start of World War II. Historians wrote much of this discourse without deep investigation into the lives and motivations of the frontier doctors who inhabited places in the West or South.[50] Many historical sources recorded the lives of Michigan's frontier and early-statehood doctors. However, the motivations for moving can be inferred by examining their origins and social and economic factors. The overwhelming majority of doctors moving to Michigan came from New England and New York. The opening of the Erie Canal in 1825 and a boom in Michigan land sales coincided with the

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[48] The relaxed standards for ascribing one the title of "medical professional" or "doctor" promoted the creation of a mass of cheap diploma mills. These proprietary medical schools didn't offer accredited M.D.s but instead offered medical diplomas. The M.D. was not a requirement to carry the title of doctor, as anyone wanting to be a physician went by that moniker. Medical diploma or medical certificate institutions offered a rapid course of basic medical classes. The long-term success of the American medical institution hardly depended on these poorly trained doctors. While medical schools were hardly ideal in terms of academic standards, the serious M.D. recipient became the cornerstone of the profession. The Civil War was central in tarnishing the poorly trained doctors who were weeded out of the military in large numbers in the early years of conflict.

[49] Paul Starr, "Medicine, Economy and Society in Nineteenth Century America," *The Journal of Social History* 10, no. 4 (June 1977), 591.

[50] William Barlow and David Powell, "Malthus A. War, Frontier Physician, 1815-1823," *Journal of the History of Medicine and Allied Sciences* 32, no. 3 (July 1977), 280.

movement of doctors. With New York and New England standing as America's oldest regions, the established doctors reigned over the profession. The economic opportunities beckoned in Michigan, and this draw would intersect with all the facets that made the state the epicenter for an innovative and successful medical industry.

Preparations for a medical career often left young doctors ill-prepared. As Zina Pitcher reflected, medical schools left students without clinical study or patient contact. Preceptorships were a medical school requirement, and apprenticeship was the most common pathway to medicine, but these did little to fill the experience gap. Apprenticeship was the standard practice for all nineteenth-century trades, but it was not ideal for the medical profession. Apprentice doctors were primarily clerical staff whose duties included cleaning, fetching horses, collecting debts, and assisting in medical cases. The students would read medicine in the library of their overseeing doctor. The poor training of doctors was exponential as poorly trained doctors often trained poorly trained doctors. Patient experience was lacking. While apprenticeships involve five to seven years of study and patient experience under a doctor in a clinic or office, they hardly compare to the patient contact models of modern-day clinical and the residency requirements to practice medicine in the United States.[51] The best potential teacher was on-the-job experience. In states with few spots open for young doctors, the opportunities on the frontier were far more enticing and would benefit the industry.

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[51] As of 2023, medical school graduates complete three years of rigorous medical education, followed by two licensing examinations known as the United States Medical Licensing Examinations Steps 1 and 2. Step 2 is focused on knowledge gained in clinical experience. Beginning in the student's third year, they must complete sixty-six weeks of clinical training and rotate through several specialties. Each student must complete General Medicine, General Surgery, Obstetrics & Gynecology, Pediatrics, Critical Care, Emergency Medicine, Family Medicine, Ambulatory Care, Neurology, and Psychiatry rotations. Graduates are then required to complete a residency in their accepted medical specialty. The residency ranges from three years for primary care residencies like Family Practice, Pediatrics, etc. Surgical residencies can range between five and seven years.

From Michigan's territorial days to the start of the Civil War, there was no shortage of experience opportunities. Even by 1860, Michigan had only 1,266 physicians, 19 surgeons, and 131 dentists, when the population swelled to 749,000.[52] Doctors who moved to Michigan during the Pioneer phase were often the first doctors moving to various towns. In 1827, Dr. George Lee of Ontario County, New York, took a boat ride along the Erie Canal, finishing his trip with a passage from Buffalo to Detroit. Rumors swirled that a small Michigan town called Mt. Clemens lacked a doctor, so Lee embarked on a journey along the coast of Lake Huron and the Clinton River, where overhanging brush caught the ship's rigging. When Lee finally arrived, he trudged into town to open the first doctor's office in the area.[53] Dr. Minos McRobert was another first to a Michigan town in 1837. The New York native, known for his burly figure, became Mason, Michigan's first doctor. 1837 coincided with the fallout from the 1834 Cholera epidemic, among other waves of illness. With only five years of practice experience before moving, Dr. McRobert willingly rode into the storm, spending hours each day on horseback. His unbreaking optimism and passion for medicine made him a tremendous medical and later political figure in Mason.[54] Stories like that of Lee and McRobert are familiar to Michigan doctors of the Pioneer era.

Aside from Detroit, most of the Michigan frontier was unsettled and unforgiving. The region was rife with disease-causing insects, predatorial animals, and hostile natives. Michigan's swamp-laden and forested terrain was treacherous. By the mid-1830s, there were few roads to travel on, a situation that did not improve significantly until the 1850s. Outside of the more

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[52] Joseph Kennedy, *Population of the United States in 1860; Compiled from the Original Returns of the Eighth Census, Under the Direction of the Secretary of Interior* (Washington: Government Printing Office, 1864), 248

[53] Burr, *Medical History of Michigan,* vol. I, 123.

[54] "Dr. Minos McRobert," in *Michigan Historical Collections,* vol. 8 (Lansing: Wynkoop, Hallenbeck Crawford Co, 1907), 34-36.

significant settlements of Pontiac, Detroit, and Saginaw, the thick wooded areas forced settlers to bushwack their way to the new settlements. Roads were often ungraded paths through stands of forest. Trees were closely cut to the ground to make way, forcing wagons to bounce over jutting stumps. A new life on the frontier required a home built from the materials provided by nature. The solid ground needed for building meant the area was heavily wooded as most other land was soggy wetland. These woods had to be cleared by hand, and settlers had to build their houses in time for a harsh Michigan winter. Preparations were needed to supply these newcomers through a long winter of need. Regardless of this ruthless lifestyle, many remained pioneers in the young territory and later state. It was a lifestyle that required the absolute hardiness of the citizens who could survive.

Despite the great mistrust of nineteenth-century doctors, there was a growing need for them along the Michigan frontier. The settler's desperate way of living made the desperate struggle to stay healthy imperative. As an expert on the Old Northwest, Carlyle Buley stated, "Nothing was more vital in the conquest of the wilderness than health, but over none of the factors involved did the settlers seemingly have less control."[55] While health was vital, Michigan was notorious for the taxing conditions on the human body. A famous quip from the east read," Don't go to Michigan, that of ills; the word means ague, fever, and chills." This poem forced many settlers to heed the warning, but to a doctor in a saturated market, this rhyme served as an advertisement for their services. This new land was a welcoming challenge for zealous doctors eager for work and experience. The advantages of harsh living include the idea that doctors willing to settle in Michigan were unlikely to take their craft lightly. A place infamously known as the "land of ills" would fail to attract anyone looking for an idle career. The economic

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[55] Carlyle Buley, "Pioneer Health and Medical Practices in the Old Northwest Prior to 1840," *The Mississippi Valley Historical Review* 20, no. 4 (March 1934), 497.

factors failed to be a driving force aside from the cheap land offered to entice settlers. Frontier doctors were able to break away from the entrepreneurial and financial constraints of the established world of medicine and focus on the work at hand.

The era growth from Michigan as a territory into a state, 1805 to 1837, was filled with social factors encouraging doctors to move to a sparsely settled region. Post-revolutionary Americans of the Jeffersonian and Jacksonian eras had a great mistrust of the elite or perceived ruling class. The medical field was no different. Medical regulation was common in the first fifteen years of the nineteenth century, but the growing distrust in oversight caused a drop in licensing regulations. This social era focused highly on the individual, presupposing the American ideal of economic freedom and self-determined success. For most practicing doctors, entrepreneurism far outweighed the desire to view medicine through a scientific lens. Medical programs were growing at an exponential rate, simply following the economic trends of the time.[56] Poorly trained doctors were released to find earning potential wherever possible, which usually meant big cities. Druggists appeared throughout the United States, with many making traveling rounds to peddle their miracle cures, thus raising the competition for work to new heights. Epidemics and disease outbreaks were common and often disrupted trade, forcing cities to sell their health institutions as destinations. These squeezed the individual doctors, causing them to find opportunities elsewhere.

In Michigan, the economic incentives were slim, but the land was cheap, and a way of life was possible for an enterprising doctor. Physicians drawn to the West were oriented towards results as pioneers could only depend on, or were willing to pay, reputable doctors. The Michigan Medical State Medical Society's *Medical History of Michigan* states that in the pioneer

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[56] James Cassedy, *Medicine in America: A Short History* (Baltimore: Johns Hopkins University Press, 1991), 58-60.

era, “the physician bore burdens out of all proportion to the unit average” and that “the health of the community was measurably, in his keeping.”[57] Doctors drawn to Michigan had access to cheap land at $2.00 per acre from 1805 to 1820 and 1.25 in 80-acre plots after.[58] Without the expensive burden, they could meet monetary needs in other ways. Farming was common for Michigan doctors seeking a secondary source of income. Dr. Nathan Webb of Ypsilanti farmed various products, including corn and sheep, often leaving his son Frederick to tend the farm. At the same time, Nathan visited patients.[59] Dr. James Willson of Flint, Michigan, practicing from 1858 to 1919, took swaps in exchange for medical services, as shown by the lifelong collection of account books.[60] Willson accepted food, services, and other favors as payment for those who could not afford him.[61]

The remoteness of most Michigan towns made opening pharmacies a lucrative venture. Doctors were required to travel extensively and were often in short supply of medicine needed. Physicians were frequently forced to formulate their medications to treat patients, and

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[57] Burr, *Medical History of Michigan,* vol. I, 120.

[58] Tract Books 1818-1962, Michigan Department of Treasury, Local Property Services, Library of Michigan-Lansing.

[59] Dr. Nathan Webb later served as a surgeon in the United States Colored Troops. His son, Frederick who was born in 1842, went on to serve in the 17th Michigan Infantry. Frederick was mortally wounded at the Battle of Antietam and died in 1863.Webb Family Papers, 1857-1883, Michigan in the Civil War, Bentley Historical Library, University of Michigan- Ann Arbor.

[60] Caldwell’s account books show he took payment as “5 pounds of butter” or “shingles for barn roof.” Bartering was a common doctor practice in Michigan. Willson’s account books show he was constantly working and taking payment in any form. James Caldwell Willson papers, 1863-1912 and 1939, Bentley Historical Library, University of Michigan-Ann Arbor.

[61] Dr. Willson’s life was somewhat incredible. Born in Canada to Scotch-Irish immigrants, he set out to strike it rich during the California Gold Rush of 1845. He made it to Olean, New York, where he was too ill to continue. He purchased a daguerreotype business from a man who wanted to pursue medical studies. Willson was inspired by the man’s interest in medicine and used the business to make money for his medical education. He graduated from the University of Michigan School of Medicine in 1858 and practiced in Flint. Willson served as a contract surgeon during the Civil War. He married the daughter of the famous Michigan governor, H. H. Crapo. Through marriage, Willson became uncle to William C. Durant, the founder of General Motors. Willson ran an incredibly successful medical practice before he died in 1912,

formulating extra allowed them to grow their business. Doctors could sell pills catering to the local citizens while lessening the burden of medical care on the doctor by offering premade remedies. In 1855, Alonson Howard, a former New Yorker, set up a medical practice in Tekonsha Township, Michigan. Supply shortages did not allow Howard to practice one type of medicine.[62] He often moved to using botanical and homeopathic ingredients for medicine formulation primarily out of necessity, which was not uncommon in the nineteenth century. Howard was largely self-taught and relied on other sources to learn *Materia medica.*[63] Howard lived near Potawatomi Indians, whom he employed to teach him about local plants and their healing properties. Howard compiled dozens of notebooks covering medication recipes he formulated into an ingestible form for patients and customers.[64]

Michigan had advantages in both opportunities: lower competition, fewer financial restrictions, and no shortage of experience opportunities. Settling doctors were often overwhelmed with patients, making the reception of experience more malleable. Doctors showed their dedication to treating patients in the countless reminiscences of those in the medical field. Dr. Henry Fairbank, born in Rome, New York, in 1824, had an unusual inspirational push into medicine when a phrenologist told him the shape of his head looked like one cut out for

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[62] The nineteenth century saw several schools of medicine arise out of resistance to the heroic medicine of the day. This included allopathic or orthodox medicine, homeopathic, hydrotherapy, Thomsonian Medicine, and others. They competed with allopathic medicine for legitimacy right up until the twentieth century. Michigan doctors were widely integrative, using multiple schools of thought to treat patients.

[63] *Materia medica* was the study of the healing properties of materials, chemicals, plants, etc. Medical schools taught the subject until the twentieth century, when it was replaced with pharmacology. The term originates from the first Century book *De Materia Medica* by Roman army doctor Pedanius Dioscórides. His book was seen as central to the study of pharmacology for over 1500 years.

[64] Dr. Alonson Howard's Physician Recipe Book, 1864-1868, Howard Family Papers, Benson Ford Research Center, Dearborn, Michigan.

medicine.[65] Fairbank purchased a Grand Blanc, Michigan, medical practice in 1847 that immediately demanded most of his time. His work meant riding thirty to forty miles daily. In November 1855, he rode twenty miles in a punishing winter storm that left him with lingering lung issues. The illness forced Dr. Fairbank to travel to Texas to recuperate, where patients overwhelmed him at every stop.[66] In 1857, he returned to Grand Blanc to continue his practice.

The experiences of Dr. Fairbank reflected the typical life of the pioneering Michigan doctor. Doctor William B. Lincoln started his Iona County medical practice in 1833. As the sole physician in the Grand River Valley "for several years," he was forced to ride a forty-mile day on average, even once traveling sixty miles to deliver a baby.[67] Alonzo Palmer, a physician who later spent his life teaching at the University of Michigan medical school, wrote that" often homes of distant patients could only be reached by bridle paths through the woods," and he was known to swim across rivers.[68] A doctor from Oceana, Thomas Phillips, lived along the roadless shores of Lake Michigan, with the beach serving as his only available path from Muskegon to Lincoln. Locals often spotted Phillips swimming while balancing his clothes and medical bag on his head.[69]

The wealth of experience opportunities resulted from unfortunate circumstances. Settlers in the "land of ills" were constantly threatened by disease. Two cholera epidemics, one in 1832 and another in 1834, were the worst in Michigan's early history. The 1832 outbreak found its

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[65] H. W. Fairbank, "A Sketch of the Life of Dr. Henry Fairbank: By his son, H. W. Fairbank, Chicago, Ill," in *Michigan Historical Collections,* vol. 29 (Lansing: Wynkoop Hallenbeck, 1901), 128-137.

[66] Henry Fairbank to the Editor of the *Wolverine Citizen,* February 12, 1856, in *Michigan Historical Collections,* vol. 29 (Lansing: Wynkoop Hallenbeck, 1901), 137-140.

[67] Burr, *Medical History of Michigan,* 127.

[68] Ibid, 127.

[69] Ibid, 131.

1830 origin in Russia, spreading to England in 1831 aboard a ship called the *Edward.*[70] This form of cholera, called Asiatic Cholera, ripped through Europe, sparking panic in the United States. By August 1832, this dreaded disease had spread to America and killed as many as eighty to one hundred victims daily in New York City.[71] The accounts of painful and horrific deaths by cholera victims terrified Michigan citizens who feared the disease's spread.[72] Despite the Detroit government's plan of barring sailors without medical inspection, the disease entered Detroit on Independence Day, 1832. *The Henry Clay,* a ship carrying American soldiers to Chicago to aid in the Blackhawk War, landed in Detroit with two symptomatic patients. The officers ordered offloading the two men and sent them to Fort Gratiot, Detroit. This decision would have catastrophic consequences.[73]

Michigan authorities did their best to combat the disease through quarantine. The Michigan government banned travel from Detroit, and the new rules forced travelers from other states to live in a Ypsilanti quarantine facility. The locals took the rules seriously enough to see a

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[70] Amanda Thomas, *Cholera: The Victorian Plague* (Barnsley: Pen and Sword History, 2015), 33.

[71] Thomas, *Cholera: The Victorian Plague*, 53.

[72] Cholera is caused by the bacteria *Vibrio cholerae.* It is still common in impoverished or third-world countries where experts estimate that three to five million people are affected each year. The disease is not contagious but does spread when the fecal matter of an infected person contaminates food or drinking water, and the unsanitary nineteenth-century living conditions caused massive outbreaks. Symptoms of cholera include profuse diarrhea and vomiting. Modern treatment consists of the administration of fluids and antibiotics in some cases. Without known treatment in the nineteenth century, patients suffered horrible and painful symptoms before death. The vomiting and diarrhea were continuous until dehydration eventually stopped the symptoms. Patients would then have blue skin, sunken eyes, and a skeletal frame. Muscle cramps were torturous. Preventatives included cleanliness, withholding or abstaining from alcohol use, and medical treatment included bleeding, emetics, opium, and numerous other treatments that did not work.

[73] "Cholera Among the Troops," *New York Spectator,* July 19, 1832. https://link.gale.com/apps/doc/GT3003762541/NCNP?u=vic_liberty&sid=bookmark-NCNP&xid=4c6bbaa3 (Accessed June 4, 2023).

Detroit mail coach fired upon by Ypsilanti quarantine officers, killing one horse.[74] Quarantine measures failed to stop the disease, and the fears were reasonable. Five of Warren Nichols's family in Athens, Michigan, including three young children, were killed by the disease.[75] Joseph Busby recalled a Detroit newcomer couple staying at a Detroit tavern while the husband went out to purchase land. When he returned three days later, the man's wife died from cholera. Busby was taken ill with the disease and survived, but his attending physician died of Cholera in 1832.[76] The disease, which carried a 10 to 20% death rate, saw a lull in 1833 but surged again in 1834, spreading to remote Michigan towns with the second scourge.

Patients constantly employed doctors without a break during the countless disease epidemics that affected Michigan, especially the two early cholera outbreaks. Kalamazoo County Doctor, Dr. Thomas, was constantly gone and was forced to leave a chalkboard screwed into his office door for patients to leave messages while he was gone. Patients filled his board daily; he returned from work and worked through the night without sleep.[77] There was little doctors could do without modern cleanliness and hygiene knowledge. Dr. Rice of Detroit worked all day on August 16, 1834, when thirty-seven cholera patients died. When Mr. Harry Cole asked Rice for news on the epidemic, Rice said, "Every patient that I have bled has died, and all my patients are dead," following that up with the statement that everyone else infected would die from the disease.[78]

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[74] B.O. Williams, "First Settlement of Shiawassee County- Written by B.O. Williams, and Published in the *Owosso Weekly Press* in May, 1872: Read at the Annual Meeting of the Michigan State Pioneer Society, held at Lansing, February 6th, 1878," in *Michigan Historical Collections,* vol. 2 (Lansing: Robert Smith Printing Co, 1901), 513.

[75] "Athens," in *Michigan Historical Collections,* vol. 2, 209.

[76] Joseph Busby, "Recollections of Pioneer Life in Michigan," *Michigan Historical Collections,* vol. 9, 122.

[77] Burr, *Medical History of Michigan,* vol. 1, 697.

[78] Ibid, 698.

Doctors were exposed to countless other diseases aside from cholera during the early years of Michigan's history. Smallpox still ran rampant amongst Native American groups, and in 1850, one doctor worked his best to help a Chippewa Village near Fort. Saginaw. Smallpox attacked the small group of 600 Chippewa at such a rate the disease-weakened people had to bury their dead in shallow graves on the sandy shores of the Tittabawassee River.[79] Michiganders suffered from Ague, Malaria, Yellow Fever, Malignant Fever, Bilious Fever, and Tuberculosis. The experience garnered coincided with a growing relationship between locals and their physicians. Growing feelings of respect for local doctors were reminiscent of Benjamin Rush's work during the 1793 Yellow Fever epidemic. While Philadelphia's sick and dying patients were piling up, Benjamin Rush worked among them, gaining heroic status. Michigan doctors established themselves in times of turmoil, like Rush, and went on to practice for decades amongst their communities.

Medical treatments were certainly lacking during the cholera epidemics and various disease epidemics to follow. In total, medical treatments showed little promise for most ailments. Doctors of the first half of the nineteenth century practiced with minimal education, without antibiotics, anesthetics, knowledge of germ theory, drug trials, and much of the standard treatments deemed a part of archaic medical practices. Doctors rarely use bleeding and never recommend treatments like purging, sweating, and blistering through the understanding of modern science. Michigan doctors had little to offer patients aside from comfort through drugs like laudanum, opium, and some others, while most of the prescriptions caused patients to suffer or did nothing at all. Supply shortages and inaccessibility to medicine gave doctors few options

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[79] Bela Hubbard, "A Michigan Geological Expedition in 1837: Read before the Wayne County Pioneer Society, February 5, 1872," *Michigan Historical Collections,* vol. 3, 189.

aside from homeopathic medicine or other natural remedies from the available flora. Surgery was virtually nonexistent before the 1846 discovery of anesthesia. Surgeries were painful enough to risk death through trauma and almost always resulted in infections that could be life-threatening. The discouraging nature of the medical field did not sap the eagerness of doctors to gain experience treating patients and the eagerness to use that experience to add to the medical science and discourse of the time.

Despite the lack of a proper healing apparatus for Michigan doctors, there were still redeeming qualities to their medical careers in the early nineteenth century. As mentioned, many doctors and thousands of others have had long and fruitful medical careers. Their medical careers straddled a time when medicine was somewhat hopeless and a time when medical science rapidly advanced, forever changing the quality of life for Americans and others worldwide. No generation of doctors had to adapt to a level of change like the doctors who practiced in the decades before the Civil War into the twenty to thirty years after. There was a generation that experienced the use of anesthesia, the professionalization of medicine, the growth of medical societies, rapid changes in medical science, standardization of medical education, the exponential publication of new medical journals, the discovery of antisepsis, and the discovery of germ theory. Moreover, this generation trained numerous generations eager to absorb the experience and new information offered through observation and professionalization. Their generation experienced one of the most significant catalysts for change in medicine, the American Civil War.

The experience was a powerful tool to modernize medicine, but perhaps the greatest was the desire to observe and experiment. These ideas of experimentation and the use of scientific methods grew along with the professionalization of medicine. The Jacksonian and Jeffersonian

ideas of individualism kept many doctors from collaborating. With entrepreneurship dominating the medical field during the first quarter of the nineteenth century, there was little push to advance the medical field. Hospitals were rarities, and there was little aside from medical schools for doctors to unite and share the goal of advancing medicine and science.[80] Deep within medical society ran a desire to legitimize the profession and collaborate, evidenced by the creation of medical journals and the reinvigoration of medical societies. This movement came to fruition in the middle of the century.[81]

While Michigan was an ideal landing place for doctors needing work, experience, or other circumstances, the state came into being at the right time to make way for a promising medical field. Heroic medicine of the nineteenth century burdened the medical profession with a growing distrust in the tenets of medicine. Allopathic medicine, as doctors and scientists later called it, or standard therapy, was dedicated to massive doses of medication along with other torturous methods. Ideas revolved around the premise that the production of bodily reactions is what proved medicine was working. Many people in the United States rejected the premise of medicine as the brutal suffering caused by many doctors opened the door for self-care and competing medical ideologies. The greatest change occurred around 1814 when German doctor Samuel Hahnemann's methods produced a new healing method in homeopathy.[82] Homeopathy

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[80] Hospitals were uncommon but were highly sought-after positions for young doctors. The experience offered by hospitals was invaluable. Michigan's first hospital, St. Mary's Hospital, opened in 1845, and there were a few public poorhouses and dispensaries but little in the way of hospital opportunities. Young doctors who worked in America's early hospitals sometimes paid the hospital for the opportunity to work there. This drive shows the tenacity of many doctors to learn. The Civil War would offer similar situations. Early in the war, many surgeons abandoned posts to get closer to action so they could have the opportunity to perform surgery. Once again, this shows many of these doctors' eagerness for their trade.

[81] Charles Rosenberg, *The Care of Strangers: The Rise of America's Hospital System* (New York: Basic Books, 1987), 4.

[82] Hahnemann (1755-1843) discovered low doses of cinchona bark while healthy, which gave him fever symptoms. He proposed that if a medicine given to someone healthy produced symptoms of a similar illness, then low doses of the same medicine would treat someone who was already sick with said symptoms. The traditional medical

represented a significant threat to the medical establishment as the low-dose mild treatments were far more desirable than the standard allopathic methods. Homeopathy later competed with orthodox medicine, Thomsonianism, herbalism, hydrotherapy, and others.[83]

American citizens pressured orthodox medical doctors to produce better outcomes and regain public confidence. In hopes of regaining the public trust, doctors established the American Medical Association in 1847, with one major purpose being to crack down on "quack" medicine. The American Medical Association sought reformation in medical education and worked to investigate the growing number of fraudulent healers, doctors, and druggists. A larger movement inspired the founding of the American Medical Association, which also inspired the growth of state-level professionalization. The *New York Medical and Philosophical Review* and *Philadelphia Medical Museum* publications started a trend towards localized medical journals.[84] Publishers created medical journals for the New England region, Boston, Louisville, Illinois, the American West, and New Jersey. Specialty publications offered differing theories of medicine, including Thomsonian and homeopathic medicine. Michigan's young medical industry fit within this larger conversation that aimed to shift the legitimacy toward orthodox medicine.

In 1848, the first Michigan medical journal was the *Michigan Journal of Homeopathy,* which immediately sparked a rising angst toward homeopathy. Michigan doctors reformed the

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community has disparaged homeopathy as a pseudoscience, but the practice does have a large body of believers. Irvine Loudon, "A Brief History of Homeopathy," *Journal of the Royal Society of Medicine* no. 99 (December 2006), 607-608.

[83] Thomsonian medicine comes from the ideology of Samuel Thomson (1769-1843). Thomson believed that restoring heat to the body was a cure for illness, so he promoted eating hot peppers, laxatives, and steam baths.

[84] *The Philadelphia Medical Museum* was first published in 1806 and the *New York Medical and Philosophical Review* published in 1809.

Peninsula Medical Society in 1851 to centralize medical ideology in Michigan.[85] In 1853, the orthodox medical field participated in the war against homeopathy by publishing *The Peninsular Journal of Medicine and the Collateral Sciences.* The first major Michigan medical journal came just two years after the first University of Michigan medical school graduating class of 1851. The legitimacy of the new medical school created distinguished young graduates who moved into a medical field that was open for the young and ambitious. Michigan now had a home for ambitious, zealous, science-minded doctors who wanted to advance medical science. Dr. Edmund Andrews was a highly ambitious graduate with the new school's inaugural class. He posted as an anatomy lecturer at the University of Michigan while co-founding and editing the *Peninsular Journal of Medicine and the Collateral Sciences.* Andrews's later career was one of brilliance as he became a medical educator, a respected military surgeon, and a medical and scientific writer.[86]

The new medical society and journals provided a scientific home for many prominent Michigan medical leaders. The establishment of medical literature and societies reverberated to the local level, giving the Michigan medical field a new era of collaborative research and standardization. Michigan medical leaders Dr. Andrews, Dr. Zina Pitcher, Dr. Alonzo Palmer. Dr. Moses Gunn, Dr. W. Brodie, Dr. Edward Batwell, and many others became leaders in the state's new medical movement.[87] The new, strengthening medical community set the tone immediately

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[85] The Michigan Medical Society was first organized in 1819 to oversee the credentials and education of doctors. A brief respite in the organization led to a reconvening, and in 1851, the Peninsular Medical Society was created.

[86] Edmund Andrews would be the first Union Army surgeon to write full medical histories of all cases. His notes later served as the standard for the Union Army Medical Department. Andrews work in antisepsis would revolutionize the medical field in the United States.

[87] Andrews, Palmer, Gunn, and Brodie contributed significantly to the shift in medical science during the Civil War. Each served as a surgeon during the conflict at varying times. Andrews, Gunn, Brodie, and Batwell had several cases published in the official medical history of the Civil War, *The Medical and Surgical History of the War of the Rebellion.*

for a new kind of group. Dr. Alonzo Palmer, in the 1856 issue of the *Medical Independent and Monthly Review of Medicine and Surgery,* wrote that Michigan doctors would "reject 'Old Fogyism' and Young Americanism' in medicine " and that the young would encourage the old and both would "endeavor to follow that spirit which combines the experience of the past with the novelties of the present."[88]

The timing of Michigan's statehood and the influx of physicians required a shift in the medical thinking of the era. The new medical journals and the design of the new medical school promoted a scientific light to the study of medicine. This scientific idea focused on the corroboration, examination, and observation of medical cases and studies. Michigan's medical founders passed this scientific idea down from doctors like William Beaumont and Zina Pitcher. This new promise of scientific and forward-thinking, as promoted by growing medical societies, medical journals, and a desire to improve in medicine, aided doctors who had garnered great experience in the medical field. As Palmer put it, it was a medical field in Michigan willing to combine the wisdom of the old with the zealousness and science of the young. This mentality helped Michigan doctors later adapt to the significant changes in medicine during the Civil War.

Factors pointing toward Michigan's medical growth and prominence seem clear. Tremendous army doctors established Michigan's medical legacy on the Michigan frontier. It was these same doctors who contributed to science and medicine. This legacy was carried forward, especially among doctors who wanted to continue work in the territory and the state of Michigan, like Dr. Zina Pitcher. The timing was impeccable due to the opening of the Erie Canal and an economic squeeze on doctors in New York and New England who carried the prominence of medicine in that region to Michigan. Doctors in Michigan were in high demand and were

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[88] Burr, *Medical History of Michigan,* 630.

pushed through heavy workloads, dealing with endless diseases and other cases. This growing wealth of experience later created the perfect condition for the ensuing rise of medical professionalism. These factors would prime a generation of doctors to adapt to the most rapidly shifting era of American medicine during the Civil War. This experience allowed Michigan surgeons during the Civil War to impact the changing medical ideology, adapt to the new doctrine, and carry that forward to change the medical field in Michigan after the war.

Chapter Three:

The Intellectual History of Medicine and the Founding of the University of Michigan Medical School

Introduction

The methodological approach debate has been a longstanding issue throughout modern history in medical education. Generations of doctors and physicians moved between the rationalist or empirical approach to medicine.[1] Rationalists centered their medical philosophy around medical theory without observable proof. On the opposite spectrum, Empiricists needed observation to determine something as fact. The debate between the two groups enveloped medical and scientific discussions during the modern era. Medical practitioners used a rationalist approach to medicine from the medieval period to the end of the early modern era and into the modern period. Doctors based their medical knowledge on theoretical beliefs over an empirical, experience-based system of medicine. Rationalist medical practice had dire consequences as doctors used their self-proclaimed expertise to solidify their place in society's upper echelons. The forceful nature of the rationalists deterred the thinkers of the Enlightenment that grew out of the early modern period. Rationalist elites used their influence to commit atrocious acts, like the European Witch Hunts of the early modern period.[2]

The latter end of the Early Modern Period gave rise to Enlightenment thinkers. Rationalists faced dissenters who took an empirical approach to understanding the world around them. Empiricists like Dutch physician Dr. Johann Weyer and German priest Friedrich Spee

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[1] In the eighteenth and nineteenth centuries, Americans based the difference between physicians and doctors on credentials. Physicians were graduates of a medical school program, while doctors were usually apprentice-trained. Physicians still carried the official "doctor" title, but the term physician conveyed credibility.

[2] The educated elite members of European society used their educational standing to inflict widespread hysteria during the Early Modern Period. Historians debate the cost, but anywhere between 100,000 to over 2,000,000 Europeans were tried and executed for witchcraft between 1450-1750. The Catholic Church's counter-reformation practices, largely the Inquisition, gave many Europeans an air of authority based on their learned superiority. Through this, they forced laypeople to turn their neighbors, family members, and vagrants into the authorities as alleged witches. The authorities systematically tortured to gain confession of witchcraft. Europeans saw witchcraft as the ultimate form of heresy during an era where heretics were bringing divine wrath to European society. These instilled beliefs were rationalist and bred a new era of skeptics who turned against these measures.

helped alter the attitude toward rationalists. Weyer's *De Praestigiis Daemonum et Incantationibus ac Venificiis,* written in 1563, and Spee's *Cautio Criminalis* turned the tide against the rationalists.[3] During the Enlightenment period, historians can observe the legacy of Weyer and Spee. Enlightenment thinkers popularized empirical thought after following the lead of early skeptics. Empiricism later became a dominant methodology in both science and medicine. Debates between the Empiricists and Rationalists played a significant role in developing medical education in the United States and, ultimately, the foundation of the University of Michigan Medical School. Students at the University of Michigan used a combination of empirical research and study with some aspects of rationalism. The University of Michigan Medical School instilled an approach known as "scientific empiricism" in its students and graduates who later took the field as Civil War surgeons.

American doctors fires established medical education in America during the Colonial years. John Morgan and William Shippen founded the University of Pennsylvania Medical College in 1765 after the pair completed training at the Edinburgh Medical School. Edinburgh was at the forefront of medical education during the 1760s. Shippen and Morgan used their superior medical education to establish a medical school in America when traditional apprenticeship or attending a European medical school were the only means of becoming an American doctor. Morgan and Shippen learned medicine from Edinburgh professors who combined Rationalism and Empiricism to understand the human body and the science of pathology. The first American medical school started a tradition of using European influence in American Medical Education. By the 1820s, when France became the leader in medical thought

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[3] Spee pushed for an Empirical approach to gather evidence on the Early Modern Period witch trials. In this passage, he wrote, "This work is essential as it shows a counter-effort to the rationalists." The later rejection of rationalists was much more decisive by the eighteenth century in Europe and America. Friedrich Spee, *Cautio Criminalis, or a Book on Witch Trials,* trans. Marcus Hellyer (Charlottesville: University of Virginia Press, 2003), 83.

and education, American medical schools reflected the French influence in medical education. The French medical model, known as the “Parisian Clinical School,” moved to a purely Empirical system where doctors were skeptical of anything they could not directly observe or experience. By the middle of the nineteenth century, the French model of education dominated American medical schools, and Paris became a draw for doctors looking to study abroad.

Another foreign influence was present when the University of Michigan opened the state’s first medical school in 1850. The founders of Michigan’s new medical school adopted a new ideology used in Germany’s medical schools. University leaders embraced the new Prussian or German model, which combined the Paris clinical school methods with empirical and rationalist methods. German doctors adopted the scientific method by formulating a hypothesis through theoretical ideas and using empirical methods to determine the viability of their hypothesis. By the twentieth century, American medical schools had made the German model the predominant means of educating doctors. This new German model, or “Scientific Empiricism,” grew in popularity immediately following the Civil War, continuing into our modern medical schools. The University of Michigan was the first medical school to adopt the German model, which ushered in the era of Michigan’s dominance in post-war medical education.

The works of influential eighteenth- and nineteenth-century thinkers drove the transition of competing methodological theories. By the 1820s, many authors and thinkers' perceptions of empiricism and rationalism became popular in medical education discourse. Books and medical journals consistently argued about the best approach to medical science. The founders of the University of Michigan were profoundly affected by the methodological debates in the nineteenth century. The school’s founders, notably the first University of Michigan President

Henry Tappan, were most influenced by the arguments in favor of the German methods of medical education. The rise of medical literature by the mid-nineteenth century, coinciding with the philosophy adopted by the University of Michigan, shows the power of the rising scientific debate surrounding medicine.

The debate between Empiricism and Rationalism consumed American doctors in the first half of the nineteenth century. While Americans saw the French Empiricists in the United States, the term took on a negative connotation for being associated with apprenticeship-trained doctors.[4] The early nineteenth-century American empiricists focused on a practical approach to medicine. The scientific realities of true empiricism stand as the modern approach to medical research and education. The American adoption of empiricism and later scientific empiricism mirrors the adoption of pure empiricism by the French in the early nineteenth century.[5]The French medical establishment adopted clinical medicine due to the French Revolutionary and Napoleonic Wars. The heavy casualties and centralization of France's Revolutionary and Napoleonic governments led to the establishment of numerous hospitals and clinics, making way for clinical study. In contrast, the American medical establishment adopted widespread scientific empiricism and clinical medicine during the Civil War. Much like the French, American doctors

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[4] The negative usage of "empiricist" was a common term in American medical literature before the Civil War. Empiricists did not bother to understand the mechanism or theories of disease. They focused on the treatment of disease and whatever they could witness through their own observation. The French applied clinical methods to their empiricism. The French used large hospitals and conducted clinical trials on numerous patients. The American "empiricist" connotated apprenticeship-trained doctors who had lacked training in theoretical medicine or reasoning. These "empiricists" were notorious for administering medications in such quantities as to produce a visible effect. These doctors were known for their use of heroic methods, including the use of purgatives, laxatives, cathartics, venesection and other dangerous methods. The "empiricists" of the first-half of the nineteenth century gave doctors a bad name and were instrumental in the rising distrust of the medical field. The Civil War was monumental as an event to remove the poorly-trained "empiricists" from the medical field especially during the rise of post-war medical licensing regulations.

[5] Scientific empiricism in this context refers to the use of rationalism or theory to formulate a hypothesis. Then scientific or clinical application are used to confirm or disprove a hypothesis. Pure empiricism used by the French ignored the theoretical approach to medicine as they were only interested in observable results.

had found the ecosystem necessary for the medical community to partake in collaborative medical studies.

The University of Michigan was the only pre-war medical school to utilize scientific empirical methods in the classroom before the Civil War. Faculty founded the medical school after doctors had recognized the merits of empiricism. The founders also realized the shortfalls of a purely empirical system. The University of Michigan faculty saw the importance of scientific teaching and used their new philosophy as a blueprint for the university. The new methodological theories led to the foundation of the first major chemistry laboratory for an American medical school. Professors did not simply teach practical aspects of medicine but also taught subjects like pathology, physiology, chemistry, microscopy, and pathological anatomy. The intellectual history of modern medicine is an essential background for understanding medical science before the Civil War, along with the predominant presence of Michigan's medical school years before and during the conflict.

Intellectual History

During the American Colonial Era, the medical field primarily comprised apprenticeship-trained doctors. Between 1607 and 1776, only four hundred American doctors out of more than three thousand had medical degrees.[6]Before John Morgan and William Shippen opened the first American medical school, earning a Doctor of Medicine was only obtainable for wealthy Americans. Earning an MD required travel to Europe, the destination of America's medical founders like John Morgan and Benjamin Rush.[7]As Americans had no means of gaining a proper

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[6] Martin Kaufman, *American Medical Education: The Formative Years, 1765-1910* (Westport: Greenwood Press, 1976), 10.

[7] Dr. John Morgan (1735-1789) was a former Continental Army doctor who founded the College of Philadelphia Medical School in 1765. Benjamin Rush (1746-1813), a signer of the Declaration of Independence, had a paramount influence on the direction of American medicine.

medical education before 1765, Americans determined the quality of their doctors by the value of their apprenticeships. Medical apprentices from the Colonial Era to the Civil War were largely uninterested in learning medical theory and the study of "physic."[8]

The apprenticeship system had shortcomings. Even renowned American doctor Benjamin Rush questioned the value of his apprenticeship. From 1761 to 1766, Dr. Benjamin Rush worked alongside Dr. John Redman, a renowned attending physician at the Pennsylvania Hospital. Redman mainly employed Rush on the business side by keeping the books, collecting bills, compounding the doctor's prescribed medicine, and working as a nurse to assist the doctor.[9] Redman's busy Philadelphia practice occupied Rush, allowing him just 11 days from the office. Rush spent his free time studying medical books from Redman's library or attending evening classes at the new University of Pennsylvania Medical College, opening in 1765. Rush even had the rare benefit of making hospital rounds with his mentor at the Pennsylvania Hospital.[10] Despite the years Rush spent working with Redman and studying in his library, Redman pushed Rush to study medicine abroad to earn his degree. Rush then traveled to Edinburgh in 1766.[11]

Rush and other apprentices during the 1700s were missing some critical aspects of medical education. The apprenticeship lacked the benefit of working alongside fellow students. A collaborative union with like-minded peers is a driving force in medical science. Apprentices were sheltered from outside ideas as they worked and learned at the whims of their mentors. The

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[8] Physic is a term often used in primary sources until the mid-nineteenth century. The term refers to an overall knowledge of nature. It is further defined as treatment with medicine.

[9] Benjamin Rush, *A Memorial containing Travels Through Life or Sundry Incidents in the Life of Dr. Benjamin Rush; Born Dec. 24, 1765, Died April 19, 1813; Written by Himself also Extracts from His Commonplace Book as well as A Short History of the Rush Family in Pennsylvania* (Lanoraie: Louis Alexander Biddle, 1905), 19-20.

[10] Rush, *Memories,* 21.

[11] Rush completed his Doctor of Medicine degree in 1768. He then returned to Philadelphia and became a chemistry professor at the College of Philadelphia.

students learned some outside ideas from the books they studied, but their preceptors rarely introduced them to new ideas the mentors deemed unnecessary. John Morgan, the founder of the University of Pennsylvania Medical School, discussed the pitfalls surrounding apprenticeship in his *A Discourse upon the Institution of Medical Schools in America,* which he published in 1765. Morgan saw the apprenticeship system lacking "a casual conversation sometimes with the most able masters whom they can have access to consult."[12] Morgan argued that a proper medical school allowed students to have "reciprocal communication" with their masters and classmates. Medical schools offered students a place to discuss new literature, articles, cases, and authors.

Medical school professors and innovators, along with John Morgan, recognized the downsides of the apprenticeship system. Silas Douglas, the longtime pioneering professor at the University of Michigan, kept an active medical practice while also training numerous doctors during his years as a medical school professor. Douglas became Michigan's undergraduate chemistry professor before the medical school opened in 1850. Douglas's heavy workload as a professor and preceptor forced him to neglect some aspects of training his apprentices. Douglas expressed his disillusion with the apprenticeship system by writing to fellow Michigan medical professor Abram Sager in 1845. Abram Sager trained apprentices in his Jackson, Michigan practice, where he consistently performed medical dissections for his students. Douglas had no time to teach post-mortem examinations to his apprentices, so he sent them off to learn the practice under Sager. Douglas's cumbersome medical practice led the professor to become "sick of this practice of medicine," as he wrote to Sager.[13]Instead of spending his time training his

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[12] John Morgan, *A Discourse Upon the Institution of Medical Schools in America: Delivered at a Public Anniversary Commencement, held in the College of Philadelphia, May 30 and 31, 1765,* (Philadelphia: William Bradford, 1765), 19.

[13] Silas Douglas to Abram Sager, January 16, 1845, The Abram Sager Papers, 1838-1877, Bentley Historical Library, University of Michigan-Ann Arbor.

apprentices in the practice of medicine, circumstances forced Douglas to use them as free labor. Douglas sent apprentices to collect medical bills, which they had "great difficulty in collecting." The situation for Douglas was common among most preceptors. Practicing doctors were busy treating patients and running their businesses with little time to train their apprentices.

While American medical schools emerged out of necessity, they were far behind their European counterparts, even as the number of American schools grew exponentially. European schools and doctors had advanced much farther in the medical field, and medical school-trained doctors became the predominant contributors to European medical science. The training methods used by medical schools varied by nation. England medical schools trained students in practical medicine methods, but the greatest focus was on theoretical medicine. Medical professors at schools like Oxford, Cambridge, and Edinburgh inundated their students with studying medical theory.[14] Before the 1820s, England and Scotland offered a premier medical education program that drew some Americans to study abroad. A minimal number of American medical students could afford the trip to England or Europe between 1765 and 1865.[15]The number of physicians migrating to America dwindled by the late 1700s as the population grew. The lack of Americans going abroad for training and the decreasing number of European doctors moving to America created a doctor shortage crisis.[16]

In contrast to England and Scotland, American apprenticeship-trained doctors saw little use for theoretical medicine, a significant component of English medical education. The

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[14] John Duffy, *From Humors to Medical Science: A History of American Medicine* (Urbana: University of Illinois Press, 1993), 10.

[15] Historical estimates show that the number of American physicians who took their medical degrees from European schools is around 1,000. Shauna Devine, *Learning from the Wounded: The Civil War and the Rise of American Medical Science* (Chapel Hill: University of North Carolina Press, 2014), 4.

[16] Duffy, *From Humors to Medical Science,* 10.

Enlightenment affected not only American political philosophy but also American medical ideologies. American doctors were more interested in the Enlightenment principle of Empiricism. This was predominantly a by-product of their training, which utilized practical methods and experience. The focus on personal experience originated with the Scottish philosophers of the Enlightenment. David Hume was a popular source of post-Revolutionary thinking in American culture and medicine. Hume stated that "Matters of fact" manifested truth that came from human experience.[17]Apprenticeship-trained doctors were more likely to apply Hume's basis of understanding to medical practice.[18]The opportunity for Americans to learn the theoretical aspects of medicine was lacking before the spreading foundation of medical schools.

Antebellum American medicine was mainly composed of apprentice-trained doctors, so there was ample room for the growth of medical theory. The opportunity for medical theorists had both positive and negative implications. American medical scientists constantly wavered between medical philosophies. The growing field of medical science led to numerous schools of pseudoscientific treatment methods and increased scientific empiricism. When the University of Michigan Department of Medicine and Surgery opened in 1850, the medical establishment started to lean toward an early version of scientific empiricism.[19] For the two centuries preceding the medical school's opening, the field of medicine experienced a war of ideas that would affect the trajectory of medical education and the curriculum used at the University of Michigan.

The history of medicine after the Early Modern Period is a fascinating study of the intellectual foundations of modern medicine. Early Modern experts in all fields, including

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[17] David Hume, *An Enquiry Concerning Human Understanding*, ed. Tom Beauchamp (New York: Oxford University Press, 1993), 108-109.

[18] Duffy, *From Humors to Medical Science,* 11.

[19] Richard Shryock, "Empiricism versus Rationalism in American Medicine, 1650-1950," *Proceedings of the American Antiquarian Society* 79, no. 1 (January 1969), 124-127

medicine, were drawn heavily towards conjecture and theory. Their understanding of abstract concepts of thought allowed them to draw on their "expertise" and refer to themselves as "authorities." The learned elite of European societies during the Medieval and Early Modern Periods were primarily ecclesiastical figures who used metaphysical ideas or conspiracies to enforce their authority. This played out in some catastrophic instances. Between 1450 and 1650, the rise of the Protestant Revolution led to a counter-revolution from the Catholic Church that sparked an increase in new forms of religious dogma. The Dominican Order arose and traveled throughout Europe to combat the heresy that brought God's wrath upon the earth through famine, plague, and war.[20] This hunt for heresy manifested the Inquisition, which saw acts of horror, like the European Witch Hunts, committed on behalf of ecclesiastical authorities. Authorities worked afflictions like witchcraft into medical texts.[21] The prominent intellectual figures of the era used their expertise to drive a European craze.[22]

The learned elites who promoted the witch hunts were ardent observers of a rationalist ideology. Rationalists viewed the world through a lens of theory and often ignored empirical approaches to any field, let alone medicine. With the growth of Enlightenment thinking, there was a more extensive adherence to thinkers like Sir Francis Bacon and David Hume. Bacon's promotion of the scientific method exemplifies feelings toward the rationalist school of thought. In the preface to Bacon's 1650 Novum Organum, he wrote: "They who have presumed to

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[20] Lyndal Roper, *Witch Craze: Terror and Fantasy in Baroque Germany* (New Haven: Yale University Press, 2004), 26-27.

[21] Hans Broedel *The Malleus Maleficarum and the Construction of Witchcraft: Theology and Belief* (Manchester: Manchester University Press, 2003), 7-8.

[22] Heinrich Institoris' bestselling witch-hunting treatise, the *Malleus Malifecarum,* sparked a movement that saw thousands executed for the crime of witchcraft. The Dominicans who promoted the movement and tortured their victims did so under the guise of "authority." The Enlightenment Period brought about an era of skepticism towards the witch craze, but the damage had already been done. Historians estimate the witch trials saw death tolls numbering from between 25,000 to over 150,000.

dogmatize on nature, as on some well-investigated subject, either from self-conceit or arrogance and in the professorial style, have inflicted the greatest injury on philosophy and learning."[23] The European aversion to dogma led to the rise of Empiricism. Bacon reasoned that the early modern commitment to dogma had eliminated outside investigation in the name of authority. Bacon believed the lack of investigation had set back scientific and logical reasoning advancement. He wrote that the "theories of mankind are but a kind of insanity."[24]Bacon was central in popularizing the skeptical approach to science. The *Novum Organum* proposed an applied skepticism to inductive reasoning while moving away from dogmatic rationalism.[25]

Philosophers like Bacon significantly influenced America during the Colonial Period, but Empirical teaching was slow to infiltrate the medical elite. Prominent European medical professors of the era, like William Cullen of Edinburgh, disparaged the lowly empiricists. Edinburgh professors who shared this sentiment taught some of the most prominent medical innovators of the Colonial and Early Republic eras of American history. They taught founding American medical figures like Benjamin Rush, John Morgan, and William Shippen. Each of these founders had studied under Cullen. Like many of his colleagues, Cullen believed that empiricists focused solely on the treatment method over using theoretical medicine to understand medical science.

Contrary to medical rationalists like Cullen, the empiricists saw the study of theoretical medical science as a worthless and time-consuming activity. What good was knowing the action of neurons, or muscles, when all that was needed was medical treatment? The empiricists believed that patients did not seek doctors to express scientific knowledge but sought doctors to

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[23] Francis Bacon, *Novum Organum,* ed. Joseph Devey (New York: P.F. Collier & Son, 1902), 5.

[24] Bacon, *Novum Organum,* 12.

[25] Ibid, 15.

cure their ailments. Rationalists like Cullen smugly looked down upon the lowly empiricists and worked to combat the empiricist teaching by retaining the rationalism they believed made medical education superior.

Professors at the Royal College of Physicians at Edinburgh grappled with the changing philosophical movement within medicine. They did not outright reject empiricism but incorporated it into their version of rationalism. Cullen's colleague, Dr. John Rutherford, taught a theory-based medical school course, The Practice of Medicine. The Practice of Medicine became a staple of American medical schools, including the University of Michigan. Rutherford worked to transition Edinburgh out of a purely rationalist system between 1724 and 1765. Professors expressed concerns over a rationalist system in Edinburgh's annual publication of *Medical Essays and Observations*, published by the medical department. The authors wrote in their 1733 edition that the knowledge and cure of diseases should "depend on observations of facts that ought to be frequently repeated before any certain axiom in Physick can be built on them."[26]

Like many medical school professors, Rutherford had to heed their medical students' desires. Students wanted more clinical opportunities, resulting in a push toward empiricism in medical education. By the 1750s, John Rutherford had incorporated clinical and theoretical aspects of medicine into his curriculum.[27]He taught that physicians could properly discern the validity of their medical theories through the empirical practice of gathering data and evidence. According to Rutherford, distinguishing between diseases required a semblance of medical theory. He taught that a valid physician "may properly be called a Dogmatical or Reasoning

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[26] *Medical Essays and Observations,* vol. 1 (Edinburgh: T and W. Ruddimans, 1733), vi.

[27] Stephen Craig, "'Enquire into All the Circumstances of the Patient Narrowly: John Rutherford's Clinical Lectures in Edinburgh, 1749-53,'" *Journal of the History of Medicine and Allied Sciences* 72, no. 3 (May 2017), 307-309

Physician."[28]His courses involved clinical rounds, which he used to properly take a medical history, assume causation, diagnose the patient, present treatment, explain new symptoms, discuss therapeutic action, and discuss cure alternatives.[29]Rutherford's changes to rationalist medicine and the adaptation of clinical medicine occurred with a changing philosophical environment at the university. Students at the medical school and other university programs were observing the works of philosophers and scientists like John Locke and Isaac Newton. There was a school-wide acceptance of debate and skepticism within the school during a time when the school moved to the forefront of medical education.

Perhaps the most catastrophic change for the future of American medicine came from Rush's adherence to William Cullen, John Rutherford's successor. From 1755 to 1790, Dr. Cullen attracted American medical students from abroad. Cullen was renowned for his experimental chemistry and medical school courses. Doctor Cullen was a proponent of monistic therapy and medical systems, which became commonplace during the late eighteenth and early nineteenth centuries.[30]The professor was interested in many aspects of medicine, including the intersections between rationalism and empiricism, making him a proponent of disease classification. Diseases were difficult to discern as their recognition was based solely on symptoms. Cullen's work in classifying diseases gave him the impression that a likely common cause of disease came from an imbalance of the nervous system. His famous two-volume medical treatise, *First Lines of the Practice of Physic,* gives the two significant cures to disease:

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[28] Craig, "Enquire into All the Circumstances of the Patient Narrowly," 310.

[29] Ibid, 313.

[30] With little access to modern pathological technology there were many questions surrounding actions occurring within the human body. Medical professors and doctors throughout the world often sought a singular cause to all disease. Adherents to this line of thinking proposed simple solutions to understand and cure disease. One example, later utilized by Benjamin Rush, is humoral pathology. Rush thought all disease was caused by an imbalance of body fluids and all could be solved through bleeding, sweating, purging, etc. This is referred to by historians as monistic therapy or a medical system.

opium and alcohol. A loss of mobility of nervous power was the central cause of disease, which arose from exposures to toxic fumes that were common in everyday life.[31] Cullen's easy fix for treating all diseases, known as a system, would become a rising phenomenon that began in the 1750s and made its way to American life during an era of rational-empirical medical science. One of America's most critical medical founders, Benjamin Rush, was a disciple of Cullen and subscribed to monistic therapies. Rush would later change the face of American medicine. He recalled his time at Edinburgh by saying, "The two years I spent at Edinburgh I consider as the most important in their influence on my character and conduct of any period of my life."[32]

At the turn of the nineteenth century, the two polarized medical ideologies caused dilemmas for United States medical philosophers and educators. Edinburgh-educated doctors like William Shippen, John Morgan, and Benjamin Rush proliferated the lessons learned from professors like William Cullen. The first medical college in the United States, in Philadelphia, was headed by a trio of Edinburgh graduates who looked to pass on the systematic ideas surrounding disease. Benjamin Rush was the most influential of the group; they produced prevalent works on various diseases and held a powerful position in America's largest medical school from 1769 until he died in 1813. Historians estimate that Rush educated over three thousand medical students during his decades of teaching. Many graduates expanded their knowledge to the next generation of doctors. Medical professors in the early nineteenth century garnered a better medical reputation, and someone of Rush's stature had an opportunity to create a sizeable medical legacy. Unfortunately, the influence Rush had on medical history led to years of harmful and painful medical treatments.

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[31] William Cullen, *First Lines of the Practice of Physic,* vol. II (New York: Samuel Campbell, 1777), 77.

[32] Benjamin Rush, *A Memorial Containing Travels Through Life, or Sundry Incidents in the Life of Dr. Benjamin Rush, Born December 24, 1745* (Lanoraie: Louis Alexander Biddle, 1905), 24.

Benjamin Rush became the father of "heroic medicine" in the United States, popularizing torturous treatment methods like bleeding, purging, blistering, and other heroic therapies. However, historians should not center their entire opinion of Rush on using and promoting harmful methods. The doctor was also an empiricist who understood the value of clinical study and quantitative analysis. In his two-volume work Medical Inquiries and Observations, historians can access a mind driven by reasoning and analysis. Rush used his service in the Continental Army to his advantage as his service allowed him access to numerous patients. His rudimentary records of the war foreshadow the records kept by the Union Army Medical Department during the Civil War. Rush recognized trends, including regional aspects of medicine, in which southern-born soldiers struggled in the northern climates of the Revolution compared to the Americans from the Northern region.[33] Rush tallied the range of camp diseases and the observed efficacy of his prescribed treatments. Contrary to widespread feelings of the eighteenth and nineteenth centuries, Rush was a major proponent of the autopsy, writing," open all the dead bodies you can, without doing violence to the feelings of your patients, or the prejudices of ordinary people."[34]

While the evidence shows Rush partially adhered to empirical medicine, his most significant and disastrous effect involved formulating a monistic therapy. While Rush's professors at Edinburgh were disciples of the clinical-empirical school, they were still holdovers from the era of rationalistic medicine. As stated, Rush's mentor, William Cullen, was an apologist for medical systems. As a medical school graduate, Rush opened his Philadelphia practice in 1769. During the early years of his medical career, he was "regulated in my practice

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[33] Benjamin Rush, *Medical Inquiries and Observations* (Philadelphia: M. Carey and Son, 1818), 147-148.

[34] Rush, *Medical Inquiries and Observations,* 260.

by the system of medicine which I had learned from the lectures and publications of Dr. Cullen."[35]Rush's strict adherence to Cullen's principles surrounding disease classification and a major, singular cause of disease had cost him patients and autonomy in advancing his medical theories. A despondent Rush recognized the futility of being Cullen's disciple as he walked the grounds of the Philadelphia Medical School after his appointment in 1789. He had an epiphany as he crossed the corridor to his office one day.[36] Rush valued Cullen's line of simplified medicine but curtailed it to meet his standards. Benjamin Rush pushed for a simpler, shorter tenure of medical education for doctors. Rush believed medical science to be so simple as to consume only two years of study. Rush believed it took only two years to understand what was "practical in it."[37]

Practical medicine to Rush meant a singular cause for many ailments. While Cullen had used neuronal movement as his causative agent in disease, Rush determined capillary action to be the primary cause of disease. Dr. Rush's belief that medical education was simple shows his movement towards a greater sense of Empiricism that would become popular in the antebellum United States. The irony, however, was Rush's commitment to rationalism through his belief in capillary causes for disease.[38] An imbalance in the blood made venesection, or bleeding, a crucial component of what was later known as "heroic medicine."

In his memoirs, Rush recounted his campaign to prove the validity of his practice. He was published in numerous newspapers, published several books, lectured, and felt vindicated by

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[35] Rush, *A Memorial,* 61.

[36] Ibid, 62.

[37] Ibid, 63-64.

[38] Shryock, "Empiricism versus Rationalism," 110.

a growing medical practice. Many of his fellow Edinburgh students and Cullen disciples were opposed to Rush's practice.[39] Rush, however, felt fully vindicated during the 1793 Yellow Fever epidemic, during which he extensively used empirical evidence to better understand the efficacy of his medical treatments.[40]

While a 21st-century audience denies the validity of Rush's treatments, the thousands of doctors who trained under Rush or read his books and articles proliferated his ideas. Rush's students branched out to become medical educators, even founding Rush Medical College in his name. Once Rush's methods became commonplace, pragmatic empiricists adopted them, using them to great detriment. Doctors of the nineteenth century, especially those of the majority who did not attend medical school, wanted practical medical advice. While historians dictate that these doctors were empiricists, they were hardly scientific empiricists. The empiricist from the apprenticeship system was mocked mainly by the highly educated physicians in medical society. In truth, the empiricists saw little value in many of the theories offered by medical schools. Rush's ideas surrounding heroic medicine showed there was a simplistic answer to most diseases, one solved through bleeding, purging, or blistering.[41]

Empiricism was on the pole opposite the rationalists of Edinburgh's descendants. Apprenticeship-trained doctors truly cared about treatment over physiology. The lack of medical regulation in the early American Republic, along with medical freedom, split medicine into two camps, between the educated and the apprenticeship doctors. Doctors across the United States were more concerned with the economic incentives of their vocation. Medical education became

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[39] Rush, *A Memorial,* 63.

[40] Ibid, 69.

[41] Shryock, "Empiricism versus Rationalism," 111-112

a means to a more prominent reputation as a physician and little else—economic incentives in medicine and a strictly empirical approach allowed for office or field turnover. Patients were more concerned with getting better than they ever were with theoretical medicine. Unfortunately, the empiricists became somewhat radicalized adherents to the heroic methods espoused by America's medical founding father, Benjamin Rush. This radical following dampened medical innovation somewhat for decades, as was noted by Dr. John Godman in 1825.[42] Godman, the director of the Philadelphia Anatomical Rooms, wrote that the empirical path of medicine and pathological study, which originated in the Renaissance, was derailed by rationalism. The rationalism that polarized medicine drove modern medicine into a rut. The response to this stagnation was to move in the opposite direction by adhering to Empiricism. Camps from both sides of the philosophical spectrum radically held on to their beliefs.

While the medical field was polarized, there were enough voices in the medical education movement to understand medicine's trajectory. Doctors of a more elitist leaning started to recognize the European shift in medical dominance immediately after Napoleon Bonaparte's rise. The French, or Paris Clinical School of medicine, was almost strictly empirical, but by the 1820s, the French medical system adopted methods of scientific empiricism. French educators were committed to a clinical model of education, but one that made heavy use of quantitative analysis. In the Parisian Model, statistical analysis focused only on the observable outcomes. French physicians and students slowly rejected the medical dogma that surrounded rationalist thinking. By the 1820s, the French Model of medicine started to become alluring to American physicians who had the means to study abroad. Paris had replaced Edinburgh as the leader in medical education by the 1820s. French physicians who had adopted the empirical model conveyed how

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[42] John Godman, *Contributions to Physiological and Pathological Anatomy: Containing the Observations Made at the Philadelphia Anatomical Rooms During the Session of 1824-25* (Philadelphia: H. C. Carey, 1825), 5-9.

true empiricism worked. There was finally a use for accurate quantitative data that later revealed the medical practices of bleeding, along with other heroic methods, to be meaningless.[43]

In his discourse on American Medical History, John Duffy states it is an oversimplification to place shifting American medical ideas on the rising French and other European schools of medical thought.[44]Plenty of skeptics in the medical community were desirous of change.[45] Benjamin Rush's heroic methods came from altering his mentor's medical methods.[46] Doctors throughout the United States took a path like Rush's. While many were strict followers of harsh heroic methods, plenty started to see the medical system's failures. Perhaps the most significant shifting force was public sentiment toward physicians of the nineteenth century. The American public had good reason to doubt and even fear physicians. Painful and dangerous medical regimens could have disastrous outcomes. Even one of America's most revered historical figures, George Washington, was killed by liberal use of venesection. The distrusting public was a barometer for the medical profession during an era when competing medical sects arose.[47] The orthodox medical community quickly dismissed these new medical ideologies through harsh propaganda and the organization of medical societies. An even greater movement was the self-sufficient domestic medical learning. Modern readers can see evidence of self-sufficiency by observing at-home medical manuals and patent medicines. The rationalist

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[43] Duffy, *From Humors to Medical Science,* 71.

[44] Ibid, 73.

[45] Ibid, 67.

[46] Even Benjamin Rush's colleague Adam Kuhn, who taught *Materia medica* and Botany at the Philadelphia Medical College, was skeptical of heroic methods. Doctors throughout the country were averse to these methods, but Rush's influence was overwhelming, and he stands as a significant figure in medical history and the Enlightenment.

[47] The nineteenth century saw the rise of medical theories like herbalism, botany, Thomsonianism, hydrotherapy, and the greatest intruder, according to nineteenth-century doctors, homeopathy.

medical perspective pushed by doctors like Rush drove patients toward a purely empirical system that desired treatment without the theory.

Medical education was greatly affected by the philosophical shifts in American medicine. By the time the University of Michigan College of Medicine and Surgery opened its doors in 1850, the medical field was heading towards an era of scientific empiricism. The French model of medicine influenced American medical schools by 1850. Medical professionals met the French school with largely positive views, resulting in French methods moving into American medical school curriculum. The Parisian records of the 1830s show that nearly 225 American doctors traveled to Paris to study medicine, of which at least sixty-seven became American medical school educators.[48] The French influence on American doctors was reminiscent of the Edinburgh influence on medical educators like Benjamin Rush.

French scientific thinkers who shaped American medical thought in the first quarter of the nineteenth century contributed to France's dominance as the leader in medical innovation at that time. One of the most influential French doctors, Pierre-Jean Georges Cabanis (1757-1808), was a physiologist and philosopher of the Napoleonic Era who espoused pure empiricism in medicine. Cabanis saw the sickbed as the only place to study medicine and advance the field. The French inventor of the stethoscope, Rene Theophile Hyacinthe Laennec (1781-1826), believed that all knowledge came from observation. One of the most potent French figures of the changing theoretical movement was Pierre Charles Alexander Louis (1787-1872), who significantly impacted American students in France. Louis was staunchly against the rationalist idea of hypothesizing. To Louis, the summarization of facts mattered most in medicine. Louis

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[48] Martin Kaufman, *American Medical Education: The Formative Years, 1765-1910* (Westport: Greenwood Press, 1976), 101.

referred to summarization as science.[49] Louis dedicated his life to strictly categorizing disease and tabulating all possible patient treatment data. The Parisian creation of a central hospital system made Louis's goals more obtainable. The American adoption of large-scale facilities for obtaining clinical data slowly came to fruition before the Civil War. American doctors saw the promise in using clinical data, but the Civil War and the expansion of army hospitals made the war the first major opportunity to adopt clinical methods.

The antebellum influence of French medicine in the United States directed the writing of many American doctors and educators. Elisha Bartlett (1804-1855) was an adherent of the Parisian School and a medical educator who held numerous teaching positions throughout his life. Bartlett earned his Brown University medical degree in 1826, and like many ambitious doctors of his generation, he traveled to France that same year. Bartlett experienced the Paris Clinical School in the aftermath of the French Revolution. While Napoleon's reign had ended long before Bartlett's time in Paris, the influence was prominent. The revolutionaries of 1788-89 overthrew the Ancien Regime and, with it, the medical establishment of old France. As France's medical revolution occurred during and after the Napoleonic years, Bartlett worked with some of France's most prominent medical revolutionaries, including Xavier Bichat, Francois-Joseph-Victor-Broussais, Phillipe Pinel, Pierre Charles Louis, and Rene Laennec.[50]

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[49] William Stempsey, *Elisha Bartlett's Philosophy of Medicine* (Dordrecht: Springer, 2005), 14.

[50] Xavier Bichat (1771-1802) was a founder of the empirical French Clinical School. Bichat established the relationship between disease and changes in body tissue, known as histology. Broussais (1772-1838) stressed the importance of physiology in the study of disease, showing that symptoms emerged from changes in the body. Phillipe Pinel (1745-1826) is seen as the "Father of Psychiatry" through the publication of several books on mental illness. Pinel's work changed the perception of mental illness, believing in a cause and possible cure for these ailments. Pierre Charles Louis (1787-1872) founded the numerical method of clinical study. The French Clinical School heavily relied on empirical evidence gathered from hospital settings. Louis' work was quantitative, placing him as a modern epidemiology founder. Rene Laennec (1781-1826) propounded the French Clinical school's focus on observation. Laennec's greatest contribution to medicine was the invention of the stethoscope in 1816. The French Clinical School was not a unified movement of all French doctors; instead, it was an assortment of influential physicians who slowly changed the trajectory of their field.

The French Clinical School was the result of pushback on antiquated ideas. Before the Revolution, only the upper echelons of French society received competent medical care. The new French push for egalitarianism put old regime doctors in the crosshairs of the revolutionaries. Pre-Revolution doctors were not subject to strict medical licensing rules, making a license easy to obtain. The pre-Revolutionary French medical establishment never required medical schooling for doctors, and medical licenses were obtainable for a fee. Medical school training would have done little to prepare French doctors for medical practice. Before the Revolution, medical schools were strictly rationalistic in their curriculum, and doctors rarely studied practical medical schools, lowering the quality of French medicine. The old regime medical professors incorporated folklore and traditional medicine into their lessons. French doctors as a group were ineffective, neglectful, and ignorant in the years before the Revolution.[51]

Financial incentives drove doctors in the old French system, which allowed only the wealthy and connected to receive ample healthcare. French society lacked any regulation in the pharmaceutical industry, and uninhibited prescribing created doubts surrounding the medical industry.[52] Hospitals and dispensaries that accepted the less fortunate members of French society were normally short-staffed and employed poorly-trained doctors. French hospital care was so inadequate before the reformation of French medicine that the French government attempted to dissolve the hospital facilities several times. The conditions of pre-Revolutionary medical care later resulted in a very positive reformation following years of hardship.

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[51] David Vess, *Medical Revolution in France 1789-1796* (Gainesville: University Presses of Florida,1975), 4.

[52] French doctors in the eighteenth century often compounded medicines, mixing dangerous chemicals and medications. French law did not require doctors to reveal medications' components to patients. Only the pharmacy or apothecary compounding the medicine had to know what was in the mixture. Vess, *Medical Revolution in France,* 12.

The symbolic elitism of French medicine made it a target of revolutionary change following the 1789 revolution. Medical schools were closed, immediately creating a physician shortage. The most significant factor affected by the doctor shortage was the many French hospitals that opted to treat French military entities and the impoverished. Before the Revolution, the French crown contributed little to healthcare, and hospitals received most of their funding from the church, charities, or wealthy members of society. All three groups took a heavy hit as the French Revolution gained momentum.[53] The Revolution had entirely decimated French medical society. Two major French medical societies, the Societe Royale de Medecine and the Academie Royale de Chirurgie, were forced to purge prestigious members in August 1791.[54] The shortage of doctors and hospital closures pushed France to the brink of a medical emergency, but this event was a monumental positive change.

The French Revolution was immediately followed by a time of national upheaval, bringing about years of war for the new Republic. With overwhelming military casualties and soldiers suffering from disease, a desperate situation led to medical reform. Several attempts at French healthcare reform failed until the Council of Health was reestablished in 1792 to properly recommend physicians to the French Minister of War for military service.[55]Doctor shortages and the growing need for medical treatment forced the French government to reinstate medical education and establish numerous hospitals. Government-funded medical schools trained doctors in practical skills, replacing the old elitist ways of rationalism with pragmatic training. Hospitals funded by the French government became the breeding ground for a new movement toward Empiricism. Patient contact in a controlled setting tended by practical-thinking doctors

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[53] Ibid, 24.

[54] The two societies are the Royal Society of Medicine and the Royal Academy of Surgery. Ibid, 58.

[55] Ibid, 65.

allowed only enough time for empirical science. The French physicians perfected the use of numerical statistics. Large groups of accessible patients, often suffering from the same ailments, opened the door for trial and error. Over the ensuing decades, between 1790 and 1830, the Paris School of Clinical Medicine stood out as the Model for much of Europe and many prominent American doctors. Clinical medicine in France had practical effects. Treatment became the most crucial aspect of doctoring, and the physiological knowledge of disease or an ailment became secondary in importance.[56]

The French preoccupation with empirical medicine resonated with a new generation of American doctors. By the 1820s, dissatisfaction with the medical field and medical education brought a new movement recognizing the French push for scientific empiricism. There was a drive to amend medical education by American students who had returned from experiencing the French medical ideology. American medical students spending time in France had access to new venues of study, mainly consisting of extensive clinical experience and the opportunity to dissect cadavers. France became the destination for over 600 doctors between 1820 and 1861, and 202 held American teaching positions before or after their trip abroad.[57]

Americans returning from France shared their experiences and were subsequently discouraged by the state of American medicine. Dr. Augustus Kinsley Gardner, a Massachusetts

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[56] Rationalist medicine focused on an overarching understanding of disease and sought to apply this knowledge to treatment. Empiricists in the French School were not interested in understanding the underlying physiological causes of disease as this idea was deemed irrelevant. Doctors could test various medical treatments in a large clinical setting, allowing for practical applications. The debate between pure Empiricism and rationalism centered around this argument. The difference between pure Empiricism and rationalism in the United States centered on education. In the United States, empiricists were usually apprenticeship-trained doctors, while rationalists held medical degrees from a medical school. In France, clinical empiricists were the medical leaders following the French Revolution, and teachers taught empiricist methods at major French medical schools.

[57] Russell Jones, "American Doctors in Paris, 1820-1861: A Statistical Profile," *Journal of the History of Medicine and Allied Sciences* 25, no. 2 (April, 1970), 144, 151.

practitioner and Harvard graduate, made the trip to Paris in 1844.[58] Gardner experienced the modernity of the French medical system and recounted his time in a memoir titled *Old Wine in New Bottles: Or, Spare Hours of a Student in Paris.* His book examines as much the cultural experience of mid-century France as it does his medical experiences, but he gave high praise to the French medical system. He spent days at the Hospice D'Huamanite, a hospital that treated over 11,000 patients a year, and only 1 out of every 872 patients died in that time.[59] He moved through surgical wards and sat through hours of French lectures on medicine. Most outstanding to him was the exposure to cadaver dissection. The Ecole Pratique d'Anatomie held Paris's largest dissecting room, where Gardner partook in one of over 4,000 yearly dissections.[60]Gardner found it curious that French citizens viewed doctors as scientists and medical practitioners. Gardner revealed that the lack of hospital training was the downfall of the American medical school system.[61] His sentiments toward hospital teaching resonated with many American doctors.

Dr. Elisha Bartlett was paramount to the growing French influence in American Medicine and the rise of scientific empiricism. Elisha Bartlett dedicated his work to educating a new generation of American doctors. The doctor had returned from years abroad, studying in the French system, and was a close follower of Pierre Louis.[62] Bartlett's *An Essay on the Philosophy of Medical Science* was published in 1844, just six years before the University of Michigan

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[58] Historians have mixed opinions surrounding Gardner's medical reputation. He was a renowned gynecologist who carried a political bent. He was widely read as a published author of books and newspaper articles. Gardner is retroactively seen as a very misogynistic-minded physician who holds strange views of women. C.J. Barker-Benfield, *The Horrors of the Half-Known Life: Male Attitudes Toward Woman and Sexuality in Nineteenth-Century America* (New York: Harper & Row, 1977), 235.

[59] Augustus Kinsley Gardner, *Old Wine in New Bottles: or, Spare Hours of a Student in Paris* (New York: C.S. Francis & Co., 1848), 20.

[60] Gardner, *Old Wine in New Bottles,* 68

[61] Ibid, 77.

[62] Stempsey, *Elisha Bartlett's Philosophy of Medicine,* 14.

opened its medical school. Bartlett's writing represents the shifting ideas in medicine and medical education that had occurred just before the start of the Civil War. Bartlett served as a professor of theory and medicine at the College of Physicians and Surgeons in New York. Theory of Medicine professors historically served as the purveyors of rationalistic medical theories, but Bartlett's writing shows a commitment to French Empiricism. According to Bartlett, the only way that doctors can ascertain facts is through directly observing phenomena.[63] He was not overtly opposed to theoretical aspects of medicine if they were used as a possible means to explain medical phenomena. Despite these feelings, he needed to observe something to realize it as fact.[64]Bartlett determined the hypothesis to be independent of actual science in his section on a scientific hypothesis.

Doctors who returned from France, like Bartlett, were not only proponents of the empirical system but also incredibly apprehensive toward a purely rationalist view of medicine. While the French pursued a purer form of empiricism, many American doctors who were privy to the French ideology were not entirely dismissive of medical theory. American doctors believed they could Americanize the French school by adhering to empiricism and rationalism to explain or theorize about various aspects of medicine. This idea of combined rationalism and empiricism was contrary to important French physicians like Pierre Louis, who significantly influenced American medicine. By the 1840s, the medical establishment of American society started to see the merit in a scientific empirical system that utilized some rationalist tendencies.

With the growing distrust in medicine in the first half of the nineteenth century, the medical community became more aware that changes were needed. The American Medical Association

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[63] Elisha Bartlett, *An Essay on the Philosophy of Medical Science* (Philadelphia: Lea & Blanchard, 1844), 10-12.

[64] Bartlett, *An Essay on the Philosophy of Medical Science,* 33.

was founded in 1847 to improve medical uniformity and revise medical education. The American medical establishment felt insecure in the shadow of the European medical giant, so the American Medical Association sanctioned an 1848 study that sought to discern the differences between American and European medical education.[65]While the American Medical Association promoted suggestions to alter the length of medical courses, there was little adherence to the committee's recommendations. Schools also avoided the rise in admission standards. The free-market, unregulated aspect of American Medical Schools left little incentive for the schools to change their ways. The medical schools needed to make money and compete with other inexpensive, low-standard proprietary medical colleges of the era. The changes to education were slow-moving, but the 1830s to the Civil War was an era of growing medical educational discourse.

While the French Clinical School was popular among many physicians and educators, there were questions surrounding clinical empiricism. The United States indeed lacked the capacity for widespread examination of medical claims. America did not have the clinical basis to instill large-scale testing of practical treatments. Following the Civil War, the United States had just 178 hospitals, including mental health facilities.[66]While American doctors could have found reasonable cures or treatments for specific ailments, it took time to disperse the information. Medical journals and textbooks flooded the American market, but with little oversight, there was no authority on medicine in the United States. A report by the American Medical Association in 1848 recognized the lack of information distribution as the downfall in

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[65] "Report of the Committee on Education," in *The Transactions of the American Medical Association,* vol. I (Philadelphia: T.K and P.G. Collins, 1848), 236-247.

[66] J.M. Toner, "Statistics of Regular Medical Associations and Hospitals of the United States," *Transactions of the American Medical Association* 24 (1873), 287.

espousing practical treatments in medicine.[67]The AMA committee appointed to study practical treatments for disease found the biggest setback to be the lack of methodological testing for alleged treatments. They also noted that "there are comparatively few minds possessing the qualities requisite to originate, either empirically or by the process of induction, improved methods of treating individual diseases."[68]The AMA recognized the lack of trained clinicians and methods of creating consensus as two significant setbacks in American medicine before the Civil War.

This shift from rationalist medical philosophy consumed the debate surrounding medical education before the Civil War. By the 1830s, France, England, and Germany had all started to strive toward a clinical focus in medical education. European medical schools also became a draw for scientists seeking to conduct research and educate students as a full-time career. Scientific advances made the creation of state-of-the-art medical facilities a way to attract renowned scientists.[69]In countries like Germany, the competitive nature of universities pushed German schools to build better facilities than other schools. This competition became a significant factor in the advancement of scientific medicine. Another strength of the European system was the drive toward scientific research.

On the contrary, American medical schools lacked clinical training facilities, and their courses were taught by practicing physicians whom society did not view as scientists. Scientific research as a facet of academic life was growing in Europe but had yet to reach the United States on any significant scale before the Civil War. Training medical students to think clinically and

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[67] Joseph Mather, "Report on Practical Medicine," *Transactions of the American Medical Association* 1 (1848), 101.

[68] Ibid, 102.

[69] Joseph Ben-David, "Scientific Productivity and Academic Organization in Nineteenth Century Medicine," *American Sociological Review* 25, no. 6 (December 1968), 838-839.

conduct scientific research was difficult, seeing the lack of scientists employed as medical school professors.

The University of Michigan School of Medicine and Surgery arose during a turmoil in medical science. Debates between Empiricism and rationalism were raging within the medical community. There was widespread recognition that the apprenticeship-trained American empiricists did little to elevate American medicine to the prominence of European medicine. Empirical, results-based, proprietary medicine forced the American public to turn from the orthodox medical field. There were new medical ideologies that did not entail painful and dangerous medical treatments. While some saw new therapies like homeopathy as pseudoscientific, the outcome was likely the same as the empirical treatments, but homeopathy did not add to the patient's misery. The move toward scientific Empiricism offered a unique opportunity for the University of Michigan, which was not beholden to the financial gain that other medical schools were. In Michigan, there was an opportunity for a rising standard in education along with experimentation with new medical methods.

Aside from Elisha Bartlett's theorizing on medicine and medical education, doctors and educators embedded themselves in the debate surrounding medical education during the era of Michigan's opening. The decades between 1830 and the Civil War saw an exponential rise in books, articles, lectures, and other debates surrounding medical education. Many of these publications set the intellectual stage for the opening of Michigan's medical school. This conversation helps us better understand the philosophical foundations of the medical school when combined with the writings of Michigan's medical educators during the school's early years. Medical education materials were circulated heavily, especially in contrast with the rampant rise of medical societies and associations. Medical societies saw their mission as a crusade against

the unorthodox in medicine. The professionalization of medicine and combatting of "quackery" were components. The first step in realizing societal goals was the revision of medical education. Years of American Medical Association transactions and reports cover the endless conversations and analysis of medical schools.

The infiltration of medical philosophy into American medical education started when medical leaders recognized the need for industry change. In 1822, Doctor John Coffin published his popular medical education book *Discourse on Medical Education and the Medical Profession.* Coffin's breakdown of medicine around 1820, he realized that doctors were in the business of promoting and securing health benefits for the American public as the medical field ensured the longevity of the American pursuit of happiness.[70] Coffin, a renowned member of the Massachusetts Medical Society, recognized the philosophical bent that had dominated his generation's medical profession, but the shift towards practicality was growing.[71] Coffin was an apologist for the empirical philosophy of medicine, believing that observation and experience are the only trustworthy sources of medical knowledge.

Coffin's 1822 publication sparked a conversation surrounding medical education. There was no proper assessment of the preparatory phase of medical education. According to Coffin, the preparatory phase should require a well-rounded education that involves the study of math, natural philosophy and history, government, poetry, and even drawing. This was the doctor's duty to be a healthcare provider, scientific observer, and cultural leader in American society. While Coffin's commitment to a universal education never became a regular aspect of medical students, an adaptation of this system carries over into modern medical school requirements that

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[70] John Coffin, *Discourse on Medical Education and the Medical Profession* (Boston: Joseph Ingraham, 1822), 1.

[71] Coffin, *Discourse on Medical Education,* 2.

seek students with a wide variety of college courses, volunteer experiences, and differing life experiences that show a well-rounded lifestyle. According to Coffin, well-rounded doctors could better communicate and relate to their patients.[72]Medical school entry requirements became a significant concern of the American Medical Association during their inaugural meeting on medical education. Standards needed to be higher, which the University of Michigan was committed to.

Coffin pushed empirical methods as the only proper way to teach medical science. The doctor was highly critical of the popular apprenticeship method of training. Coffin doubted the capability of apprentice-trained doctors to learn proper medical science. Medical science was seen as intricate and required an understanding of anatomy, chemistry, natural history, and philosophy as long as this philosophical understanding did not overtake the importance of observation.[73]According to Coffin, apprenticeship-trained doctors were forced to understand their preceptor's medical expertise without proper scientific education. Students needed to digest suitable medical lessons while also gaining clinical experience. The apprenticeship system exposed trainees to clinical experience, but there was little basis for researching and advancing scientific medicine without a proper basis for medical study. Coffin saw chemistry as the most crucial analytical skill doctors needed and could only correctly learn it in university.

Perhaps the most understandable aspect of Coffin's ideology was his recognition of valuable teamwork. Outside of the apparent involvement of professors, the most significant difference between education and apprenticeship was the inclusion of fellow students. Coffin

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[72] Ibid, 17.

[73] Ibid, 17.

wrote that young men engaged in the same studies mutually assist each other.[74]Coffin believed the collaboration with fellow students led to the engagement and encouragement of each student's passions. Coffin thought that the more encouraging and competent the students, through more outstanding medical school standards, the students' education would become superior to earlier eras. The education students received, Coffin wrote, should not simply be composed of professor lectures directly from a textbook. Students needed to learn anatomy, not from a book, but from specimens, models, and cadaver dissection. Students working together in this environment would promote this style of medical education by setting an example.

Coffin's book was forward-thinking in 1822. Medical education could not continue on the apprenticeship model in perpetuity. Over the next several decades, the medical education system proliferated in American medicine. Proprietary medical schools, which operated to fill classroom seats, became problematic. During that period, rising publications examined medical education similarly to Coffin. Andrew Boardman was the top graduate in the 1839 Geneva Medical School class who published a layout of his school experience. His experience was far from positive. He later presented a version of his 1840 *Eclectic Journal of Medicine* article to the faculty at his school. The students who attended Geneva with Boardman had attended simply to earn their medical degrees and a better chance at lucrative medical practice.[75]The courses taken by Boardman were disappointing. Medical students from the New York area skipped their anatomy courses to attend private courses that had better outcomes for the attendees.[76]

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[74] Ibid, 22.

[75] Anthony Boardman, *An Essay on the Means of Improving Medical Education and Elevating Medical Character* (Philadelphia: Haswell, Barrington, and Haswell, 1840), 1.

[76] Boardman, *An Essay on the Means of Improving Medical Education,* 1-5.

The New York and New England schools were deemed the best, but much of their published marketing materials stretched the truth. Geneva College sold students like Boardman on a modern take on physiology courses and the most modern medical theories. Instead, old professors taught an outdated course on physiology, and Geneva College recounted medical theories that were becoming obsolete by 1832.[77]Professors lectured word for word from Robley Dunglison's and Charles Macintosh's works.[78]While addressing his former professors, he proposed more changes to medical education. The medical schools of the 1830s sought students who knew both Latin and Greek. Boardman proposed eliminating language preferences; professors should teach students the necessary information to cure and understand disease.[79]

Most of Boardman's medical essay works through a system of proposed changes. Medical students need to have experience handling and examining the human body. Dissection was critical to the medical student's familiarity with anatomy. Nineteenth-century Americans were uncomfortable with the concept of cadaver dissections, which made acquiring specimens difficult. During Boardman's term at Geneva, he put down a $40 deposit to provide the funds for a cadaver. Instead of providing bodies for the entire class, the anatomy professor just dissected one cadaver before all the students of Boardman's class.[80]Boardman was critical of his lack of dissection experience at Geneva and most other medical colleges. He correctly noticed that all students should have a working knowledge of the human body through direct contact.[81]

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[77] Ibid, 11.

[78] Ibid, 6.

[79] Ibid, 11.

[80] Ibid, 6.

[81] The medical school catalogs, as studied by Boardman, failed to show dissection as a requirement to graduate. While most schools promoted the idea and tried to provide cadavers, no schools required the practice.

The Geneva medical professors used methods that were commonplace during the nineteenth century. Repetition was the primary teaching mode, and Boardman criticized this practice, stating that the only thing students were learning to be was a "good echo." Instead, according to Dr. Boardman, the students needed a practical application of medicine that they learned through patient exposure. The lack of clinical opportunities was another downfall of Geneva. The medical school recognized the need for this clinical study but only meagerly imposed it.[82] Boardman deemed clinical education a necessity of medical education. He proposed making a requirement for clinical research in the classroom, hospital, and clinic. His survey of medical schools showed that the College of Physicians and Surgeons in New York hired an entire clinical staff, but the medical school made the courses optional.[83] Optional clinical instruction did little to advance the idea as students who often saw medical school as a means to a diploma were not interested in the optional yet extra work.

Medical schools in the first half of the nineteenth century presented diplomas with the blessing of the medical school professors. Students took two terms of courses followed by a short examination and presentation of a medical school thesis or dissertation. The professors who taught the students determined the legitimacy of the student and conferred the doctorate. Boardman saw this as a conflict of interest. Before Michigan's opening in 1850, professors at all medical schools made their teaching salaries through direct student payments. Filled classrooms equated to more money, and a failed medical school candidate represented a failure on the professor's behalf, which could cost the school applicants. Boardman wrote that the examiners

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[82] The catalog promised Geneva students clinical access to the "Western Hospital," which was hardly adequate for clinical experience. The school placed the Western Hospital on the second floor of the defunct Geneva Shoe Store. The students did not see a medical patient during Boardman's tenure and only worked with one surgical patient. Ibid, 7-10.

[83] Ibid, 18.

needed independent parties who did not teach the students directly. His essay proposed an overarching organization to oversee the qualification of examiners, professors, and medical school graduates. The American Medical Association came to fruition seven years after Boardman's essays. While the AMA spent years trying to do the very thing Boardman presented with a centralized standardizer, the medical schools largely refused to cooperate.

The intellectual history of medicine and medical education in the nineteenth century shows that medical schools tore between different schools of thought. The empiricists and rationalists fought for domination in the medical field, but the debate forced the medical field to compromise. The American Medical Association's foundation made medical education the crucial focus but struggled to make any headway. Regardless of their failed immediate outcome, the AMA did bring to the mainstream the ideas surrounding medical education. Comparisons with European universities forced the conversation between the merits of both Empiricism and rationalism. The downfall of the Edinburgh style of education and the rise of French clinical Empiricism became a pedagogical trend in the United States. Rather than adhering to a strict French model, the American adherents to the French school still applied a form of rationalism. The French Model became prevalent throughout the United States by the 1830s. Five of Harvard's medical faculty had trained in France. Men who had studied in France filled the American Medical Association's medical education committee.[84]Outside of those trained through apprenticeship, the educated medical establishment was strictly moving toward scientific Empiricism. While the French Model of Scientific Empiricism had merits, it did not solve the problems within medical education. Medical outcomes were still wavering, and the American public still doubted the

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[84] Kaufman, *American Medical Education,* 101.

efficacy of American doctors who still used drastic treatments despite knowledge of the benefits of clinical medicine and scientific Empiricism.

The University of Michigan's College of Medicine and Surgery opened its doors in 1850, well after the medical community had recognized the benefits of clinical medicine and scientific Empiricism. The Paris Clinical School had exceeded the traditional Edinburgh and London models of medical education by the time the founders set the medical school's opening in motion. However, the founders modeled the new Ann Arbor medical school after a growing clinical and scientific medicine leader in Germany. In the latter half of the nineteenth century, Germany surpassed all European counterparts as the medical epicenter of the world. Germany's medical education system did not adapt to the new empirical science until the 1830s after being heavily focused on philosophy. The French success in empirical science influenced a generation of German doctors. In 1833, scientific medicine and specialization took hold in Germany. Johannes Mueller's *Handbuch der Physiologie* popularized the scientific study of physiology and paved the way for professional scientific research in Germany. By the 1840s, Germany had started to rival the French in terms of medical prowess.

German medical education became heavily focused on clinical and laboratory science. In the 1840s, Germany's scientific superiority came from developing excellent laboratory and hospital facilities. German academics recognized the university as a platform for proper research organization and management. The preponderance of German universities made for excellent teaching mobility and grew the offering of premier research facilities.[85]While the exposure to financial competition degraded American academic medical institutions, the same issue had the opposite effect in Germany. Decentralization and economic competition pushed Germany to the

[85] Ben-David, “Scientific Productivity and Academic Organizations in Nineteenth Century Medicine,” 833.

forefront of medical superiority, moving ahead of France and England by the late nineteenth century.[86]As science became a professional vocation in Germany, universities competed to attract the top researchers and scientists. The key to attracting new talent came from the creation of research facilities. Contrary to the French medical facilities, the Germans constantly upgraded theirs, thus growing their capability to attract better scientists.[87]

The German idea of scientific Empiricism later became the desire of American medical schools. By the middle of the nineteenth century, Germany's dominance in scientific medicine was well underway.[88] German medical students underwent extensive scientific training centered around laboratory study, which was conducted in conjunction with medical training.[89]German medical schools were created independently from German universities, and the German medical institutes became focused on research, making Germany the leader in medical science by the end of the nineteenth century. The system of research in Germany led to the proliferation of medical

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[86] Internal conflicts broke up German society. In 1870, after Germany became a unified nation, the centralization of education became more stringent. Regardless, the Germans used state funding to run their universities, and while they were, in a sense, centralized financially, the school administrators ran the individual schools. This allowed for more economic competition between schools. In the United States, economic competition diluted the quality of education, but Germany's rise in scientific specialization made the drive for better facilities greater. Ibid, 835-837.

[87] France had Europe's best medical facilities during the first two decades of the nineteenth century. France differed from Germany in the push for scientific specialization. French research positions at government-funded schools were lacking. The French schools saved premier research posts for renowned scientists, and the other faculty positions were filled by practicing clinicians. Research scientists held onto positions in a highly competitive arena in France. With little desire to open these jobs to younger scientists, the number of positions stagnated. With no economic competition in the French centralized schools, there was no desire to update research facilities, and the state-of-the-art institutions failed to upgrade over the following decades.

In Germany, the administrators constantly updated the school research facilities. Economic competition and decentralization helped research and science positions grow exponentially, often through the pressures of younger students and doctors. With competing schools updating their capabilities and the desire to attract the best scientific talent, the German schools were constantly updating their facilities. Growing scientific research positions and more opportunities for specialization made Germany a world leader in both areas until the beginning of the First World War.

[88] Thomas Bonner, “The German Model of Training Physicians in the United States, 1870-1914: How Closely Was It Followed?,” *Bulletin of the History of Medicine* 64, no.1 (1990), 19.

[89] Bonner, “The German Model of Training Physicians in the United States,” 20.

specialties. Medical school students in Germany were given heavy instruction in laboratory science, including cadaver dissection, chemistry, physiology, physics, and others, while also being trained in the practical and applicable medical sciences.

Doctors and historians have traditionally viewed Johns Hopkins University as a real beacon in the German Model of medical education. However, there is merit in seeing the University of Michigan as the first school to use European ideas heavily. Johns Hopkins doors were not opened until 1893, giving the university designers the advantage of history to instill modernity. The University of Michigan opened its medical school forty-three years before Johns Hopkins and was quick to adopt changes and experiment with new ideas. Michigan's first university and medical school became the proving ground for modern scientific education and research in an academic setting. The University of Michigan was one of the first to hire professors who sought science as a full-time vocation. Professors exposed Students who attended Michigan to laboratory study in areas not taught at rival medical schools before the Civil War, including biochemistry, analytical chemistry, physiology, and clinical courses. School founders modeled the University of Michigan after the German system, and students were well-versed in scientific empiricism.

The idea surrounding the University of Michigan's foundation set it apart from other American universities and aligned it with the German schools. In 1837, the Organic Act of March 18 established the formation of the university using a state-funded model, and in the same year, Michigan gained statehood. A medical department became one of the three departments issued, but the official opening of the medical school did not come until the 1850 term. The University of Michigan followed the German education model as the state-funded university allowed for lesser economic competition and the likelihood of adequately educated citizens of

the new state. While this overall work has detailed the depths of the medical school curriculum and experience in the ensuing chapters, it is crucial to understand the intellectual foundation and ideology of the medical school. The school made heavy use of a research-oriented focus and lauded scientific medicine. As the school opened with basic facilities, it quickly expanded research facilities, and the school's reputation made it a destination for ambitious, scientifically-minded medical students following the Civil War. As the first American medical school to follow the German education model, the University of Michigan offered a better educational opportunity before the Civil War than other medical schools.

From an intellectual standpoint, the best indicators of ideology come from the founding members of the medical school. Dr. Zina Pitcher, a former army surgeon and Detroit physician, was elected to the first Board of Regents at the University of Michigan. Pitcher was not only a popular citizen in early Michigan society, serving as the sixteenth and eighteenth Mayor of Detroit, but an esteemed physician. A New York native, Pitcher chose to stay in Michigan after his military career, where he sought medical reform in what was then a territory in 1836. The study of science had been Pitcher's inclination as an adolescent, but in the 1810s, medicine was the only actual path for those interested in the sciences.[90]He graduated from Castleton School of Medicine in 1822 and simultaneously spent four years training under a preceptor. After graduation, President James Monroe commissioned Pitcher as an assistant surgeon in the United States Army. The only major takeaway from his medical training was how lacking it was in

[90] Frederick Novy, "Zina Pitcher," *Physician and Surgeon: A Professional Medical Journal* no.30 (1908), 50

preparing him for his first post.[91]Pitcher recalled having no clinical experience in 1823 yet being granted complete medical control over the garrison of Fort Saginaw.[92]

Zina Pitcher was the greatest proponent of a Michigan medical school, and as a regent at the university, he fought vigorously to realize the medical school's opening. Pitcher's vision centered on a medical school that offered greater real-life preparation. Pitcher and the new faculty hires focused on teaching practical medical skills and promoting scientific medicine at the university. The University of Michigan's burgeoning science department drew significant interest from early American scientists. Douglass Houghton, another New Yorker and physician, was focused on studying science over a career in medicine. Houghton conducted the first State Geological Survey in Michigan upon gaining statehood in 1837. Douglass Houghton's interests in geology, mineralogy, and chemistry helped him obtain a professorship in 1839 at the University of Michigan. Houghton's cousin, Silas Douglas, became the school's first chemistry professor.[93]Despite being a physician in training, Douglas became a full-time chemistry professor who revolutionized academic chemistry.[94]Longtime anatomy professor Corydon Ford at the medical school focused his career on anatomy and physiology, putting aside his medical career.[95]Michigan's faculty as state employees were not required to work in conjunction with teaching as most American medical schools required. The medical school's push to professionalize medical science made the school a first in the history of American medical education.

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[91] C.B. Burr, ed. *Medical History of Michigan,* Vol I, (Minneapolis: The Bruce Publishing Company, 1930), 196.

[92] Burr, *Medical History of Michigan,* 196.

[93] Horace Davenport, *Not Just Any Medical School: The Science, Practice, and Teaching of Medicine at University of Michigan, 1850-1941* (Ann Arbor: University of Michigan Press, 1999), 2.

[94] Davenport, *Not Just Any Medical School,* 4.

[95] Ibid, 8-11.

Full-time professorships in scientific subjects were uncommon in the United States when Michigan's medical school opened in 1850. Michigan's state constitution outlined the necessity of state-run educational institutes through professional school training. The state gave concessions through state funding unknown to other medical schools. Professors were full-time employees paid by the state. This was contrary to the operation of different medical schools in America, where medical students purchased course tickets, with the money going directly to the professors who owned shares in the school. Professors at different schools worked regularly in their medical practices to make an adequate living and used their prestige as educators to bolster their reputation as doctors. At the University of Michigan, this was not necessary. The medical school became a destination for ambitious, scientifically-minded educators who broke away from the traditionalist and rationalist medical schools of the United States.

The academic debate between rationalism and Empiricism puts the history of American medical education and Civil War medicine in a better context. Early in the conflict, medical personnel from all areas of the Union inundated the Army Medical Department. The new volunteer force included surgeons and assistant surgeons for each Union regiment, and the number grew continuously throughout the war. Doctors who joined varied between apprenticeship-trained doctors and medical school graduates. The training of these eventual surgeons included rationalism, pure Empiricism, scientific Empiricism, and sometimes a combination of both. Inept doctors filled the ranks, as did adequate medical personnel who would modernize the Army Medical Department between 1861 and 1865. The rationalists versus empiricism debate that raged in the scientific and medical community for decades affected the doctors who served in the Civil War as the shifting medical ideology forced doctors to adapt.

All these medical philosophy, education, and treatment changes occurred when the University of Michigan School of Medicine and Surgery opened its doors in 1850. While most medical educators were committed to the French Model of education, professors, regents, and a president at Michigan were dedicated to the German Model of medicine and education. While Michigan professors opposed dogmatism in medicine, their numerous speeches, articles, books, and essays show a group of physicians who were promoters of medical rationalism and encouraged their students to think outside the confines of nineteenth-century medical thought.

Chapter Four:

"To Spread the Blessings of this Education Throughout the Land": The University of Michigan Medical College and the Methods of Training

"The people of our State have founded this Institution for the sole purpose of enabling our talented and energetic young men to require a superior medical education, that they may become efficient agents, under God, to spread the blessings of this education throughout the land."[1]

Introduction:

The American Civil War shocked numerous of the country's systems, but none was more shocked than the medical system. For the most significant American army ever raised to fight in the country's bloodiest conflict, the military required a body of doctors and workers unprecedented in history. Over 12,000 Union Army surgeons served throughout the Civil War, and most lacked the preparations necessary for the war.[2] Civil War surgeons were products of apprenticeships or medical colleges, with some serving as professional military doctors. By the start of the Civil War, nearly one hundred medical schools had been established nationwide, giving off mixed results of success.[3] The American medical school system failed in adherence to a unifying effort with the founding of the American Medical Association in 1847. Financial incentives drove some schools more than others, making graduation outcomes sporadic. Not all schools had properly prepared Civil War surgeons for the conflict, but not all schools were a complete loss, especially the University of Michigan Department of Medicine and Surgery.

During the Civil War, medical education had a legacy of poor preparation, yet it still maintained an essential step in modern medicine. In 1765, John Morgan and William Shippen Jr

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[1] M. A. Patterson, *An Address to the Graduates of the Medical Department of the University of Michigan on the Romance and Reality of Ancient Medicine* (Detroit: Barne, Brodhead & Co, 1952), 3

[2] Alfred Bollett, *Civil War Medicine: Challenges and Triumphs* (Tucson: Galen Press, 2002), 27.

[3] William Norwood, *Medical Education in the United States Before the Civil War* (Philadelphia: University of Pennsylvania Press, 1944), xiii-xvi.

founded the first American medical school in Philadelphia. Before this founding, university education focused on theology, arts, language, and the classics. Morgan and Shippen's school brought a semblance of science education to the university-level students. By the mid-nineteenth century, medical schooling was among the only ways to get a university or doctoral-level degree in the sciences. While science education could be attributed to medical schools, some early medical schools lacked a thorough teaching of the subject. The study area slowly evolved throughout the nineteenth century, and the study of medicine produced many scientists and doctors. As medical schools left many doctors ill-prepared for their careers, they still had an important place as a collective of scientifically minded students and educators.

Medical schools varied in quality and preparation. The University of Michigan medical school graduates resulted from one of the first modern medical schools in the country. The way the founders designed the Michigan Medical School allowed for outstanding graduates. Michigan's science-focused and laboratory-based curriculum made it one of the best medical schools for American medical students during the Civil War. The medical school's success was highly dependent on the school's founding leaders and the innovative and pioneering faculty. The foundational group unified around a central philosophy for the medical school while each professor and administrator strove for personal goals that pushed the new medical school to the forefront of education in time for the Civil War.

Michigan is highly esteemed in the world of modern medical education. As of 2023, the state has six Doctor of Medicine programs and one Doctor of Osteopathic Medicine program.[4]

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[4] Doctor of Medicine programs are known as Allopathic Medical schools. Allopathic medicine traces its origins back to the orthodox medical field and remains the industry standard for medical education. Osteopathic Medical schools still graduate physicians who have full licensure to practice medicine. Michigan's only Osteopathic Medical School is the Michigan State College of Osteopathic Medicine, founded in 1969. Their scope of care does not differ at all from their Allopathic counterparts. Osteopathic medicine is an integrative form of medicine that incorporates orthodox medicine and other areas like chiropractic, cranial-sacral methods, and other areas. Osteopathic medicine

The beginning of Michigan medical schools goes back to the University of Michigan Department of Medicine and Surgery, which opened its doors in 1850. The University of Michigan's medical department rose to the forefront of medical education immediately following the Civil War. The number of enrollees clamoring for admittance rose extensively following the war, from 92 students in the initial 1850 class to 525 in 1867.[5] The legacy of the medical school is firmly built on the quality of its graduates during that time, between 1850 and 1865.

The school operated an entirely different system from its contemporaries. The medical school's creation resulted from a state-sanctioned university system. The University of Michigan thus opened the first state-run medical school affiliated with a university in the country. The funding paid the salaries of full-time professors with no financial stake in the school. Survival of the medical school was not dependent on filling lecture hall seats. The direct financial competition faced by other schools directly led to a decline in the value of medical education during the nineteenth century. A preoccupation with money drove rival medical colleges. Schools felt a reluctance to raise acceptance standards or risk closures. The University of Michigan medical school staff, could focus solely on the quality of graduates and the curriculum with little risk to their positions.

The proximity of the medical school's opening to the start of the Civil War meant many school graduates and attendees served in the conflict. 44% of the 501 who graduated between

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in theory is more driven towards curing patients and using a multi-faceted approach that does not always involve medication, surgery, or other methods. Allopathic medicine has been widely focused on treating symptoms and preventative care, using scientific methods to determine outcomes to combat future ailments.

[5] Dea Boster and Joel Howell, *Medicine at Michigan: A History of the Medical School at the Bicentennial* (Ann Arbor: University of Michigan Press, 2017), 26.

1851 and 1865 served as assistant or full surgeons during the Civil War.[6] The schooling of these doctors was integral to their military careers, whether the information learned was sound or not. Historians have neglected this area of Civil War medical history. Most Civil War medical historians briefly brush over medical education, and medical education historians assume the instruction was of little merit due to the archaic nature of nineteenth-century medicine. Regardless, the educational experience was transformational as a point of molding the ideas of young surgeons.

Doctors of the "West" were scoffed at by their Eastern counterparts during the Civil War. Their medical schools were often deemed poor, and the frontier had little to offer as medical prominence belonged in the East with schools like Harvard, University of Pennsylvania, Yale, Jefferson Medical College, and others. The University of Michigan had a unique placement in the history of medical education. The school was established later than more recognized schools but managed to draw a large group of medical and scientific pioneers to fill faculty positions. State regulations also laid the groundwork for a state-sanctioned medical school, bolstered by a physician on the school's original board of regents. Regent Dr. Zina Pitcher was a massively popular physician and civil servant who connected the school with idealistic and capable faculty.

Graduates who served in the Civil War from the University of Michigan Department of Medicine and Surgery had an advantageous position compared to graduates of other schools. The first significant difference came from the different applied science programs that were superior to those from other universities in the country. The school focused on analytical chemistry, dissection, surgery, clinical instruction, and physiology. Comparisons to America's more famous medical schools show the advantages offered at the University of Michigan. The curriculum at

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[6] Assistant surgeons were junior to surgeons in pay grade and name only. Later in the Civil War only the best surgeons were allowed to operate on or treat patients regardless of rank. Experience, ability, knowledge, and personality determined the various duties of both ranks.

Michigan was arduous, and survivors of a full Doctor of Medicine program were far from the rabble commonly attributed to nineteenth-century medical schools.[7] Understanding Michigan's advantage in antebellum medical education is done by recognizing the medical school's founders, faculty, and philosophy.

The Civil War was a time of medical discovery and change. The need for medical collaboration overrode the individualistic aspect of American medicine. Leaders in the medical branch of the Union Army built the mechanisms for scientific medicine through an organized teamwork structure. Army doctors submitted case studies and medical questions for peer review to the highest medical order of the Army. Doctors were encouraged to disregard the medical consensus and challenge it through questions and ideas. The medical staff collected medical records, and case studies were published to help other physicians in the army direct their research venues. The Civil War represented the first era of scientific corroboration in the United States. The war forced doctors to adapt rapidly to changes as they occurred. Doctors dropped their individualistic preconceptions of medicine and joined a movement to modernize their field. It was a movement that required not only adaptation to new medical procedures but also adaptation to new medical theories and equipment. The war resulted in an overwhelming amount of new research they were to learn.[8]

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[7] Kenneth Ludmerer is often seen as a pioneering historian of American medical education. Ludmerer asserts in *Learning to Heal: The Development of American Medical Education* that professors went through extreme lengths to fill rolls. Ludmerer even states that schools cleared out prisons to fill classroom seats. Kenneth Ludmerer, *Learning to Heal: The Development of American Medical Education* (New York: Basic Books, Inc.,1983),13.

[8] Reorganization of the Union Army Medical Department in late 1862, at the behest of William Hammond put in motion a new ideology of medicine. Hammond, as Surgeon General of the United States Army, kept every hospital stocked with current medical textbooks, medical journals, pamphlets, and modern medical equipment. Doctors needed to adapt to this ever-changing field of medicine. Shauna Devine, *Learning from the Wounded: The Civil War and the Rise of American Medical Science* (Chapel Hill: The University of North Carolina Press, 2014), 28.

The changes to the Union Army Medical Department and medicine during the Civil War required the capability of doctors to think scientifically while utilizing experience. As medical schools became more commonplace in the Antebellum United States, the proprietary nature of education made schools less driven toward prestige and innovation. The existence of genuinely scientific medical education started to fade while proprietary medical schools eroded the standard of medical education. A scientific medical education is an integrative study of science that includes clinical and applied scientific instruction. Degree mills, known as proprietary medical schools, existed to print certificates for graduates of their cheap programs. Medical college founders created these proprietary schools during the era of Jacksonian Democracy while taking advantage of low-era medical standards. After the War of 1812, the proprietary school movement pushed established medical schools to compete for applicants. The rise of proprietary schools resulted in lower standards for all established medical schools, and graduates became less prepared for the scientific advancement of medicine.[9]

Poor scientific medical education was problematic at the beginning of the Civil War. Many surgeons were inexperienced and could not handle the exposure to new medical ailments and procedures. William Hammond's takeover of the Union Army Medical Department in 1862 put a premium on research skills. On May 21, 1862, Hammond issued *Circular No. 2,* creating an Army Medical Museum as a receptacle for case reports, specimens, post-mortem examinations, research projects, experiments, and medical histories.[10] Most American medical schools lacked training in the areas needed to contribute to the military records. Medical school

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[9] Martin Kaufman, *American Medical Education: The Formative Years, 1765-1910* (Westport: Greenwood Press, 1976), 39.

[10] William Hammond, *Circular No. 2* (Washington: Surgeon General's Office:1862)

students preferred coursework offering practical applications over theoretical or scientific training.[11]

Nineteenth-Century Medical Education

Graduates from the University of Michigan Department of Medicine and Surgery profited from the delayed establishment of the school. The idea for the University of Michigan came to fruition during the territorial era. In 1817, the conception of the school included the plans for a medical school, but the state delayed its establishment numerous times.[12] The 1850 establishment of the school occurred during a rising concern over the legitimacy of allopathic medicine.[13] The Jacksonian era saw relaxed medical standards and regulations; distrust in the medical institution was a rebounding effect. Heroic medical practices of bleeding, purging, blistering, and sweating did not endear Americans to their physicians. New medical theories arose in response, including homeopathy, Thomsonian medicine, hydrotherapy, and other forms of therapy. Physicians who took the profession seriously panicked over the rising competition. At the 1846 National Medical Convention, attendees selected seven doctors to head the new National Medical Association, later known as the American Medical Association. Doctors created the association to give the profession a unified direction, voice, and an elevated standard of medical education.[14] This push

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[11] William Rothstein, *American Medical Schools and the Practice of Medicine: A History* (New York: Oxford University Press, 1987), 11.

[12] Boster, *Medicine at Michigan*, 9.

[13] The 1817 inception of the university was known as the Catholepistemiad or the University of Michigan. Medical school was consistently listed as a priority for the university but failed to manifest due to financial constraints. The territorial, later state of Michigan, plan to offer a free education burdened the school financially, delaying the establishment of the medical school until it opened in 1850.

[14] *Proceedings of the National Medical Conventions, Held In New York, May, 1846, and in Philadelphia, May, 1847* (Philadelphia: T.K. & P. G. Collins, Printers, 1847), 55.

with the hope of ”exciting and encouraging emulation and concert of action in the profession” took place just four years before the opening of the Michigan medical school.[15]

The fruition of the Michigan Medical School at this juncture of science and medicine allowed the school to stand at the forefront of medical education. The 1850 establishment of the school led to the placement of serious, scientifically minded faculty. Aside from Doctor Zina Pitcher’s early influence, the school had an early legacy tied to a scientific leader, Dr. Douglass Houghton. A licensed doctor, Houghton, born in 1809, had a background lecturing in chemistry and the natural sciences in his home state of New York when he was called to Michigan by a former college professor. The state authorities appointed Houghton to the first Geological Survey of the State of Michigan, where he gained fame.[16] The doctor’s survey established Michigan’s dominance as a state with rich natural resources in precious metals and flora. Houghton’s fame resulted in a post at the University of Michigan, but a tragic drowning cut his life short before he could teach medical students.[17] Houghton’s exploits as an explorer attracted a new body of scientists to the state and university, including his cousin Silas Douglas, a pioneering chemistry professor.[18]

The University of Michigan Department of Medicine was fortunate in its distance from the foundation of American medical education. When William Shippen and John Morgan founded the University of Pennsylvania Medical School in 1765, most American doctors participated in apprenticeships to receive training. Co-founder of the new university, John

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[15] *Proceedings of the National Medical Conventions,* 55.

[16] Alvah Bradish, *Memoir of Douglass Houghton: First State Geologist* (Detroit: Raynor & Taylor, 1889), 26.

[17] Bradish, *Memoir of Douglass Houghton,* 64. Houghton died on October 13, 1845, on another surveying expedition. At the age of 36, Houghton drowned in Lake Superior at the mouth of the Eagle River.

[18] William Hubbard, *The Origins of Michigan’s Leadership in the Health Sciences* (Ann Arbor: Historical Center for the Health Sciences, 1995), 25-26.

Morgan, managed to alienate the established medical field in America by targeting apprenticeship-trained doctors. John Morgan, a 1763 graduate of the elite European medical school in Edinburgh, Scotland, published *A Discourse upon the Institution of Medical Schools in America* as a treatise on medical education. While his ideas established the significant tenets of modern medical education, the American medical establishment rejected his arguments for decades following his book's publication.[19] Morgan's book disparaged the apprenticeship system by pointing out the lack of a well-rounded and in-depth education in all areas of medicine.[20] He further offended surgeons by separating their work from the field of medicine.[21] Morgan's former friend, William Shippen, became his rival, and the rivalry led to the dismissal of Morgan's ideas for the next several decades of American medical education.[22]

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[19] Morgan's layout for medical education included an in-depth science education in which the sciences were separated into anatomy, botany, and chemistry each taught in a laboratory setting. Schools would require rigorous clinical follow-up after completing coursework at a teaching hospital affiliated with the medical school. He even believed that students should require a rigorous pre-medical education and that medical schools could be the direct catalyst for medical research and change. Henry Beecher and Mark Altschule, *Medicine at Harvard: The First Three 300 Years* (Hanover: The University of New England Press, 1977), 22.

[20] John Morgan, *A Discourse Upon the Institution of Medical Schools in America: Delivered at a Public Anniversary Commencement, held in the College of Philadelphia, May 30 and 31, 1765* (Philadelphia: William Bradford, 1765), 18-27.

[21] Morgan's sentiments surrounding surgeons were not uncommon in the eighteenth century. This was especially true for a doctor educated in Europe. In Europe, surgeons were seen as an entirely different entity in the medical field. Physicians held deep knowledge of science and were allowed to give medical advice while surgeons had to perform major surgery in the presence of a physician. By the early-nineteenth century this differentiation started to dissipate. Nonetheless, Morgan managed to alienate the surgeons operating in America.

[22] Morgan was a deeply egocentric and ambitious physician. William Shippen preceded him in graduating from Edinburgh in 1761. While the pair met up in London to discuss the idea of opening an American medical school, Morgan was still jealous of Shippen's seniority. Morgan attempted to undermine Shippen's attempts at founding the University of Pennsylvania Medical School by approaching the university without notifying Shippen first. Morgan later made several public remarks, mocking his former friend. Dr. Morgan managed to alienate most of the Philadelphia medical community, including Dr. Benjamin Rush. Morgan eventually became the Continental Army's medical director in 1775 but his continued feud with Shippen cost him his position and he even suffered a reprimand from George Washington over his petty rivalry. Shippen replaced Morgan as director and the insanely jealous Morgan doctored charges of fraud to bring against Shippen but the case ended with a non-guilty verdict. Morgan fell into obscurity in the 1780s and was no longer affiliated with the University of Pennsylvania Medical school, dying alone in 1789.

Medical education took on the same form at all early medical schools. Schools admitted students with little to no prerequisite education. Many of the pre-1850 medical schools medical schools placed no limit on the number of enrolled students. Students then sat through two terms of classes, ranging from 16 to 20 weeks in length. The usual course load consisted of a deep anatomy study that analyzed specimens and lecture material. Professors instilled students with a basic understanding of the material in courses like chemistry, botany, *Materia medica*, and natural philosophy.[23] At many schools, professors taught clinical courses by lecture only, including the subjects of surgery, obstetrics, and clinical medicine. Patients were rarely part of the clinical courses. Students periodically observed surgical procedures from the school's amphitheater along with other spectators. Most medical schools used ungraded lecture courses as the main style of instruction. Many early medical schools lacked supplementary textbooks. Students trusted the knowledge their instructors instilled without further investigation.[24]

Dr. James Jackson, a Harvard University Medical College professor, published an overview of lectures given to his students in the Winter of 1815.[25] Jackson was the closest thing to a medical celebrity when he took up his posting at Harvard, from which he had graduated in 1796.[26] Jackson's lectures on clinical science were typical for educators of his day, covering the essentials of medicine at a basic level. Classes focused on the body's composition, structure, movement, and primary function. Lectures on hygiene break down the most rudimentary areas of

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[23] *Materia medica* was composed of pharmacology and botany. Plants used medicinally and other materials were covered in this course for therapeutic use in medical practice.

[24] Rothstein, *American Medical Schools and the Practice of Medicine,* 35.

[25] Harvard University's medical school was established in 1782. The affiliation with the university was minimal aside from the name. Oversight was directed by the faculty.

[26] Jackson was an early member of the Massachusetts Medical Society, one of America's first medical societies. He served as the head physician at Massachusetts General Hospital from 1811 to 1835, working concurrently as a professor at Harvard where he taught clinical medicine. Beecher, *Medicine at Harvard: The First 300 Years,* 45.

human understanding and connection to health, including proper diet, where Jackson instructed his students on the importance of moderation and avoiding the ”evils of excess.” [27] Students were taught to identify the unique aspects of all diseases while understanding the causes. Jackson taught that by examining symptoms, we ”thus are led to the primary changes induced in the body by noxious agents, and then to the characters of those agents.”[28] Basic types of medications were covered in one short lecture, followed by several weeks of breaking down common ailments and treatments. Treatments changed little over the ensuing thirty-five years, giving access to the general clinical knowledge gained by medical students in the early nineteenth century.

The clinical experience came solely from the three-year apprenticeship required under the guidance of a preceptor. While most doctors were apprentice-trained in the eighteenth and nineteenth centuries, apprenticeship in conjunction with medical school was more beneficial. Apprenticeships without going to medical school required attending doctors to teach theoretical aspects of medicine and the surrounding sciences, making most apprentice graduates poorly versed in the sciences. While professors gave some rudimentary clinical instruction in the lecture hall, it was recorded as words in a notebook with little opportunity to see the action first-hand. The lack of clinical education was central to the founding purpose of the University of Michigan. Dr. Zina Pitcher, who served as a regent and founder of the medical school, was driven by his embarrassing origins in medicine. Pitcher was commissioned as an army surgeon and thrust into a position as the lead physician on numerous frontier army posts.[29] Despite earning a medical

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[27] James Jackson, *A Syllabus of the Lectures Delivered at the Massachusetts Medical College to the Medical Students of Harvard University* (Boston: Harvard University, 1816), 24.

[28] Jackson, *A Syllabus of the Lectures Delivered,* 28.

[29] C.B. Burr, *Medical History of Michigan,* vol. I (Minneapolis: The Bruce Publishing Company, 1930), 196.

degree from Middlebury College in 1822, he was shocked to realize how lacking his clinical experience was upon his first posting.

This typical form of medical education produced doctors with limited medical knowledge despite having a more prominent education. Students who sat through two identical semesters of coursework and finished their apprenticeships to earn medical degrees. The economics of American medicine during the early nineteenth century put young doctors into a competitive world, and their medical degrees gave them a sense of prominence. Many early American medical schools placed graduates in areas already occupied by practicing physicians. While having a medical degree gave young physicians a sense of importance, there was much to learn for their ensuing medical careers. The education each received left them wanting clinical patient experience, and the medical knowledge of the nineteenth century left each doctor with limited means of treating patients.

When the state established the University of Michigan Department of Medicine and Surgery in 1847, the founders benefited from the historical experience of medical education, creating a period of mistrust in medicine. Standards throughout the country were dropping, followed by a gross public distrust of medicine during a stagnation in medical science and education. The medical school system failed to produce innovation in medical science as schools were unable to stand as centers of medical research.[30] The medical school graduate seemed of small benefit to many Americans as visits from the doctor often meant painful and often dangerous medical treatments with various poisons and painful instruments. Americans often felt

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[30] The NIH states that over 84% of their budget distribution in medical research funding is conducted at research universities and medical schools. This represents 84% of a $45 billion annual. This data is used to show that current medical schools stand as the preeminent mode of medical research while nineteenth-century medical schools did little to no research in most schools. The modernization of medicine is directly tied to the scientific research conducted at the university and medical school level. Research for the People," National Institutes of Health, August 1, 2023,https://www.nih.gov/ABOUT-NIH/WHAT-WE-DO/BUDGET.

safer depending on their medical skill. John C. Gunn's *Domestic Medicine* became a prevalent domestic medical text published in 1830. The book, which went through several editions, showcased the public sentiment surrounding physicians in conjunction with the individualistic and unregulated aspect of Jacksonian America. Gunn even dedicated his initial edition to President Andrew Jackson.[31] Gunn, a self-proclaimed" doctor," taught his readers how to diagnose and prescribe medications while instructing them on finding natural alternatives to standard drugs. The manual uses nonchalant language to walk readers through limb amputation, saying, "The only difficulty, I confess to you, is to know when this operation ought to be performed."[32]

The unregulated medical industry gave rise to patent medicines that became popular during the constant cycle of epidemics and other diseases that riddled the United States. These bottles of "snake oil" were often filled with hard narcotics like cocaine, opium, and morphine, making them extremely addicting.[33] Nineteenth-century newspapers were inundated with ads for patent medicines that didn't list the drug's ingredients but instead marketed the miraculous effects. Drugs like "Mother's Relief" advertised effects that would "still all febrile and nervous affections- cause sweet and natural rest," along with a list of more expected outcomes that followed familiar advertising tropes.[34] These tropes included the false promise that "Medical

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[31] Ben McClary, "Introducing a Classic:'Gunn's Domestic Medicine,'" *Tennessee Historical Quarterly* 45 no. 3 (Fall 1986), 212.

[32] John Gunn, *Gunn's Domestic Medicine or Poor Man's Friend, In the Hours of Affliction, Pain and Sickness, This Book Points Out, In Plain Language, Free from Doctor's Terms, the Diseases of Men, Women, and Children, and the Latest and Most Approved Means in Their Cure, and is Intended Expressly for the Benefit of Families in Western and Southern States* (Xenia: J. H. Purdy, 1837), 695.

[33] James Young, *The Toadstool Millionaires: A Social History of Patent Medicines in America before Federal Regulation* (Princeton: Princeton University Press, 1974), 221.

[34] "Mother's Relief," *Pontiac Weekly,* March 4, 1842.

men of high standing have acknowledged that their prejudices must be abandoned and have advocated for its use." Bottles of medicine marked as medical cure-alls were dangerous and periodically led to cases of overdose and death, but their effects were no worse or better than the drugs commonly prescribed by doctors of the nineteenth century.[35] The University of Michigan Medical School opened during this time of medical mistrust.

Just two years before Zina Pitcher's push for a medical school was approved, a national move to organize the medical field set its sights on education. Unrestricted entrance to medical schools made the medical establishment leery.[36] A New York State Society Meeting determined that medical school admission standards were too low. The society's desire for New York's medical schools to raise the standards was met with the realization that higher standards lessened their chances for enrollees. This recurrent problem dates back to the 1820s when schools ignored the unified standards in the name of economics.[37] A unified effort was needed, and doctors called for a National Convention in New York. The National Convention became the birthplace of the American Medical Association (AMA), formally voted into existence at the 1846 meeting. The group immediately established an annual report on the status of medical education, with an assessment of medical school requirements coming first.[38] Medical education was chaotic,

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[35] Young, *The Toadstool Millionaires,* 222.

[36] N.S. Davis, *History of the American Medical Association from its Organization up to January 1855; to which is Appended Biographical Notices, with Portraits of the Presidents of the Association, and of the Author* (Philadelphia: Lippincott, Grambo, 1855), 19.

[37] State medical societies realized the waning standards upheld by medical schools. Proposals by many medical societies to control state licensing were slowly rejected due to rising distrust in government and institutions. Medical schools refused to adhere to unified medical standards due to individual state problems. States that agreed to raise standards then faced financial loss via competition with schools in other states. Kaufman, *American Medical Education*, 86

[38] American Medical Association, *Proceedings of the National Medical Conventions, Held in New York, May, 1846, and in Philadelphia, May, 1847* (Philadelphia: T.K. & P.G. Collins, 1847), 63.

according to the surveys returned by nineteen medical schools.[39] There was no uniformity amongst schools, and despite AMA recommendations to reform, schools failed to change.[40] The 1847 meeting continued the trend into the 1850s, where educational reform was the constant companion at all meetings. Regardless, the recommended changes were slow to come. The discontent with medical education during the 1840s-50s gave the University of Michigan a unique opportunity.

The University of Michigan Department of Medicine and Surgery:

The University of Michigan medical school's opening was pushed several times by regent Dr. Zina Pitcher during a move to modernize the scientific study at Michigan. The January 1847 meeting of the regents took place in the aftermath of Douglass Houghton's death. The school arranged for enough money to purchase the scientific papers and books left behind by Houghton while regents recognized modern science texts were needed to complete the library.[41] In that meeting, Pitcher stood firm on his proposal for a medical school, pending state funding.[42] Out of desperation, when 1848 arrived with little movement on the medical school, Pitcher formed a special committee to determine the need for a medical school. Pitcher called upon the valuable experience of settling in Michigan through hardship as a tool for "mental training

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[39] Of 33 schools contacted, only 19 sent back filled surveys. The questions surrounded: 1) Number of 1845-46 students 2) Number of graduates 45-46 3) Number of charity students 4) Number of professors at each school 5) The date at which lectures begin and end 6) Degree Requirements 7) Inquiry, before final examination, as to whether the requirements for graduating are fulfilled 8) Any evidence of clinical coursework 9) is cadaver dissection required? American Medical Association, *Proceedings of the National Medical Conventions, held in New York, May, 1846,* 79.

[40] Kaufman, *American Medical Education,* 94.

[41] University of Michigan Board of Regents, *University of Michigan Regent's Proceedings: 1837-1864* (Ann Arbor: University of Michigan Press, 1915), 358.

[42] *University of Michigan Regent's Proceedings,* 365.

essential to the usefulness if not success" of the medical community.[43] According to the committee, the state needed a medical school to pass the knowledge attained through struggle. The committee found that the lack of a medical school forced young aspiring doctors to seek medical schooling elsewhere, and over one hundred medical students had left the state for the 1847-48 school year.[44]

The regents approved the building of a medical school after Pitcher's presentation under the oversight of Silas Douglas. The school completed the $9,991building in 1850 when the medical school's inaugural class entered the school. The new medical school differed crucially from other American schools in one area: ownership. Medical schools of the nineteenth century, before 1850, were owned by faculty members, and university affiliations were only to serve as a mutual boost to reputation. Students at other schools purchased tickets to attend lectures, paying $15 to $20 for a four-to-five-month term. Course outcomes were utterly dependent on the course teachings and the professor.[45] The young state of Michigan was the first to instill plans for state-run education that controlled primary, secondary, and college education. This difference factored in a budget for state endowments that allowed students to enter the school free of charge aside from a university entrance fee.[46] Professors were not only forced to adhere to positive outcomes but were accountable to the university. As full-time paid staff, the first of their kind for medical school professors, their ability to uphold academic excellence equated to job security. University

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[43] Ibid, 390

[44] Findings from the committee showed that thirty students were enrolled at the Cleveland Medical College along with ten at Rush Medical College in Chicago for the 1846-47 school year. The Indiana Medical College at La Porte was stated to have "more Michigan students than students from Indiana." Ibid, 391.

[45] Rothstein, *American Medical Schools,* 32.

[46] Davenport, *Not Just Any Medical School,* 13.

of Michigan Medical School historian Horace Davenport stated that this crucial difference immediately set the school apart.[47]

The University of Michigan's state-run university system mirrored the German or "Prussian" system of the nineteenth century. The Michigan Constitution outlined this idea of government-directed education in the Michigan Constitution of 1835. Guided government education was a partial adaptation that made its way to the University of Michigan. Prussian standards forever changed the academic standards of university education. Following the German 1806 defeat at the hands of Napoleon, an administrative overhaul in Germany reconditioned the state from an authoritarian-absolutist focus. Wilhelm von Humboldt, an educator and philosopher, took charge of educational changes during the Prussian Reform Movement. Educators needed a shift from absolutist policies to one of citizen contributions to place Germany at the pinnacle of enlightenment. The Humboldtian model of higher education equated to a well-rounded and integrative approach to education. Prussian reform sought to involve the citizens in society to give them a stake.[48] Reformers applied this to education. The government expected students to research while working through their studies, using their academic background to advance in the sciences and arts.[49] While the university was state-

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[47] Ibid, ix-x.

[48] The humiliating Prussian defeat at the battles of Jena-Auerstedt on October 14, 1806, led to Napoleon's occupation of Berlin. The ensuing Treaty of Tilsit cost Prussia half of its population, at over 4 ½ million Prussians and a payment of 120 million francs. The Prussian government, which had been hostile to enlightenment ideas and change, recognized the need for new government administration and economic management. The series of reforms, known as the Prussian Reform Movement, adopted the thinking of the Enlightenment, forever changing the history of Germany. This movement led to Germany's unification in 1870. Reforms wanted to instill in the Prussian and German people a sense of pride and involvement in areas of government, economy, industry, education and other areas of reform. Education changed in Germany and ultimately ended with many of the world's university systems adopting the German style of government.

[49] The step-by-step education process, from primary to post-secondary education guided students in their academic growth. By the time of a student's arrival at university the students would have had an incredible grasp of science and a basis to conduct research in all areas of academia. Students were allowed to pursue areas of interest, and they were permitted to take elective courses.

funded, Humboldt's ideas pushed for self-guided research safe from bureaucratic pressures.[50] Through Humboldt's reforms, the modern research university found its origin, putting research goals on teachers and students alike to serve as a conduit for progress.[51] Universities had ample opportunity to reform education and produce societal change and improvement through a research system.

The educational direction of the University of Michigan adhered strictly to this Prussian model of study, as shown by the school's first president. Dr. Henry Phillip Tappan was elected as the first university president in 1852 while the medical school was in its infancy. Tappan was a renowned philosophy scholar from New York who came at the recommendation of former Naval Secretary George Bancroft.[52] Tappan's academic career had him deeply embedded in philosophy. Tappan shaped his work around his heroes, and no one shaped his ideology more than French Philosopher Victor Cousin. Cousin's career in Europe found him studying in Germany, where he had gone to study educational reforms, publishing a popular book on education titled *Report on the State of Public Instruction in Prussia,* which contrasted the novel educational philosophy with Europe and the United States.[53] Cousin's work admired the Prussian model that directed the proper educational structure for a truly universal education.[54] Tappan's philosophical works

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[50] Jurgen Backhaus, *The University According to Humboldt: History, Policy, and Future Possibilities* (New York: Springer Cham, 2015), 35.

[51] Peter Josephson, Thomas Karlsohn, and Johan Ostling,eds., *The Humboldtian Tradition: Origins and Legacies* (Leiden: Brill, 2014), 5.

[52] Tappan became a renowned academic in the city of New York, taking a post as Professor of Philosophy at the University of the City of New York in 1832. Tappan became friends with Bancroft during his time in New York, gaining his friend's recommendation during the search for a University of Michigan president.

[53] Victor Cousin, *Report on the State of Public Instruction in Prussia* (London: E. Wilson, 1834), 336.

[54] Cousin served as a member of the French Council of Public Instruction during the July Monarchy (1830-1848). Cousin had tremendous educational influence as he oversaw philosophy teaching and used it to popularize French nationalism. His ideology promoted the university as central to the rise of French national identity and stability. His

gained popularity in Europe, and his travels put him in contact with Cousin and a lifelong correspondence. There is little doubt that Cousin's educational philosophy altered Tappan's. Henry Tappan's letters to his colleague border on hero worship as he wrote to Cousin in 1859, "At no distant day I hope to lay at your feet a work to testify that I have not known you in vain."[55] The new president's career at Michigan reflected a commitment to the Prussian philosophy of education.

Tappan's nomination nearly failed. Tappan's previous summoning of a homeopathic physician almost led to his downfall, clearly showing hostility towards other forms of medicine.[56] However, Tappan's election came after two other nominees turned down the job, and in 1852, he immediately went to work. Tappan went to work and immediately raised funds for library books and an observatory. Travels for observatory parts took Tappan to Berlin, where he further divulged in German culture, going so far as to earn the moniker *Chancellor*.[57] Despite the mockery, Tappan strictly believed in the new university. Through Tappan's adherence to German-style education, he was an advocate for the sciences as a conduit for industry, and the university was to encourage research.[58] The treatise written by Tappan, *University Education,*

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research effectively inspired the Guizot Act of 1833. The act centralized French education based off of the German model. Doris Goldstein, "'Official Philosophies' in Modern France: The Example of Victor Cousin," *Journal of Social History* 1, no.3 (Spring, 1968), 276-279.

[55] Henry Phillip Tappan to Victor Cousin, June 3, 1859, Henry Tappan Papers, 1840-1881, Bentley Historical Library, University of Michigan-Ann Arbor.

[56] Tappan's character and quality was informed by references on the east coast. His mistake of using a homeopathic physician angered the medical establishment in both Ann Arbor and Detroit. Charles Perry, *Henry Philip Tappan: Philosopher and University President* (New York: Arno Press, 1933), 171

[57] Perry, *Henry Philip Tappan,* 195.

[58] Henry Philip Tappan, *University Education* (New York: George P. Putnam, 1851), 109.

advocated strongly for academic freedom and capable, distinguished professors who could drive research interests.[59]

The ambition behind the university as a Prussian institution clashed with the standards of most established universities. Brown University president Francis Wayland assigned a committee to determine the direction of his university's education model. In the 1850 published report, the committee determined that Brown and the other East Coast colleges and universities followed the Great Britain style of college education. The old universities, like Oxford, originated to educate clergy by focusing on theology, philosophy, language, and mathematics.[60] Classical American education relied heavily on the lecture, which almost exclusively came word for word from textbooks in the teacher's collection.[61] The new philosophy of the University of Michigan sought to deviate from this classical mode of education and transform the college into the "University."[62]

Tappan's work was valuable to the sciences and nurtured the expansion of scientific study at the university. Aside from his observatory, Tappan removed the dormitories from the main college building to expand the library and install a natural history museum.[63] Tappan and

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[59] Tappan, *University Education,* 68-69.

[60] Francis Wayland, *Report to the Corporation of Brown University on Changes in the System of Collegiate Education* (Boston: Thurston, Torry, and Company, 1850), 6.

[61] Perry, *Henry Philip Tappan,* 220.

[62] The idea of the university planned to break students from a sense of meaningless education and instead prepare them for production in society. Students were allowed to take charge of their education and the university, in turn, could offer something of true value. These changes were important during an era where colleges and universities were struggling financially.

[63] When the university opened, in 1837, it was common for students to live in the same building they studied in. Tappan disliked the idea of the in-school dorm as it gave college life a preparatory or boarding school feel. Students living in the dorms, away from parents and other watchful eyes, were obnoxious and immature, engaging in hazing and practical jokes. The new idea of the "university" would put students out into the community in which they studied where they would board in town. This lessened the need for chaperones and opened the university up to rennovation. Perry, *Henry Philip Tappan,* 233

the school faculty used the funding to fill the library with hundreds of scientific books and modern scientific and medical periodicals, and the library was open to students daily.[64] Administrators placed a museum dedicated to minerals, geological, and zoological specimens in the main university building. Students filled a brand-new laboratory devoted to analytical chemistry to the maximum limit of students in the year of its opening. Medical students were required to undergo laboratory instruction in chemistry, but by 1855, the university offered advanced analytical chemistry for students who completed the basics.[65] The school offered courses in Geology, Zoology, and Botany, and students outside of the medical program could now obtain a bachelor's degree in science. Tappan's tenure as president ended in 1863 in tumultuous fashion as a new board of regents unanimously voted to remove him from office. His eleven years as president focused on pushing the university towards lofty goals.[66] Tappan's time in office was especially friendly to the fledgling medical department, which would pioneer medical education throughout the nineteenth and twentieth centuries. Tappan's legacy eventually carried over to a later and longest-serving university president, James Angell, who continued to drive the university in Tappan's proposed direction.

Henry Tappan was fondly remembered by graduates and professors present in the early days of the medical school. Despite Tappan's background as a philosophy scholar, he was a

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[64] Ibid, 233.

[65] Ira Mayhew, *Reports of the Superintendent of Public Instruction of the State of Michigan, For the Years 1855, '56, and '57: With Accompanying Documents; Including Reports from The University of Michigan; the State Agricultural College; the State Normal School; Incorporated Academies, Colleges, and Seminaries; Union Schools; etc., etc.* (Lansing: Hosmer & Kerr, 1858), 101-102.

[66] Tappan was an arrogant man of aristocratic persuasion who scoffed at the less educated. This was problematic in a state just coming out of the Pioneer Era. Most of the new board of regents, elected during the 1858 term, lacked a college education. They disliked the superiority Tappan displayed and unanimously voted him out of office after putting up with his ambition and arrogance for five years, removing him on June 25, 1863.

profound ally to the scientific personnel at the school. Tappan wrote to 1859 graduate William Breakey that the success of the Michigan Medical School gave him pride late into his life, even well after his dismissal as president.[67] Students and faculty alike saw Tappan as the true founder of both the University and the medical school.[68]A.B. Prescott, an 1864 medical school graduate and innovative Michigan chemistry professor, remembered Tappan as a great friend to the science faculty.[69]The medical faculty were hit hardest after Tappan's removal from office in 1863. Prescott remembered Dr. Silas Douglas being devastated by the loss of Tappan as the school's leader.[70]Tappan's placement as school president assured the Department of Medicine and Surgery would move to the forefront of medical education before the Civil War.

The scientific drive of the university was good for a medical school founded by faculty to be different. The school's success came through the scientifically minded faculty who operated the school in the early years. Regent Dr. Zina Pitcher's ideal scientific-medical program depended on the staff to institute the hopes of building an elite medical school. Silas Douglas, who met through connections to Pitcher, was one of the first faculty hired by the university for the eventual medical department.[71] At the 1848 regent's meeting, the Regents appointed Douglas

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[67] Henry Tappan to William F. Breakey, March 25, 1876, Basel, Switzerland, in *The Michigan Alumnus* VII, no. 62 (March 1901), 268-269.

[68] Walton Ambruster, "Reminiscences of Dr. Tappan: President of the University from 1852 to 1863," *The Michigan Alumnus* VIII, no. 67 (October 1901), 11.

[69] Albert Benjamin Prescott (A.B.) became close with Silas Douglas during his time at Michigan. Douglas took a liking to Prescott and brought the young man in as an Assistant Professor of Chemistry after the Civil War in 1866. Prescott is seen as a pioneering medical educator in creating strict admission requirements to the University of Michigan School of Pharmacy. Pharmacy students, beginning in the late-1860s were required to study in the school laboratory and serve an apprenticeship which were unusual requirements at the time. Prior to Prescott's changes most pharmacy students were required to merely memorize drug names and repeat them for examination.

[70] A.B. Prescott, "Silas Hamilton Douglas, the Founder of the Chemical Laboratory," *The Michigan Alumnus* IX, no. 77 (October 1902), 1.

[71] Silas Douglas switched between different spellings of his last name. For the first several years of his career, he used the Douglass spelling the double-s at the end of his name. By the start of the Civil War he had moved away

to oversee the school's building as "Superintendent of University Buildings."[72] The first medical school building was a small, square Greek Revival-style structure built on a barren dirt road in the small town of Ann Arbor. The facilities grew consistently over the ensuing decades as the student body grew regularly.

The building Douglas oversaw had only five faculty offices, small lecture rooms, a chemical laboratory, and a dissection room under a domed window.[73] In 1856, just six years after the medical school opened, Douglas convinced the regents to build an entirely separate chemistry building, the first on any American campus dedicated solely to chemistry.[74] Douglas built a massive chemistry department throughout his thirty-three years as a professor at the University of Michigan. He directed the creation of a chemistry department that later allowed students to study toxicology, urinalysis, pharmaceutical chemistry, organic chemistry, qualitative analysis, and quantitative analysis.[75] Douglas oversaw a rapidly growing department centered around the medical applications of chemistry. The University of Michigan professor and renowned surgeon Moses Gunn remarked that Douglas' ability to build his department and organize faculty made him a" pioneer in this kind of work."[76]

Doctors and historians have often overlooked the historical importance of the chemistry lab and instruction provided by Douglas. Douglas quietly built the first fully functioning

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from the traditional family spelling and the later spelling is used in this dissertation. Douglas had apprenticed in the office of Pitcher to learn the practice of medicine, while Pitcher's popular practice was open in Detroit.

[72] *Proceedings of the Board of Regents,* 397.

[73] Howell, *Medicine at Michigan,* 9

[74] *Proceedings of the Board of Regents (1837-1864),* 643.

[75] Davenport, *Not Just Any Medical School*, 4.

[76] Jane Gunn, *Memorial Sketches of Doctor Moses Gunn* (Chicago: W. T. Keener, 1889), 28.

chemistry laboratory available in any American medical school.[77] Victor Vaughan, a student of Douglas and later Dean of the Medical School from 1891 to 1921, wrote that Douglas was one of the first American educators to appreciate and utilize the laboratory teaching method. Medical schools overlooked the importance of laboratory studies before the Civil War. Douglas's laboratory was far superior and advanced during an era of underappreciation for lab study.[78] Laboratory instruction set the University of Michigan apart from other medical schools. Douglas's chemistry building first appropriated twenty-six tables for medical students.[79] That number grew to sixty by the start of the Civil War, and by the 1870s, he expanded his laboratory to fit one-hundred and thirty-two tables.

America's most prestigious medical schools could not provide Michigan's level of scientific instruction before the Civil War. Harvard University medical students were given little applied chemistry training before the Civil War. When Josiah Parsons Cooke took over Harvard's chemistry department in 1850, he lectured at two locations, splitting between the undergraduate and medical schools. Cooke tried to establish an applied chemistry course by outfitting the medical school with four tables for instruction.[80]Cooke's applied chemistry course was optional due to the lack of facilities. Instead, medical students sat through chemistry lectures while watching their professors perform experiments. Students were required to recite the

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[77] Victor Vaughan, "The Semi-Centennial of the Medical Department," *The Michigan Alumnus* VI, no. 52 (March 1900), 280.

[78] Jerome Knowlton, "Silas Hamilton Douglas," *The Michigan Alumnus* XIII, no. 122 (March 1907), 252.

[79] A.B. Prescott, "Silas Hamilton Douglas, the Founder of the Chemical Laboratory," *The Michigan Alumnus* IX, no. 77 (October 1902),4.

[80] Henry Beecher, *Medicine at Harvard: The First Three Hundred Years* (Hanover: University Press of New England, 1977), 68.

chemistry material to their professors, but that was the depth of chemistry instruction at Harvard Medical College before the Civil War.

The University of Pennsylvania and the Jefferson Medical College lacked proper chemistry facilities. Dr. Joseph Carson's 1869 history of the University of Pennsylvania fails to mention any chemistry or applied sciences laboratory study.[81] Carson, a pharmacy and materia medica professor, brushed over the school's history without focusing on the lack of laboratory facilities, which likely showed the typical disregard for laboratory courses. Jefferson Medical College of Philadelphia only used broad lectures on chemistry as a required part of study. The school offered analytical chemistry but only as an extracurricular course, with no facilities to train the Jefferson student body.

The lack of laboratory coursework is unfortunate, especially for schools that employed some of the brightest chemistry scientists of the nineteenth century. Prized chemist Robert Hare ran the University of Pennsylvania's chemistry department from 1810 to 1847. Hare received the first-ever American Academy of Arts and Sciences Rumford Prize in 1839 for inventing the oxy-hydrogen blowpipe.[82]Hare was a tremendous experimenter, designing a calorimotor called the Galvanic Deflagrator.[83]The Jefferson Medical College staff boasted the employment of Chemistry Professor Franklin Bache from 1841 to 1864.[84] Bache, along with pharmacy professor

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[81] Joseph Carson, *A History of the Medical Department of the University of Pennsylvania from its Foundation in 1765 with Sketches of the Lives of Deceased Professors* (Philadelphia: Lindsay and Blakiston, 1869)

[82] Carson, *A History of the Medical Department*, 166.

[83] In Hare's initial experiment presentation, he did not officially name his device the Galvanic Deflagrator. In later correspondence, he did refer to it as such. Robert Hare, "Letter from Robert Hare, M.D. Professor of Chemistry at the University of Pennsylvania, to B. Silliman, Professor of Chemistry at Yale College, on some improved Forms of Galvanic Deflagrator; on the Superiority of its Deflagrating Power: Also, an Account of an improved Single-leaf Electrometer; of the Combustion of Iron by a Jet of Sulphur in Vapour; and of an easy Mode of imitating native Chalybeate Waters," *Philosophical Magazine and Journal* 63, no. 312 (April 1824), 241.

[84] George Wood, *Biographical Memoir of Franklin Bache, M.D.* (Philadelphia: J.B. Lippincott & Co., 1865), 16

George Wood, conspired to write the premise of what would later become the *Pharmacopoeia and the U.S. Dispensatory.*[85]The only way students could learn from these masters was through lectures and observing experiments. The students performed the experiments at the University of Michigan with their esteemed chemistry professors to guide them.

Silas Douglas' diligence directly benefited the students. Before medical school opened in 1850, Douglas taught chemistry to the University of Michigan undergraduates. The professor grew frustrated with the lack of chemistry facilities. Almost immediately, he urged lengthening the chemistry coursework and wanted students to spend an entire year learning Organic Chemistry as early as 1847.[86] He argued that teaching chemistry was not merely about dazzling experiments and popular lectures. Douglas stated in 1847 that his goal for teaching chemistry involved combining scientific principles with their practical applications. Douglas was a great experimenter in both chemistry and education. In 1846, he brought a group of students to his private laboratory and had them design their experiments and give him lectures. Reciprocating learned information through teaching is a top method for ensuring comprehension, showing that he was ahead of his time in many ways. It was this experimentation format that served as a guide for future teaching. Practical teaching in applied and analytical chemistry set the University of Michigan into a separate category of medical school.

Dr. Moses Gunn was hired in 1850 as the Professor of Surgery and Anatomy for the fledgling medical school. Gunn was there to teach students at the medical school's opening,

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[85] This work is designated as the definitive work on pharmacy and Materia Medica and was first published in 1834. The book, now known as *The Dispensatory of the United States of America,* has gone through at least twenty-seven editions and has been deemed culturally necessary for contributions to medical science. Wood, *Biographical Memoir of Franklin Bache,* 34.

[86] Silas Douglas letter to Anonymous, January 15, 1848, Ann Arbor, Douglass Family Papers, Bentley Historical Library, University of Michigan-Ann Arbor..

teaching a combination of surgery and anatomy to the large 92-person class.[87] He remarked that the initial course went so well that faculty egotism" sprang an ambition to gain a position in the foremost rank for the college."[88] The young professor and surgeon graduated from Geneva College in 1846 after serving as an apprentice to Dr. Edson Carr, a famous New York physician. Gunn immediately gained a reputation for his surgical skills. Dr. Carr would take Gunn with the young student to consult on surgical cases. His capability as a surgeon factored into his work as a lecturer. Famous anatomist and University of Michigan professor Corydon Ford wrote about Gunn's lectures, which combined dissection, surgery, and anatomy, and he produced medical specimens that were the first of their kind in the state.[89]

During Gunn's days working at Geneva College, before his years in Ann Arbor, he aspired to be a part of the young medical school in Michigan. As a roommate with Dr. Corydon Ford, Gunn heard of the proposed medical school, and the pair immediately aspired to the new post.[90] The new school in the "West" likely offered an opportunity for freedom. Teaching posts in eastern schools, like those held by Ford and Gunn before 1850, were strictly mired in tradition. The medical community exiled doctors or scientists who attempted to break the usual education methods or challenges to medical ideology. Medical students and doctors who were medical school graduates no doubt found their medical education lacking. Most graduates were ill-prepared for medical practice and forced into an ultra-competitive market of other mediocre physicians. Young, idealistic physicians like Gunn saw the new Western schools as a disconnect from the established, standard thinking.

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[87] Gunn, *Memorial Sketches,* 33.

[88] Ibid, 34.

[89] ibid, 17.

[90] Burr, *Medical History of Michigan,* vol. I, 464.

Moses Gunn's tenure at Michigan was innovative in presentation. Dr. Gunn recognized the lack of clinical opportunities in the small town of Ann Arbor, so he established a surgical practice in Detroit, which he commuted several times weekly. He believed his medical practice was necessary to give him ample experience to train the next generation of doctors. In 1854, Gunn gave the anatomy lecture section of his course over to his old friend Corydon Ford and was then able to focus solely on surgery. While Gunn was a Professor of Surgery at the University of Michigan, surgery was essentially an unexplored frontier. Anesthesia was first successfully used on October 16, 1846, at the Massachusetts General Hospital. Before this success, physicians and surgeons shied away from most surgeries. Surgery without the anesthetic was harrowing, and the quickness required by the surgeon's hands made anything outside of amputations impractical. With the discovery of painless surgery, surgeons opened up a new world of medicine, which Dr. Moses Gunn demonstrated in front of his students. During the 1852-53 school year, Gunn performed twenty-six surgeries before his class. Students gathered around a stage as he treated gangrene, cancer, dislocations, and infections while performing amputations. His surgical theater, coming from a master at the craft, made his work wildly popular and successful.[91] The surgeries witnessed by students would later serve as a reference for the numerous University of Michigan graduates who served as surgeons during the conflict.

Silas Douglas and Moses Gunn served as pioneering educators on a team of many others. Corydon L. Ford, a lecturer and demonstrator of anatomy, followed his friend Moses Gunn to Ann Arbor in 1854. Ford's work was wildly popular as his presentations appealed to his students and the public. Ford's curriculum benefited from Michigan's lack of a cadaver law.[92] In

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[91] Davenport, *Not Just Any Medical School,* 17.

[92] nineteenth century Christian views made the dissection of cadavers abhorrent. It even called into question the dissection of criminals, or John/Jane Doe bodies. This gave rise to an underground black market known as "Body

conjunction with rising individualism and deregulation in medicine, many states made the movement and dissection of bodies illegal. What is now called "Gross" anatomy was a required practice at many medical schools, but numerous states that housed these schools made the practice illegal.[93] Cadaver dissection is integral to studying medicine and is needed to understand human anatomy properly. Michigan professors and medical students benefited from no unlawful use of cadavers. Each student at the university was required to dissect at least one cadaver during their tenure at Michigan under the watchful eye of Corydon Ford. Students who later served in the Civil War recalled the benefit of this exercise about their work as Civil War soldiers. Dr. Samuel K. Crawford, an 1861 graduate who served as a surgeon in the 50th Ohio Infantry, was immediately tasked with performing amputations when he arrived at his unit. Crawford recalled to his friend, another University of Michigan graduate, James Guthrie, "Cutting among living tissue of the human fabric seems as trivial in its nature as dissecting those old cadavers last winter."[94] 16th Michigan Infantry Surgeon Robert Augustus Everett seconded the same sentiment.[95]

Medical students were required to watch numerous surgeries, conduct countless chemistry labs, and spend most of their time in medical school studying anatomy. Professors at Michigan exposed students to new medical technology. During the 1850s and 60s, the cutting-edge medical technology was the compound microscope. By 1855, the university had gained a

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Snatching." Many medical schools were secretly required to employ workers who would dig up the graves of freshly deceased people to supply medical schools.

[93] Gross anatomy represents a macro study of human anatomy. Modern medical students are required to study anatomy for over 1200 hours while in medical school. Michigan had two six-month course requirements of which anatomy encompassed the largest part of their study.

[94] Samuel Knox Crawford to James Guthrie, August 21, 1861, James Guthrie Papers, Michigan in the Civil War, Bentley Historical Library-University of Michigan-Ann Arbor.

[95] Robert A. Everett to Caroline Everett, September 3, 1863, Robert Everett Papers, Archives of Michigan-Lansing.

collection of medical and botany slides. Professors required the use of the microscope as a medium for demonstration.[96] Microscopy and analytical chemistry were crucial steps in medical history toward building a better pathological basis for studying disease. During the Civil War, these tools became a requirement at most military hospitals and clinics. The study of tissues and other specimens under the microscope became a standard aspect of studying the human body by army surgeons. Microscopes were incredibly rare among the established medical schools outside of the personal collection of some professors.[97] Silas Douglas oversaw a thorough education of the compound microscope. John Bennitt, who later served as a surgeon in the 19th Michigan Infantry, wrote to his wife that 3 hours a day in the chemical lab involved heavy use of Douglas' Grunow Microscope.[98] Silas Douglas' instruction in chemistry and microscopy would serve as a crucial experience for Michigan graduates who contributed to medical science during the Civil War.

Competing medical schools neglected to teach with the microscope. Top-tier microscopes by the middle of the nineteenth century were extremely expensive. Historian William Frederick Norwood's research on pre-war medical school showed a lack of microscope instruction until the late nineteenth century, after the rise of bacteriology and pathology.[99]Harvard Medical College did not introduce microscope training before the end of the Civil War.[100]Civil War historian G.W.

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[96] *Report of the Superintendent 1855-1857,* 107.

[97] Rothstein, *American Medical Schools,* 51. Microscope courses were available but mainly through privately taught courses outside of medical schools..

[98] John Bennitt to Mrs. Bennitt, November 8, 1861, John Bennitt Papers (1861-1865), Special Collections and University Archives-Grand Valley State University.

[99] William Norwood, *Medical Education In the United States Before the Civil War* (Philadelphia: University of Pennsylvania Press,1944), 396.

[100]Beecher, *Medicine at Harvard,* 66.

Adams asserted that due to the inadequacy of American medical schools, students received no institutional training in using the microscope.[101]The microscope was absent in the catalogs of all the top pre-war medical schools. The University of Michigan, however, first listed the microscope in its 1854-55 catalog.[102] Professor Corydon Ford and Silas Douglas confirmed the school's early use of the microscope in their remaining records.[103]

Corydon Ford taught the school's most important subject, anatomy. Dr. Ford was born in 1813 in Green County, New York. A childhood attack of polio left Dr. Ford with a lifelong limp, and his bone-topped cane was always his trusty companion. A passion for science and education drove Ford. Ford was an 1842 graduate of the Geneva Medical College with grand designs to teach medical students and change the trajectory of medical education. Immediately after graduation, Ford became a Demonstrator of Anatomy at Geneva. Moses Gunn came to Geneva as a student in 1844, and the pair quickly became friends as the promising Gunn helped Dr. Ford with his work as an anatomy demonstrator. The team incessantly planned for the perfect medical school and future teaching opportunities, which later came at the University of Michigan.[104] In 1854, Moses Gunn recommended his friend Ford for a Michigan teaching position, and the school hired Ford to teach anatomy at the University of Michigan.

Ford's teaching career made him one of the nation's most popular medical lecturers. The professor's love for his subject came through in his daily life. Victor Vaughan remembered Ford,

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[101] George Adams, *Doctors in Blue: The Medical History of the Union Army in the Civil War* (Baton Rouge: Louisiana State University Press, 1952), 51.

[102] *Catalogue of the Officers and Students of the University of Michigan: 1854-55* (Ann Arbor: E.B. Pond, 1855), 36

[103] Silas Douglass, Albert Prescott, Preston Rose, Willard Rising, *Synopsis of the Various Courses of Practical Instruction Pursuied in the School of Analytical and Applied Chemistry in the University of Michigan* (Ann Arbor: Dr. Chase's Steam Printing House, 1866), 5; Cordydon Ford, "Synopsis of Lectures," [manuscript], Corydon Ford Papers, Bentley Historical Library, University of Michigan-Ann Arbor.

[104] Jane Gunn, *Memorial Sketches of Doctor Moses Gunn* (Chicago: W.T. Keener, 1889), 16.

writing when it came to his issues, the professor "lived it, and he taught it in a way that held the individual attention of every student."[105]Vaughan likened sitting in Ford's room to being "under his spell." Ford's tremendous wealth of archival material shows a professor who never repeated the same lectures annually. The professor constantly recalculated his knowledge and beliefs about science and anatomy. Each new year, Ford began his notebook with the question, "What is life?" he followed with a few lines contemplating his changing philosophy.[106]The professor thought regular dissections and reflections served to enlighten his students. He kept pages of dissection notes and oversaw countless preparations made for student instruction.[107]

Ford's passion for anatomy carried over into creating the school's anatomy museum. Anatomical museums were commonplace in medical schools throughout the United States. Some schools offered little more than some bookcases filled with preserved animals and some other specimens. The Michigan Anatomical Museum was filled with jarred specimens and preserved bones for students to examine. Professor Ford's constantly growing list of illustrations shows bones from mice, dogs, cats, humans, muskrats, raccoons, and others.[108]The professor preserved veins, brains, organs, amputated limbs, and other curiosities in jars for students to marvel over.

The University of Michigan's anatomy department benefited from Ford's brilliance. The anatomy department ensured students would get both instruction in anatomy, but the faculty pressed premium focus onto dissection laboratories. Modern standards see the dissection of cadavers to be among the most essential parts of medical education. Through cadaver dissection,

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[105] Victor Vaughan, *A Doctors Memories* (Indianapolis: The Bobbs-Merrill Company, 1926)194-195.

[106] Cordydon Ford, "Synopsis of Lectures and Anatomy Notebook," [Manuscript] Bentley Historical Library, University of Michigan-Ann Arbor.

[107] Corydon Ford, "Dissection Notebook, 1855-1865," [Manuscript], Bentley Historial Library, University of Michigan-Ann Arbor.

[108] Corydon Ford, "Specimen List, University of Michigan Anatomical Museum," [Manuscript], Bentley Historical Library, University of Michigan-Ann Arbor

students can get a true sense of the human body by properly locating organs, bones, structures, body systems, veins, arteries, and other body parts. Dissection allows students to understand pathology and physiology better. Ford's students performed their dissections with an eye on post-mortem examination. This skill later grew in importance during the Civil War. Ford and his employees ensured a consistent supply of cadavers for student dissection. During the nineteenth century, as Americans frowned upon the desecration of the deceased, this was no simple feat. Ford's anatomy assistants were to obtain subjects through any means necessary while allowing the medical faculty plausible deniability.[109] "All means necessary" meant digging up the poor or deceased prisoners or taking the unclaimed bodies from morgues throughout Michigan and other states.[110]

Cadaver dissection is integral to studying medicine and is needed to understand human anatomy properly. Each student at the university was required to dissect at least one cadaver during their tenure at Michigan under the watchful eye of Corydon Ford. Students who later served in the Civil War recalled the benefit of this exercise about their work as Civil War soldiers. Dr. Samuel K. Crawford, an 1861 graduate who served as a surgeon in the 50th Ohio Infantry, was immediately tasked with performing amputations when he arrived at his unit. Crawford recalled to his friend, another University of Michigan graduate, James Guthrie, "Cutting among living tissue of the human fabric seems as trivial in its nature to dissecting those

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[109] Burr, *Medical History of Michigan, vol I,* 551.

[110] Edmund Andrews to William F. Breakey, 1901, in *The Michigan Alumnus,* VII, no. 63 (April 1901), 274-275.

old cadavers last winter."[111] 16th Michigan Infantry Surgeon Robert Augustus Everett seconded the same sentiment.[112]

The University of Michigan uniquely required medical students to partake in dissection labs to fulfill graduation requirements.[113]Cadaver labs at most medical schools were entirely optional.[114] At medical schools like Harvard, students had access to resources like clinicals and dissections, but each came with a fee. If Harvard students desired to work in the dissection lab, they paid $5 for a ticket to enter, hoping the school would obtain enough materials for students looking to work on the subject.[115]Jefferson Medical College staff never gave practical anatomy requirements in the years before and during the Civil War.[116]Dissection courses were essential to ensuring proper medical school training, but medical students often left school without ever performing a dissection. Cadaver dissection is vital for clinical anatomy instruction, but it is also an essential part of emotional training for medical students.[117] Graduates of medical schools in the nineteenth century were thrust out into the field, often requiring them to perform surgeries and post-mortem examinations that required an emotional and fundamental understanding of

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[111] Samuel Knox Crawford to James Guthrie, August 21, 1861, James Guthrie Papers, Michigan in the Civil War, Bentley Historical Library-University of Michigan-Ann Arbor.

[112] Robert A. Everett to Caroline Everett, September 3, 1863, Robert Everett Papers, Archives of Michigan-Lansing.

[113] *Catalogue of the Corporation, Officers and Students in the Department of Medicine, Arts and Sciences, In the University of Michigan, 1852-53*, (Detroit: Free Press Book and Job Print, 1853), 27.

[114] Rothstein, *American Medical Schools*, 34-35.

[115] *A Catalogue of the Officers and Students of Harvard College for the Academical Year, 1852-53, First Term* (Cambridge: John Bartlett, 1852), 68.

[116] Nineteenth Century medical terminology for cadaver dissection was consistently referred to as "practical anatomy."

[117] Sanjib Kumar Ghosh, "Cadaveric Dissection as an Educational Tool for Anatomical Sciences in the 21st Century," *Anatomical Sciences Education* 10, no. 3 (August 2016), 286-289.

handling the human body. Doctors aiming to begin their medical practices without practical anatomy training were likely unprepared for the realities of medicine.

A significant component of medical student success centers on clinical experience. The new Ann Arbor medical school offered the local community a place to receive free medical treatment. Hospitals were a rare commodity in the years immediately preceding the Civil War. Hospitals provided a significant opportunity for students to gain vigorous clinical training, but students coveted these positions due to the sparseness of positions. Without hospitals readily available, the school clinics were the best opportunities for students to get clinical experience. Despite living in Detroit, Dr. Moses Gunn commuted throughout the week to ensure students received clinical opportunities in the surgical clinics and amphitheater. The school staff decided clinics would supplement the clinical experience gained by the required apprenticeship that all students were to serve. The three years of apprenticeship required to receive the Doctor of Medicine degree served as the de facto residency conducted by modern medical students. Universities across the country lacked the personnel resources to properly administer the clinical training of all students, which was a crucial component in learning medicine.

Dr. Zina Pitcher never forgot the insecurities surrounding the lack of clinical education he received as a medical student.[118] Pitcher worked with the staff at Detroit's first hospital, the St. Mary's Hospital, to obtain clinical training for Michigan's medical students. In 1850, St. Mary's expanded from its original two-story structure to a much larger, four-story hospital, giving the university more patients to work with.[119]Alonzo Palmer, pitcher, and Internal Medicine instructor, arranged clinical opportunities with St. Mary's for the 1857 school year. The clinical instruction

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[118] Burr, *Medical History of Michigan, vol I,* 196.

[119] Edward Martin, *Early Detroit: St. Mary's Hospital, 1845-1945* (Detroit: St Mary's Hospital, 1945), 54-55.

was somewhat unusual as the lack of transportation forced Pitcher and Palmer to improvise. Dr. Pitcher gathered cases each morning from the hospital, which were then relayed to students by Dr. Palmer.[120] The students then conferred, using clinical data and other information to determine a diagnosis and proceed with proper treatment. The expertise of the professors helped ensure clinical success, and this usually meant the collaboration of professors like Moses Gunn and Zina Pitcher.[121]The students were able to observe the benefits of colleague consultation.

Students learned several aspects of medicine through the St. Mary's Hospital program. The rational and comprehensive study of clinical medicine in the classroom allowed the students to work with experienced doctors like Moses Gunn and Alonzo Palmer while understanding the thought processes necessary to treat patients. The decisions made in the conference would have real applications and students would receive feedback on the outcome of their treatment. Doctors followed up patient deaths with post-mortem examinations that involved chemical and microscopical analysis. The students were required to analyze the post-mortem data while working with Professors Corydon Ford and Silas Douglas to pull on their expertise in understanding the pathology of the patient's demise.[122] The post-mortem examinations allowed students to see the "changes in structure or the chemistry of the secretions or organic products

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[120] *Catalogue of the Officers and Students of the University of Michigan: 1857.* (Ann Arbor: The University of Michigan, 1857), 46.

[121] A.R. Terry, "Surgical Cases," *The Medical Independent: A Monthly Review of Medicine and Surgery* 3, no. 3 (May 1857), 135-137.

[122] *Catalogue of the Officers and Students of the University of Michigan: 1858* (Ann Arbor: The University of Michigan, 1858), 50.

are to be determined."[123]Students often kept detailed notes of their clinical experiences in their notebooks, leaving evidence of varied cases in all areas of medicine, including surgery.[124]

Few medical schools offered clinical opportunities outside their usual apprenticeship requirements. Medical students at the University of Pennsylvania were the only major medical school to continually provide clinical opportunities for students.[125] The Pennsylvania students worked at the Philadelphia General Hospital and the school's dispensary for the entire nineteenth century.[126]Jefferson Medical College students and their professors saw patients in the school clinic. Often, the most taken away from a patient encounter was the prescribed therapy with little explanation of medication purpose.[127]The opportunities for clinical education were lacking throughout the country. Aside from sporadic patient encounters in the school clinics or local dispensaries, professors had to find other ways. The best opportunity for professors to relay clinical training was to bring patients before the class.[128]

The clinical opportunities for Michigan students were somewhat better than at most American medical schools. Professors and administrators who understood the importance of clinical teaching consistently offered clinical courses. The staff made steps to ensure better opportunities for students. Students met with patients in the school clinics for medical and

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[123] *Catalogue of Officers and Students, 1858*, 51.

[124] Benjamin Thompson Notebook, 1865, Benjamin Thompson Papers, Bentley Historical Library, University of Michigan-Ann Arbor; John Alexander Campfield, "J.A. Campfield Student Notebook, 1860-61," [manuscript] Bentley Historical Library, University of Michigan-Ann Arbor

[125] University of Pennsylvania, *Report on the Medical Department of the University of Pennsylvania for the Year 1845; To the Alumni of the School, By the Faculty* (Pennsylvania: University of Pennsylvania, 1845), 25.

[126] The dispensary was another name for the school's clinic. Before the widespread use of hospitals, dispensaries were often created to serve as outpatient clinics. Norwood, *Medical Education,* 81-82.

[127] Ephraim Santee, "E.A. Santee Lecture Notes from Jefferson Medical College," Philadelphia Historical Medical Library, The College of Physicians-Philadelphia, 50-55.

[128] Rothstein, *American Medical Schools,* 54-55.

surgical procedures. These steps were valuable. Students worked alongside their professors, who relayed diagnosing and treating disease procedures. Faculty showed Michigan students the importance of post-mortem examinations to show the pathological changes in the diseases they had diagnosed. Clinical opportunities continued progressing at Michigan before the Civil War as the school's popularity grew.

Medical students were required to watch numerous surgeries, conduct countless chemistry labs, and spend most of their time in medical school studying anatomy. The school exposed students to new medical technology. During the 1850s-60s, the cutting-edge medical technology was the compound microscope. By 1855, the university had gained a collection of medical and botany slides. Professors required the use of the microscope as a medium for demonstration.[129] Microscopy and analytical chemistry were crucial steps in medical history toward building a better pathological basis for studying disease. During the Civil War, these tools became a requirement at most military hospitals and clinics. The study of tissues and other specimens under the microscope became a standard aspect of studying the human body by army surgeons. Microscopes were incredibly rare among the established medical schools outside of the personal collection of some professors.[130] Silas Douglas oversaw a thorough education of the compound microscope. John Bennitt, who later served as a surgeon in the 19th Michigan Infantry, wrote to his wife that 3 hours a day in the chemical lab involved heavy use of Douglas' Grunow Microscope.[131] Silas Douglas' instruction in chemistry and microscopy would serve as a

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[129] *Report of the Superintendent 1855-1857,* 107.

[130] Rothstein, *American Medical Schools,* 51. Microscope courses were available but mainly through privately taught courses outside of medical schools..

[131] John Bennitt to Mrs. Bennitt, November 8, 1861, John Bennitt Papers (1861-1865), Special Collections and University Archives-Grand Valley State University.

crucial experience for Michigan graduates who contributed to medical science during the Civil War.

The University of Michigan Department of Medicine and Surgery still taught some outdated ideas surrounding medicine. Students still heard lectures covering bleeding, purging, emetics, and other heroic methods. Medical school terms were short, at six months, and students had to take two six-month terms to graduate. Each student was required to complete three years of medical apprenticeship under a preceptor. During the school year, second-year students submitted to oral exams at the end of each term.[132] The second-year students presented written essays every two weeks during the second year, followed by a final thesis. Students were to pick one thesis to present to the faculty as a final graduation project. These requirements were particularly arduous at the University of Michigan. Michigan medical students sat for written examinations, an unusual exam for the first half of the nineteenth century. Competing medical schools utilized oral examinations.

The medical program's strength centered on the scientific nature of the university. Science serves as a process and a skill set, but it was a new way of thinking that evolved from this type of education. The forward-thinking laboratory and research focus of critical figures like Henry Tappan, who developed the university and medical school on this type of planning, would correlate to the changes many graduates would have to handle during the Civil War. The modifications installed by the new military medical regime in late 1862 required a research focus in the medical field. Medical school and apprentice-trained doctors from most universities lacked the training to understand a mode of innovative or research-oriented thinking. Scientific progress depended on this way of understanding medicine as a science rather than a vocation.

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[132] The two six-month terms were identical. Students took the same classes during each term and a large body of the work was in lecture material.

The faculty at the University of Michigan was central to the changing mentality in medical education. Moses Gunn, Corydon Ford, Silas Douglas, and the rest of the medical school class were pioneering groups in medical education. Gunn's surgical lectures and in-depth study of the specialty were unique to his surgical courses. Faculty taught surgery at other universities, but most surgical posts belonged to professors who held their positions for years before the discovery of anesthetic. Gunn, as a young and ambitious surgeon, took a post at the Renaissance in the field of surgery, and as an active surgeon, he could recount his experiences to his students. It was another moment in the fortuitous timing in which the University of Michigan medical school opened. Exposure to new techniques and cases became a basis for those graduates who served in the Civil War.

The Michigan professors taught students the latest analytical science methods using microscopes, chemistry, and other new medical tools to aid diagnosis and medical understanding. The Army Medical Museum opened during the Civil War quickly with specimens, research studies, and questions. The slow knowledge of these new medical methods first burdened medical science. However, graduates from the University of Michigan Medical School had a foundation set in these methods, and many graduates applied them in their early medical careers before the Civil War. Michigan graduates carried this experience with them into the field. The Civil War offered an endless supply of medical specimens available for dissection. These bodies were accessible to all doctors, of which most had minimal experience performing autopsies or studying specialties like pathology, epidemiology, and other diagnostic sciences. Under the direction of Corydon Ford, University of Michigan, medical graduates had experience in these areas of anatomical study. Ford's massive contributions to the U of M anatomical museum gave students access to specimens they would later have experience with. Contributions from

Michigan Medical School graduates inundate the official medical records of the Civil War and the *Medical and Surgical History of the War of the Rebellion* with medical contributions. Graduates could readily adapt to the new scientific medicine according to the official medical records of the war.

The applicable treatments taught at the University of Michigan were not ideal. When the Civil War came, there was plenty to learn in treating patients for the medical school graduates who served. The Civil War presented an overwhelming caseload of new diseases, traumatic injuries, surgeries, and medical procedures. Historians rarely argue that doctors revolutionized medical treatments during the war. Doctors changed the practices surrounding scientific medicine during the war. The war forever altered the knowledge of anatomy, pathology, surgery, public health, and medical research, sending the United States to become a leader in world health and research. Doctors started to drop heroic methods during and after the Civil War as the dangers of poisonous chemicals like mercury and others became evident. The most revolutionary change came in 1867 with the publication of Joseph Lister's "Antiseptic Principle of the Practice of Surgery," which highlighted the ideas of antiseptic surgery. This discovery and the adaptation of Germ Theory following the publication of Koch's Postulates in 1884 were among the two biggest medical findings of the nineteenth century. While these changes were integral to medical theory, the Civil War forever changed the field of medical science. The individualistic medical study was no longer the norm. Doctors were working together to better understand medical science based on experience. In this area, the University of Michigan Medical School excelled, as we will see with these physicians' Civil War and post-war careers.

The medical school benefited from the timing of its opening during an overall push to change medical education. While the changes the American Medical Association instigated were

slow to catch on, the University of Michigan was not beholden to medical school competition due to its government funding. Medical schools could raise standards regardless of the competition. If students sought education elsewhere, the university could still uphold these firm standards, which would later become a draw for the medical school. The rising distrust in physicians and the competition from other fields of medicine forced the school to perform better. As a secluded school outside the medical establishment, the university could draw idealistic, zealous, and pioneering medical educators, which they found in professors like Gunn, Douglas, and Ford. These professors and a scientifically oriented curriculum made Michigan graduates primed to succeed in the evolution of medical science during the Civil War. Student experience, as the next chapter will show, presented the university as both a challenging and inspirational environment that opened up innovative careers in medicine.

Chapter Five:

"To Prove Itself Worthy of the Age We Live In": Michigan's Medical School Reputation, Student Experience and Major Subjects

The University of Michigan College of Medicine and Surgery was founded to be different. University regent Zina Pitcher's background made him the most visible establishing force, but Michigan doctors recognized the need for a medical school.[1] By 1847, when the regents approved the medical school's founding, the declining perception of the medical field had encouraged doctors to accept the inevitable fact that a school was needed. The American public was tired of the drastic treatment measures prescribed by physicians.[2] For the rest of the country, proprietary medical schools and programs had distilled the importance of medical education.[3] Michigan state leadership recognized the needed change, but there was little value in producing more of the same. The country's apprenticeship training predominance lessened the quality of doctors. Medical schools were hardly a better alternative in many of the nation's schools.

The atmosphere of outdated medical theories, poor therapeutic options, and financially driven medical school faculty made the American public doubt the medical field. The era of distrust was also one of the greatest medical needs. Large cities faced rapid expansion as immigration stood at an all-time high.[4] Between 1840 and 1850, New York City's population increased by over 200,000 residents.[5] The expansion of New York City represented the influx of immigrants funneling into America's most active disembarkation point. In Michigan alone, the state saw a 571% population increase from 1830 to 1840.[6]

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[1] C.B. Burr, ed. *Medical History of Michigan,* vol. 1 (Minneapolis: The Bruce Publishing Company, 1930), 460–462.

[2] John Duffy, *From Humors to Medical Science: A History of American Medicine* (Urbana, University of Illinois Press, 1993), 87.

[3] Martin Kaufman, *American Medical Education: The Formative Years, 1765-1910* (Westport: Greenwood Press, 1976), 40.

[4] Rothstein, *American Medical Schools and the Practice of Medicine,* 43.

[5] *The Seventh Census of the United States of America, 1850,* ed. Richard Fisher (New York: J.H. Colton, 1851),54.

[6] *The Seventh Census of the United States of America, 1850,* 33.

Michigan's population had jumped to 402,041 residents by 1850. The population increase brought a spike in death rates. From 1810 to 1857, the death rate in New York City rose from 21 to 37 per thousand. United States infant mortality rose from 8.7% in 1820 to 23.8% from 1850 to 1859.[7] In Michigan, increasing death rates were brought on by ailments like cholera, pneumonia, croup, and measles, directly related to population growth.[8]

The expansion of America's borders left a shortage of doctors, duplicated in the young state of Michigan. As Michigan doctors and citizens recognized the need for a proper medical school, the opportunity to capitalize by building a modern medical college was at hand. State funding meant the school had an obligation to the taxpayers to produce physicians who could prolong the lives of Michigan citizens in the hostile "western" frontier. Pitcher's original connection to Michigan came from eight years of Army service in the Michigan territory. His years moving throughout the untamed Michigan frontier exposed him to the hardships that the region's settlers endured.[9] After his army career, he returned to Detroit, giving the eventual medical college a great ally. The former Army Surgeon had spent years in the company of his medical comrades and recognized the shortcomings in their preparations.[10]Zina Pitcher campaigned for change in education and medical training. He seized the opportunity surrounding a state-sponsored university, lobbying for and getting a University of Michigan Regent position.

Pitcher's oversight in building the medical college attracted the names of pioneering medical educators who came to the young state to teach in the upstart medical college. The

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[7] Rothstein, *American Medical Schools,* 43.

[8] The House of Representatives. *Mortality Statistics of the Seventh Census of the United States*, 137-139. Mortality statistics of the seventh census of the United States, 1850: United States. Census Office: Free Download, Borrow, and Streaming: Internet Archive.

[9] Frederick George Novy, "Zina Pitcher: An Address Delivered before the Medical Department on Founders' Day, February 22, 1908," (Ann Arbor, 1908), 4.

[10] William Breakey, "The Department of Medicine and Surgery in the Fifties," *The Michigan Alumnus* 7, no. 63 (April, 1901), 272.

group of professors who settled in the backwoods town of Ann Arbor, Michigan, to build up one of history's most outstanding medical schools effected a change in a generation of young doctors who would later serve in the Civil War. The Army surgeons who later served in field hospitals, general hospitals, and ambulance corps were to partake in a significant change that pushed them to commit to an experimental and clinical style of medicine. The Civil War doctors did not only need to know the proper remedy to treat a particular wound or disease to excel in the Union Army Medical Corps. They were later expected to contribute to medical science by studying clinical data, experimental treatments and surgeries, physiology, pathology, microscopy, chemical analysis, and pharmacology. Not a single one of these areas held greater precedence. Instead, a working knowledge of how they all came together was the actual test of the Civil War Surgeon, and the University of Michigan offered that integration.

A dire need for a quality medical institution became apparent with rising mortality rates and the declining quality of doctors and medical education. The student experience at some of America's most renowned medical schools, like Jefferson Medical College, Geneva Medical College, Harvard Medical School, and others, was undesirable regarding school quality. Students seeking a quality medical education struggled to find value in schools that were simply interested in their money. In the western states, new medical schools were coming to fruition but largely fell into the proprietary category. For Michigan residents, there were no options in the state before 1850. Aspiring doctors seeking a proper medical education left Michigan to take medical courses in states like Indiana and Ohio.[11] University of Michigan Regent Zina Pitcher's 1848 report before the university's Board of Regents showed that Michigan residents seeking a medical education had to leave the state. At least

[11] The Medical College of Ohio (founded in 1821), Miami University Medical Department of Ohio (founded in 1831), Medical Department of Cincinnati College (founded in 1835), and LaPorte University Medical Department of Illinois (founded in 1843) were the most popular options for Michigan students seeking an institutional medical education.

eighty-five recorded instances showed that Michigan students attended medical school in surrounding states.[12]

The value of a nineteenth-century medical education was volatile. The older East Coast schools in New York and New England were committed to the empiricist education model while clinging to the heroic medicine methods. It is easy to understand doubts surrounding medical education of the nineteenth century. Dr. James Wiley's medical school notes, beginning in 1835, show what students were being taught at the Jefferson Medical College of Philadelphia, vindicating the apprehension surrounding medical competency. Each medical student at Jefferson required a Materia medica course taught by Samuel Colhoun. Of utmost importance to Wiley were the first pages of Materia Medica, in which he highlighted bloodletting and cathartics. Wiley nonchalantly captions his bloodletting notes: "convulsions sometimes seen after fainting from bleeding."[13] Wiley's section on cathartics discusses the wonderful effects of mercury, offering a "fine effect not only by producing alterative effects but also by producing pancreatic & biliary secretions" in instances where overuse of cathartics had caused chronic issues.[14] Wiley's notes offer treatment options that include massive doses of ipecac and tartar emetic.[15]

These treatment methods gained the nomenclature of "heroic medicine" from the medical schools, who were among their most loyal disciples.[16] The heroic therapies

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[12] University of Michigan Board of Regents, *University of Michigan Regent's Proceedings: 1837-1864* (Ann Arbor: University of Michigan Press, 1915),

[13] John Wiley, "Lecture Notes from Jefferson Medical College, 1835-1837" (medical school notebook, John Wiley Papers, 1835-1837 The College of Physicians of Philadelphia Historical Medical Library, 1835), 21.

[14] The body's "biliary" action was seen as an essential factor in overall health. Cathartics had a purging effect. Doctors believed these drugs would help regulate the body by returning it to balance. John Wiley, "Lecture Notes from Jefferson Medical College," 21-22.

[15] Tartar emetic is a compound of antimony. Antimony is a chemical element of the metalloid class. Lead and tin manufacturing uses antimony to produce lead and tin. Ibid, 22.

[16] William Rothstein, *American Medical Schools and the Practice of Medicine: A History* (New York: Oxford University Press, 1987), 40-42.

encompassed nineteenth-century medical theory that carried over from the originators of medical education. Medical school graduates before 1850 were well-versed in medical theory, which mostly came from the repetition of their professors, but these theories were largely outdated. Students also worked with professors who lacked modernity in their thinking and teaching. Dr. Andrew Boardman graduated from Geneva College at the top of his 1840 class, and he immediately recognized the stark reality of his education. Boardman wrote a critical essay on his school, which he later presented to the faculty. Boardman's Physiology Professor taught theoretical concepts from the turn of the nineteenth century.[17] Recognizing chemistry as an essential science made it a part of every medical school course. An academic theologian presented Boardman's chemistry course, lecturing from notes at least five years old at the time of presentation.[18] Students of Boardman's class were not encouraged to think original thoughts. Boardman's dissertation, while lauded, was denied the award for best dissertation as it impinged upon accepted medical beliefs. Surgery Professor D. L. Rogers admitted that the faculty feared reputational damage from the approved topic instead of rightfully giving Boardman the award. D.L. Rogers was so disgruntled by the slight towards Boardman that he took his name off the prize presented to another student who ventured safely into a common topic.[19]

Not all medical educations were created equal. Schools were diverse in their priorities, theories, and professors. The motley nature of nineteenth-century medical education is why reference to the industry as a whole should be avoided. Civil War medical historians are especially dismissive of medical education. Blaming the unpreparedness for war on the

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[17] Andrew Boardman, *An Essay on the Means of Improving Medical Education and Elevating Medical Character* (Philadelphia: Haswell, Barrington, and Haswell, 1840), 6.

[18] Boardman, *An Essay on the Means of Improving Medical Education,* 6-8.

[19] D. L. Boardman to the Medical Faculty at Geneva College, January 20, 1840, in *An Essay on the Means of Improving Medical Education and Elevating Medical Character* (Philadelphia: Haswell, Barrington, and Haswell, 1840), 7.

medical education system can carry some merit. However, regardless of the comparisons between modern medical education and the past, it needs to be recognized that medical colleges were the premier scientific institutions in nineteenth-century America. Graduates of medical college programs spent hours learning about the human body while preceptors guided them through their clinical experiences. Aside from Harvard College and the University of Michigan, the Civil War generation lacked the opportunity to get a bachelor's degree in the sciences. The only chance for professional training in science at the hands of experts came through the medical college system. While the professors were not always premier teachers, and many lacked sound teaching methods, the generation that modernized medicine in the United States was trained in medical colleges.

The nineteenth-century system was not comparable to modern medical schools. Historians should not discount the zeal and drive of many Antebellum medical students. Modern medical students are rewarded for years of training with a return on investment. In 2022, according to the Bureau of Labor Statistics, the average physician's salary is nearly $230,000 per year.[20] Graduating doctors before the Civil War entered a competitive and taxing field. The financial incentives were meager even in Michigan, where competition was light compared to the East Coast. James Willson, an 1860 University of Michigan College of Medicine and Surgery graduate, consistently charged $.50 to $1.00 for each case, and actual payments totaling $2.00 on any given day were rare.[21]The fees for doctors changed little over the ensuing decades. Even by the 1870s, the average charge stayed around $1. This $1 charge was the average fee invoiced by University of Michigan graduate Benjamin Thompson, with

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[20] Bureau of Labor Statistics, "Occupational Outlook Handbook: Physicians and Surgeons, 2022," (Washington: Bureau of Labor Statistics, 2022). https://www.bls.gov/ooh/healthcare/physicians-and-surgeons.htm (accessed June 8, 2023).

[21]While he was consistently busy, collecting payments from many patients was burdensome. Frontier doctors regularly took payments in the form of goods or services. James Caldwell Willson's Day Book, 1863, James Caldwell Willson Papers, 1863-1912, Michigan in the Civil War, Bentley Historical Library, University of Michigan-Ann Arbor.

his most expensive fee at $5 for an infant delivery.[22] With monthly takes running as low as $20, the lack of financial incentives was also hampered by the cost of running a medical practice. Doctors purchased medicine, surgical supplies, medical supplies, and medical books to keep up their practice.

Medical students traveled to the nation's schools to enter an unforgiving profession with little to gain financially. The desire to practice medicine and study science was common among the medical school crowd. However, the proprietary history of medical schools buried many of these zealous students in the undesirable aspects of medical education. The proprietary aspect of medical school paints a picture of passive medical students and educators. This was because schools had weak admission standards nationwide, even at the most prestigious medical schools. As of 1830, there were no admission standards at Harvard Medical College. The only stipulations surrounding a student's background were proven Latin and experimental philosophy knowledge.[23] The Jefferson Medical College's 1833 announcement of spring lectures is oddly transparent concerning low standards and capabilities. The school opted to sell students on a relatively light courseload. Out of fears that a perceived challenge may deter students, the medical school posted that students only needed the bare minimum in course attendance.

The college's adherence to proprietary competition was apparent. Concerning competing schools, the college stated that course obligations "will not differ from those which are imposed on candidates for graduation in most distinguished Medical Schools in the

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[22] Benjamin Thompson Daybook, 1870, Benjamin Thompson Papers, 1864-1886, Bentley Historical Library, University of Michigan-Ann Arbor.

[23]Before attempting to obtain their M.D., students who were not college graduates were subjected to a brief examination by the faculty to determine their capability in these two subjects. *Statutes of the University in Cambridge, Relative to the Degree of Doctor in Medicine* (Cambridge: Harvard University, 1831), 3.

country."[24] Each hopeful graduate at Jefferson was required to take a final examination after their second term. To avoid repulsing anxious test-takers, the school gave sample questions, asserting the simplicity of the test.[25] The spring advertisement explained that the short four-month lecture period prevented professors from teaching their subjects entirely. Prospective students received a warning that due to the short sessions, "Many subjects must be left without being even noticed; and others can only receive a very cursory attention."[26] Despite the superior reputations of these schools, the weaker standards were typical of medical education in the decades before the Civil War.

The admission standards of early medical colleges should not stand as a testament to the graduates of the era. Contrary to the modern take on Antebellum medical school, getting a medical education was no easy task. Enduring two six-month terms of all-day lectures and recitations was necessary to graduate. University of Michigan graduates spent mornings in lectures with a break between their afternoon lab section in the chemistry lab or the dissection room. Second-year medical students wrote and defended medical essays every two weeks and had to defend a final dissertation in conjunction with final medical exams. Before receiving the Doctor of Medicine degree, each student at Michigan had to complete three years of an apprenticeship, which made them unpaid labor for a practicing doctor. Completing these steps was not for the weak-minded. Medical schools had high dropout rates, and most students never returned for a second session. The average percentage of students who would graduate from an incoming class stood at 16.45%. Two thousand nine hundred fifty-six students matriculated to the University of Michigan College of Medicine and Surgery

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[24] Jefferson Medical College. "Spring announcement of lectures: MDCCCXXXIII" (Philadelphia: Jefferson Medical College, 1833), Medicine in the Americas, 1610-1920, National Library of Medicine, http://resource.nlm.nih.gov/101200503, 1.

[25] Jefferson Medical College, "Spring Announcement of Lectures: MDCCCXXXIII," 2.

[26] Ibid, 3.

between 1850 and 1865, of which only 490 obtained their M.D.s.[27] These numbers show that while medical schools were quick to accept students, even at a school with stricter requirements like U of M, that should not serve as a barometer for the quality of graduates.

Proprietary medical schools with low standards should not serve as a benchmark for the type of student attracted. The assessment that medical school standards equated to the stature or intent of applicants needs to be revised. There were multiple reasons for attending a medical school in the nineteenth century. Some were interested in the coursework as a short road to starting a medical career, thinking the Doctor of Medicine degree would earn them more patients. However, a medical career in the nineteenth century was rarely a path to wealth. Nineteenth-century Americans were driven more toward a lifelong vocation or trade, and medicine fell under this purview. Apprenticeships were available for those looking to learn the trade, but medical school graduates did receive a higher reputation. In some cases, family members pushed students into studying medicine. In the case of University of Michigan graduate James Guthrie's friend Samuel Knox Crawford convinced James to leave Wooster, Ohio, and study in Ann Arbor.[28]

Prospective University of Michigan medical students sought to join the profession amid widespread debate. Just three years before Michigan's opening, the American Medical Association's foundation was centered around a shift in the quality of medical education. The inaugural meeting of the American Medical Association established an annual committee to report on the state of medical education. At the 1848 meeting, the AMA recommended a connection between medical societies at the local or state level and medical schools.[29]The

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[27] V.M. Spalding, "University of Michigan Department of Medicine and Surgery: Summary of Students and Graduates," *The Michigan Alumnus* VI, (1899-1900), 284.
[28] James Guthrie Papers,1845-1907, Michigan in the Civil War, Bentley Historical Library, University of Michigan-Ann Arbor.

[29] *The Transactions of the American Medical Association*, vol. 1 (Philadelphia: T.K. and P.G. Collins, 1848), 240-241.

purpose of the meeting was to establish a more legitimate professional standing by leaning on numbers. Books were published regularly on the subject of medical education reform. Reformers like John Ware wrote in 1847 that physicians were the popularizers of actual science.[30] Ware's book showed that a connection between scientific study and medical education was growing commonplace. Reformers sought to aid students in obtaining knowledge and enforce the nurturing of skills to study and challenge science.[31]There is little doubt that students aspiring to enter the medical profession were at least somewhat aware of the existence of the American Medical Association and the growing changes in medical education.

The University of Michigan opened its medical school at a time that surrounded these conversations. The students attracted to the new medical school were initially so out of convenience, but almost immediately, the medical school pulled away from the rest of the country's medical schools. Early medical historians and educators recognized Michigan as the pioneering state in upholding the importance of medical education.[32]Renowned for the quality of medical schooling, it came quickly. While the initial 1850 incoming class was around ninety students, the student body grew to over five hundred and twenty-five students just sixteen years later. By 1866, the medical school had become one of the most prosperous in the country.[33]

The rising prominence of the medical school meant an attraction of exemplary students and medical scientists. This era of growth was between 1850 and the end of the Civil

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[30] John Ware, *Discourses on Medical Education and on the Medical Profession* (Boston: James Munro and Co., 1847), 21.

[31] John Ware, *Discourses on Medical Education and on the Medical Profession,* 25.

[32] Burr, *Medical History of Michigan,* vol. 1, 468.

[33] *History of Washtenaw County, Michigan; Together with Sketches of Its Cities, Villages and Townships, Educational, Religious, Civil, Military, and Political History; Portraits of Prominent Persons, and Biographies of Representative Citizens* (Chicago, Charles Chapman & Co., 1881), 301.

War. The sudden reputational increase in the school's quality drew students from all over the country. The 1853-54 medical school session exemplified this fact. Of 157 students in the medical department at that time, 104 enrollees came from outside states and territories.[34] Most students chose Ann Arbor over medical colleges in their state. Forty-one New Yorkers traveled to Michigan for medical studies, choosing U of M over thirteen New York medical schools.[35] Students traveled from Vermont, Missouri, Ohio, and the Sandwich Islands to attend Michigan's medical school three years after it opened.[36] Vermont was home to three medical schools, Missouri had eight, and another eight in Ohio. The school was a draw for those looking to learn the trade of medicine and those interested in scientific medicine.

The number of students traveling throughout the country to study at the University of Michigan can serve as a reputational barometer. The history of nineteenth-century medical education shows few limits regarding medical school access. Schools had shallow admission standards, making it unlikely that students could not get into their home state schools. Proprietary medical practices of the era did not allow for an admission cap. Schools were driven mainly by financial gain and accepted many students who could pay the tuition. Academic standards for active medical students were uniform throughout the country. A primary reason why medical schools refused reform was to deny competition. Competing medical schools with lower standards could funnel away students who could not enter the higher-standard schools. Students who studied in Michigan from other states outside the Sandwich Islands resident had passed up more accessible local schools. The growing reputation of the University of Michigan made it a draw for medical students.

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[34] *Catalogue of Officers and Students: University of Michigan, 1853-54* (Ann Arbor: S. B. M. McCracken, Book and Job Printer, 1854), 13-17.

[35] Some Michigan medical students traveled from Buffalo New York for medical school. The University of Buffalo in their own hometown, had established a medical school in 1846.

[36] The Sandwich Islands in 1853 would later become Hawaii. George M. Bates came from Honolulu to study medicine at the University of Michigan. *Catalogue of Officers and Students: University of Michigan, 1853-54,* 13.

Over fifteen years, from 1850 to 1865, 490 medical school graduates earned their diplomas from the University of Michigan.[37]Of this number, 224 graduates used their medical degrees to gain positions as either Assistant or Full-Surgeons during the Civil War. The University of Michigan was already a premier medical institution at the start of the war. While it is a regional example, the study of medical education at Michigan shows there was educational value for Civil War surgeons. Contrary to the popular notion that medical education was virtually worthless to army surgeons, the experience at Michigan indicates otherwise. Students who attended the University of Michigan were exposed to cutting-edge techniques in most scientific concepts and learned an excellent basis for further medical contribution.

Student Experience at the University of Michigan College of Medicine and Surgery

The coursework in the Michigan medical school catalogs is not necessarily outstanding. The prescribed outline of education was typical for nineteenth-century medical students. Each student was required coursework in Anatomy, Physiology, Pathology, *Materia Medica,* Chemistry, Pharmacy, Obstetrics, Women's Diseases, and Medical Jurisprudence.[38] Students began their yearly term on October 1, which then ran until the end of March. Students spent their entire day in the school, hearing five lectures daily. The students recited the previous day's lessons each weekday to the professor.[39] In congruency with their medical education, each student working for three years as a medical apprentice under a preceptor

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[37] Numerous medical students participated in courses but did not complete their medical degrees. Certain students attended lectures in addition to their apprenticeships. The 501 graduates represent only a fraction of the students who were enrolled in the school prior to the Civil War.e the Civil War.

[38] *Materia Medica* is the antecedent to contemporary pharmacology, which embodies the therapeutic resources deployed in the treatment of patients. Although most universities incorporated pharmacology into their Materia Medica coursework, the pioneering University of Michigan chemistry professor, Silas Douglas, taught pharmacology as a separate chemistry course. Medical Jurisprudence, which was the nineteenth-century equivalent of psychiatry or psychology, was taught at most major medical schools by 1850. This course was inherited from the Paris School of Medicine and was primarily created to comprehend the mentality of criminals.

[39] *Catalogue of Officers and Students of the University of Michigan, 1854-55* (Ann Arbor: E.B. Pond, 1855), 36.

was a requirement. University of Michigan medical students were required to take two six-month-long lecture courses, one at the university, to earn a Doctor of Medicine degree. Students were required to meet the age minimum of twenty-one to graduate, submit a graduate thesis on a medical topic, and pass a final examination to graduate.[40]

While the courseload was typical for other medical schools, the University of Michigan's matriculants had no impression that the school would maintain low standards on par with the rest of the country. In the yearly university catalog, the medical department published a statement, writing, "The University of Michigan has aimed to elevate the standard of medical attainments."[41] The medical school faculty pressed students to have a reasonable, well-rounded background in educational subjects. Prussian standards drove school policy, stating that students gain a liberal undergraduate education. Any students who were incompetent at the university retook coursework until they could pass the examinations. High standards remained for all University of Michigan medical students. The state-run schools did not have to compete with outside medical schools to maintain funding, allowing transparency in their higher standards. Michigan's standards compare to Jefferson Medical College, whose spring announcements ensured relaxed student standards.[42]

The university's higher standards made the coursework difficult for some students. Marshall Chapin Jr. entered Michigan's medical school for the 1851-52 medical term. Chapin was a descendant of Michigan medical royalty. His father, Marshall Chapin Sr., was one of Michigan's first appointed army surgeons, serving in Detroit. The senior Chapin served as

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[40] *Catalogue of Officers and Students of the University of Michigan, 1854-55,* 37.

[41] Ibid, 37-38.

[42] Jefferson Medical College. "Spring announcement of lectures: MDCCCXXXIII" (Philadelphia: Jefferson Medical College, 1833), Medicine in the Americas, 1610-1920, National Library of Medicine, http://resource.nlm.nih.gov/101200503, 1.

Detroit's mayor in 1828.[43] Chapin Sr was a charter member of the Michigan State Medical Society before his premature death from heart disease in 1836.[44] Chapin jr complained about his time at the new medical school. The medical student spent each day studying until midnight.[45]Professors at the medical school kept the medical students in class for as long as they were allowed. Chapin's letter seems to reflect the opposite notions surrounding medical school in 1850. Most medical schools readily accepted all applicants, but the picture of the exhausted medical student mirrors our modern standards. The dedicated medical students who persevered through their studies worked through rigorous lectures, examinations, laboratory exercises, dissections, and essays that needed defending. David Carson Rankin, of the 1862 class, shared Chapin's sentiments. Rankin, writing to his fiance Maggie, said he spent the early morning hours before class studying, his one-hour break after morning classes, and evenings before bed. The afternoons were spent arduously in the chemistry lab or dissecting the cadavers under the watchful eye of Corydon Ford.[46]

The University of Michigan graduates were of a minority within their matriculating classes. Many incoming students contrast heavily with the small number who received their medical degrees from the school. When Henry Hurd entered the university in 1861, there were 261 students in the school, and he was one of only 66 to graduate in his class. Hurd recalled that many of his fellow students had been college graduates before entering medical school, but many in the program were ill-suited for the demanding medical school courses. On Hurd's first day of medical school, he listened to Professor Samuel Armor's lecture about Materia Medica. For nineteenth-century medical students, the materia medica course was

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[43] Burr, *Medical History of Michigan,* vol. 1, 213.

[44] Ibid, 226.

[45] Marshall Chapin to Louise Hinchman, May 28, 1852. T.H. Hinchman Papers, Burton Historical Collections, Detroit Public Library.

[46] David Carson Rankin to Maggie, November 15, 1862, David Carson Rankin correspondence, 1861-1863, Bentley Historical Library, University of Michigan Ann Arbor.

second to anatomy in importance as they learned the necessary therapeutics for medical ailments. Hurd watched as the student in front of him desperately tried to copy Armor word-for-word before giving up. Armor had stated that medicines are "substances used for the treatment and cure of diseases," while the unfortunate student wrote, "medicines are substances."[47]

Life as a Michigan medical student left students with little free time. Ann Arbor was a secluded part of the state, and the school was surrounded by woodlands and local farms. Michigan medical students lived in dormitories or boarding houses in the small town. Medical students across the country were rowdy, and Michigan students were no exception. Silas Douglas, the school's chemistry professor, doubled as the Inspector of Buildings, and his reports show the destruction caused by students who tore doors from their hinges, broke windows and wrote on the walls.[48]Sheltered young men were free from the confines of their Victorian-Era parents, and they took advantage of every opportunity. While there was little free time between courses, some Michigan students made their way to a local brothel until the suicide of a despondent student forced the house's closure.[49] Many of the students took part in more wholesome extracurricular activities. James W. Guthrie, who later served as a surgeon in the 20th Ohio Infantry, attended lectures on geology and paleontology whenever the time allowed.[50] The only free day, Sunday, saw many students attend church or church functions.

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[47] Henry Hurd, "The Medical Department in 1865," *The Michigan Alumni* VIII (1901-1902), 221.

[48] Silas Douglas to Major Kearsley, January 28, 1847, Ann Arbor, Michigan, the Douglass Family Papers, Bentley Historical Library, University of Michigan-Ann Arbor.

[49] The unfortunate student, while drunk, proposed to a worker at the brothel, and she accepted. When he awoke the next morning, sober, he was so ashamed that he took his own life. Kaufman, *American Medical Education*, 47.

[50] James W. Guthrie Diary Entry, January 1, 1860, James Guthrie Papers, Michigan in the Civil War, Bentley Historical Library, University of Michigan-Ann Arbor.

If students could afford to break from studying, weeknights were popular times to attend bible studies or evening sermons.[51]

Life in Ann Arbor was spent almost exclusively in the company of professors. There was no shortage of practical jokes in the classroom. Any student who tried to outdo his fellow pupils or gain special favor with a professor was a victim of "passing up." In the stadium-style amphitheater, the victim was brought to the bottom level and passed over the heads of his fellow students from the bottom of the lecture hall to the top before being dumped on the floor of the top row.[52]Shouting nicknames to embarrass fellow students was another break from the monotony of study. When a student stepped into the classroom, he would hear his nickname shouted enthusiastically. One student, while trying to impress a local girl with his knowledge of anatomy, mentioned the deltoid muscle, which was a great mystery to the poor young woman. Students perpetually shouted, "Deltoid! Deltoid!" whenever the attempted seducer entered the room.[53]

Michigan medical students spent their mornings in lectures, attending four one-hour lectures before a break for lunch. They followed their lecture with afternoons spent dissecting cadavers and observing specimens presented by Professor Ford or his demonstrators. They alternated between Ford's anatomy labs and Silas Douglas's chemistry lab. On Tuesday and Saturday afternoons, students sat in and assisted in Professor Moses Gunn's surgery clinics held under the glass dome of the school's amphitheater. Throughout the school year, students volunteered their time, gaining clinical experience in the clinic that treated residents of Ann Arbor and other nearby towns. The busy life of Michigan's future graduates centered around medicine and science for the two years they spent in the company of their beloved professors.

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[51] David Carson Rankin Papers, Bentley Historical Library, University of Michigan-Ann Arbor.

[52] Robert C. Kedzie, "The Early Days of the Medical Department," *Michigan Alumnus* VIII (1901-1902), 207.

[53]Hurd, "The Medical Department in 1865," 221.

Second-year students were in constant contact with their professors, who guided them in writing medical essays, which they defended on Saturdays after Gunn finished his surgical presentations. The dissertation, their final big project, was time-consuming and required research directed by their mentoring professors. They did all this while preparing for weekly examinations and a final examination covering their tenures as students before graduation. Professors commonly held additional lectures on weekends and evenings. Professor Alonzo Palmer forced his students to take an additional weekly examination to prepare them for the cumulative finals.[54]

The coursework at the university differed from competing universities in several ways. The first significant difference was the approach to medical education. The rationalist versus empiricist argument was a minor component of the classwork. Students received instruction in the practical areas of medicine, but the professors at the university primarily focused on the sciences they taught. The school was heavily committed to the Prussian education model, encompassing the sciences. Lectures were just one of the avenues of education. Students spent hours working in the laboratory while taking a heavy courseload of lectures and recitations. The campus clinic served as a healthcare hub for the rural town of Ann Arbor. Each Tuesday and Saturday, students were directed to attend the school's clinic, where they observed professors consulting on various cases, including surgeries. Silas Douglas, Douglass Houghton's cousin, became a trailblazer in the field of chemistry. The regents allowed him to build a separate chemistry building in 1855, making it the first of its kind in the country.[55]Douglas's laboratory course was revolutionary at the time of the school's opening.

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[54] James Lamb to Sarah Lamb, January 15, 1853, Ann Arbor, James Lamb Letters, Bentley Historical Library, University of Michigan Ann Arbor.

[55] Horace Davenport, *Not Just Any Medical School: The Science, Practice, and Teaching of Medicine at the University of Michigan, 1850-1941* (Ann Arbor: University of Michigan Press, 1999), 4.

Medical schools insisted on the didactic lecture as the educational tool, while Michigan had students take practical classes like chemistry and other laboratory sciences courses.

Chemistry

The practical and hands-on emphasis in coursework was a primary difference between Michigan and other medical schools. The chemistry lab at Harvard University's medical school was not installed until 1853, three years after Michigan opened its medical school.[56] Before 1853, Harvard medical students only studied chemistry through lectures. Harvard's chemistry lab expanded from six desks to sixteen in 1857, which was hardly ideal for a school averaging nearly two hundred students for each medical school term. Harvard's analytical chemistry courses were optional, making chemistry lectures the chosen medium of instruction. Michigan medical students regularly spent several hours each day in the chemistry lab, which held over sixty students per class.[57]By the 1860s, medical students in Michigan had spent four hours in lectures and another three hours in the chemistry lab. Chemistry professor Silas Douglas, an energetic and encouraging professor, pushed students to experiment and study independent areas of interest.

Chemistry education throughout the United States varied, but most schools lacked the facilities to teach students properly. Harvard College, Yale, Jefferson Medical College, and the University of Pennsylvania had a reputation as the most elite scientific universities at the time of Michigan's opening. Aspiring chemistry teachers and professors regularly made the University of Pennsylvania their educational destination, where they could learn under legendary chemists like Robert Hare. Medical schools like the Jefferson Medical College employed one of the American founders of professional pharmacy and medical chemistry in

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[56] Henry Beecher, *Medicine at Harvard: the First 300 Years* (Hanover: University Press of New England, 1977), 67-68.

[57] John Bennitt to his Wife, November 16, 1861, Ann Arbor, Michigan, John Bennitt Letters and Correspondence, Digital Collections, Grand Valley State University.

Franklin Bache. The schools lacked chemistry facilities to teach medical students despite the employment of these great chemists. The best these schools could offer were seats in the audience of these professors. Harvard College built a rudimentary chemistry lab in the basement of their old medical building but could only manage three or four tables for students to work.[58] The University of Michigan was the first in the history of the United States to make building a proper chemistry lab the focal point of its medical program.

Silas Douglas approached chemistry education in an epic format. Douglas focused on an analytical program from the beginning of his tenure. He pushed the regents to allow him to build and expand the chemistry program consistently.[59]The University of Michigan medical students performed their experiments differently from established medical colleges. Douglas started small with four benches in the first medical school building, but his constant lobbying led to funding for the most comprehensive chemistry program in the nation. The regent's approval for a separate chemistry building in 1855 was the road for the first of its kind on any campus. In 1856, the lab officially opened with twenty-six tables, which expanded to sixty tables for the 1860 school year.[60]Students who entered Douglas' $6,000 chemistry lab had access to the modern amenities available in the late 1850s. The tables had gas hoods, gas pumps, running water, chemicals, and reagents that were scarce even in the most advanced European chemistry labs. Douglas's resourcefulness and persistence were central to materializing the state-of-the-art facility, the nation's most advanced university chemistry lab, for years.[61] Analytical chemistry was not complete without training with microscopes, which

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[58] Henry Beecher, *Medicine at Harvard: The First Three Hundred Years* (Hanover: University Press of New England, 1977), 67-68.

[59] Zina Pitcher to Silas Douglass, January 21, 1847, Douglass Family Papers, Bentley Historical Library, University of Michigan-Ann Arbor.

[60] A.B. Prescott, "Silas Hamilton Douglas, the Founder of the Chemical Laboratory," *The Michigan Alumnus* IX, no. 77 (October 1902), 4.

[61] Prescott, "Silas Douglas," 4-5.

the university provided in conjunction with Douglas's extravagant Grunos microscope that cost the professor $170.[62] The chemistry laboratory set Michigan apart from other medical colleges.

Work in the chemistry lab was the most significant component of medical education at the University of Michigan. Letters from students always detailed their time in the laboratory for either chemistry or dissecting cadavers for Professor Ford's courses. Students remembered Professor Douglas's zeal for chemistry and readiness to help any student. Robert Kedzie, who later served in the 12th Michigan Infantry as a Surgeon, remembered that Douglas was always eager to demonstrate the explosive elements of chemistry.[63]William F. Breakey, the future surgeon for the 16th Michigan Infantry Regiment, wrote about Douglas's laboratory courses. The professor was energetic and actively working to revolutionize college chemistry education. What stood out to Breakey was Douglas's insistence that students do the work themselves and keep away from the recitation of textbooks or notes.[64]Students packed into the small lab while Douglas oversaw their experimenting with chemicals, electricity, gasses, and various chemical apparatus.

The chemistry courses at the University of Michigan set the school apart from competing medical colleges. Students at Michigan were using analytical chemistry to connect all areas of medical science. The school was the first to make chemistry laboratory study a

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[62] John Bennitt to Lottie Bennitt, November 8, 1861, Ann Arbor, in *"I Hope to Do My Country Service": The Civil War Letters of John Bennitt, M.D. Surgeon, 19th Michigan Infantry,* ed. Robert Beasecker, (Detroit: Wayne State University Press, 2005), 1-2.

[63] Kedzie was a notable figure in the realm of academic science in the nineteenth and early 20th centuries. He was a prominent member of the first graduating class of a medical school in 1851. However, Kedzie's professional direction shifted after the Civil War, transitioning into the field of science education at Michigan State University, which was then known as the Michigan Agricultural College. Kedzie established himself as one of the most esteemed science educators in Michigan, dedicating his career to teaching various scientific disciplines at MSU. He later ventured into the public health domain, where he made valuable contributions as a public health officer. Kedzie's contributions to the field of chemistry were also noteworthy, as he eventually rose to become the head of Michigan State's Chemistry Department. After retiring in 1902, he left behind a legacy that continues to inspire and motivate the scientific community. Robert C. Kedzie to William F. Breakey, February 19, 1901, Lansing, in *The Michigan Alumnus* VII, no. 63 (April 1901), 275-276.

[64] W.F. Breakey, "Department of Medicine in the Fifties," *The Michigan Alumnus* VII, no. 63 (April 1901), 271.

graduation requirement. It is possible to see the depth of student coursework using records from Silas Douglas's papers, student notebooks from the era, and Douglas's synopsis of educational chemistry. The first chemistry course covered the basics of Elementary Chemistry, with a needed examination before moving on to the next level. Elementary chemistry covered the basics of chemical properties. Douglas taught concepts that included the chemical change occurring during boiling, freezing, and heating.[65] The Elementary Chemistry concepts mirror modern courses in Basic Inorganic Chemistry. The chemistry faculty taught the chemical properties of both inorganic and organic elements or solutions. The staff taught terminology for all areas of chemistry, along with basic overviews that Douglas presented in his lectures before students proceeded to practice in the laboratory. After passing the Elementary Chemistry examination, students advanced to identify a given chemical's components, known as qualitative analysis. They analyzed five different levels of substances composed of mixed acid and base solutions, or solids equaling one hundred different solutions.[66]Breakdowns required an explanation and students were expected to show their work. Students would learn logic, reasoning, analytical chemistry, and general chemistry principles through this qualitative analysis.

The curriculum broke analytical chemistry into segments, including Determinative Mineralogy, Quantitative Analysis, Metallurgy and Assaying, Toxicology, and Urinalysis. Quantitative Analysis was the driving force behind analytical chemistry at the University of Michigan. The determination of toxins, heavy metals, and other known poisons had a direct connection to medical science. Not only did students learn to detect toxins in the body, but they also learned how to determine the volume of any substance afflicting a patient. Students

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[65] Daniel Hall Student Notebook, entries from October 14, 15, 25, and 29, 1852. Hall Family Papers, Bentley Historical Library, University of Michigan-Ann Arbor.

[66] Silas Douglass, A.B. Prescott, Preston Rose, Willard Rising, *Synopsis of the Various Courses of Practical Instruction Pursued in the School of Analytical and Applied Chemistry in the University of Michigan* (Ann Arbor: Dr. Chase's Steam Printing House, 1866), 3.

received training in Gasometry, an early form of the Arterial Blood Gas. The premise behind both practices hoped to produce the same result as they measured the atmospheric gasses in the bloodstream.[67] Urinalysis involved the extraction of elements in the urine with both a quantitative and qualitative analysis of the data.

The chemistry notes of University of Michigan students before the Civil War hardly differ from those written by modern students. Notes included properties of liquids, gasses, and solids. Douglas explained the attractive qualities of particles that allow for substance formation. Students learned the shape of molecules and the chemical bonds that created the various shapes.[68]Several Elementary Chemistry lectures involved the chemical structure of substances and the chemical properties of what we now know as elements.[69]Medical students understood the chemical structure of acids, bases, metals, and minerals. In their fundamental understanding of chemistry, students learned inorganic and organic chemistry elements.[70] Douglas expected his students to dissect every chemical formula crossing their paths and piece them back together. Douglas covered chemical affinity in his lectures, explaining why specific chemicals bond. The final chemistry examination taken before graduation involved nearly three hundred questions spread across all areas of chemical study.[71]

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[67] Douglass, Prescott, et al., *Synopsis of the Various Courses*, 4.

[68] Daniel Hall Notebook, November 30, 1852.

[69] Elements are fundamental substances that cannot be further broken down through chemical reactions. The first periodic table of elements was established by Dmitri Mendeleev in 1869, though early nineteenth-century chemists had already discovered numerous elements, and the eighteenth century witnessed a rapid discovery of new elements, beginning with the isolation of Cobalt by Swedish chemist Georg Brandt in 1735. In fact, 28 elements were isolated during this century, reflecting the rapid evolution of the science of chemistry. The concept of elements was first presented by Robert Boyle in his 1661 book, *The Sceptical Chymist.* However, it was not until Antoine Lavoisier defined Boyle's premise as an element in 1789 that the notion gained widespread acceptance. Indeed, Lavoisier's book, *Elementary Treatise of Chemistry*, became the modern standard for chemistry textbooks.

[70] Daniel Hall Notebook, March 3, 1853.

[71] Benjamin Thompson Notebook, 1865, Benjamin Thompson Papers, Bentley Historical Library, University of Michigan-Ann Arbor.

What University of Michigan medical students were doing in the lab was unprecedented in American medical colleges. Students at Jefferson Medical College, the University of Pennsylvania, and the New York College of Physicians and Surgeons learned chemistry through didactic lectures. Professors lectured from prewritten notes, and the students' perceived comprehension depended on how well they could repeat the lesson to the lecturer. Even in the lecture rooms of early America's great chemists like Robert Hare and Franklin Bache, the medical students learned solely through watching and listening. The professor performed chemical demonstrations before the class, explaining the mechanism of a chemical breakdown. Michigan students performed the same experiments their professors showed while being equipped to apply chemistry in their future medical careers. The different schools offering practical chemistry courses never made the course a requirement before the Civil War. The courses were optional at competing schools, and students eager to embark on their medical careers rarely volunteered for more work. University of Michigan medical students quietly revolutionized medical education with their eager chemistry master.[72]Dr. Edmund Andrews, an 1852 Michigan graduate, famous medical educator, and Civil War surgeon, saw the lab course as a beacon, interesting prospective medical students. He wrote, "This small laboratory, well equipped for the times, grew year by year until it soon became the largest and best-equipped chemical laboratory open to students in this country."[73]

Michigan graduates left the university well-exposed to applied chemistry techniques. Douglas covered Metallurgy and Assaying in the analytical portion of the course. In the next phase, students embarked on the study of toxicology, which had indeed applied medical value. Douglas presented students with several medical cases that the young men analyzed to determine the poison used and the quantity of the substance using human blood to determine

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[72] Breakey, "Department of Medicine in the Fifties," 270-271.

[73] Edmund Andrews, "Reminsicience of the Michigan Medical Department," in *The Medical History of Michigan,* vol. I, ed. C.B. Burr (Minneapolis: The Bruce Publishing Company, 1930), 472.

the toxin. Students observed toxins such as oxalic acid, arsenic, mercury, sulphuric acid, ammonia, and other toxins in Douglas's analytical coursework. The course presented the symptoms of poisoning along with the chemical composition. Toxicology, Urinalysis, and the other facets of Analytical Chemistry would become a large part of well-rounded clinical science. For those physicians who later served in the Civil War, the modernizing Union Army Medical Department made chemical analysis part of their new stream of changes.[74] Michigan students, the only students with deep training in analytical chemistry, were suited for this change in medical science.

Anatomy and Physiology

Students rotated between afternoons in the chemistry lab and the dissection room. Dr. Corydon Ford oversaw anatomy instruction during the morning lecture sessions and their afternoon anatomy labs. The afternoon sessions centered around hands-on anatomical study. Every University of Michigan medical student dissected cadavers, a material that was elusive in the nineteenth century. Students also spent days examining the numerous specimens from the anatomical museum. Dissections also involved animal specimens. Ford and his professors collected and preserved their specimens for the museum and the classroom. The university purchased specimens from other medical schools, suppliers, and sometimes nefarious actors to bolster the library of items for study. Every medical college in the country offered an anatomical museum for students to explore, but the quality was lacking at many schools.[75]

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[74] Shauna Devine, *Learning from the Wounded: The Civil War and the Rise of American Medical Science* (Chapel Hill: The University of North Carolina Press, 2014), 2.

[75] Harvard Medical College has one of the nation's largest anatomical museums. Smaller schools, like the Castleton Medical College in Vermont, had limited space, giving them little room for a big collection. Collections could be boxes of bones, two or three jars with pickled specimens, or hundreds of neatly organized and archived items.

Professor Ford worked diligently to create the most extensive possible anatomical collection. The professor created his anatomical models and drew his anatomical charts.[76]

Michigan's medical graduates greatly respected and admired their beloved anatomy professors. The soft-spoken and zealous instructor had a way of exciting students with a deep veracity for learning the most important medical science. Modern medical students spend over 1200 hours studying anatomy. While Antebellum medical students lacked this level of anatomical education, educators saw the subject as the most essential part of their curriculum. They sat, captivated by the lectures of Ford, remembered as one of the greatest anatomy instructors of the nineteenth century. Professor Skene of the New York College of Physicians and Surgeons wrote, "His ability to excite interest in students and keep them interested was wonderful."[77]Medical school graduate Lewis Darling remembered Dr. Ford was "most thorough, and the students were well prepared for the most rigid examination in anatomy and physiology."[78]Ford was almost unanimously the favorite among the professors. His ability to incite his students' emotions is evident in medical student Francis Thomas to his fiance Beulah Haines, written on March 5, 1865. Ford worked part-time at other universities, and his Michigan students came to see him off at the Ann Arbor train station as he went off to conduct lectures at Bowdoin College, Maine. As his students watched him leave, they begged for a speech, and he "began to talk in the most eloquent & pathetic manner and so great was our estimation of him, that, medics as we were, we could scarcely control the tears that were want to make an appearance."[79]

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[76] Dea Boster and Joel Howell, *Medicine at Michigan: A History of the University of Michigan Medical School at the Bicentennial* (Ann Arbor: University of Michigan Press, 2017), 19.

[77] Victor Vaughan, "The Semi-Centennial of the Medical Department," *The Michigan Alumnus* VI, no. 53 (April 1900), 281.

[78] Lewis Darling, "The Medical Class of 1866," *Michigan Alumnus* IX, no. 77 (October 1902), 12.

[79] Francis Thomas to Beulah Haines, March 5, 1865, Ann Arbor, Francis Thomas Letters, Bentley Historical Library, University of Michigan-Ann Arbor.

Under the guidance of Professor Ford, the students were most inspired to learn anatomy. He was incredibly popular among the medical school attendees. For John H. Doughty, Dr. Ford was not just his favorite professor but the inspiration for his enrollment at the University of Michigan. Doughty had a mixed background, attending seminary at New York Conference Seminary, then earning a Bachelor of Arts and a Master of Arts at William College before one year at the Berkshire Medical College in Pittsfield, Massachusetts. Dr. Ford was giving a course of anatomy lectures at Berkshire in 1861, which Doughty attended three days before approaching Ford. Ford so inspired Doughty that he covertly asked the professor if he should leave Berkshire for Ann Arbor's better educational potential. Ford merely smiled and told Doughty he could not advise him to go there but "told me that if I went there, he did not think I would regret it!"[80]Doughty failed to regret his decision and graduated with the class of 1863 before passing his examination to become an Assistant Surgeon for U.S. volunteers during the Civil War. Doughty later headed up numerous medical departments during the war, forever grateful for his time with Ford in Ann Arbor.[81]

In Ford's classroom, the students studied the basic tenets of anatomy. Corydon Ford's papers show that he was constantly reworking his courses and reasserting the best way to educate on anatomy. His first lecture each semester covered the history of anatomy and paid homage to revolutionary anatomists like William Cruikshank, Jacques Dubois, and Andreas Vesalius. Ford had an encyclopedic knowledge of anatomy and physiology. The professor's commitment to voracious reading and absorption of the writing of his contemporaries made him an invaluable teacher. Ford gave students his take on anatomy textbooks like *Gray's Anatomy*, *Leidy's Human Anatomy, Bichat's General Anatomy,* and *Cruveilhier's Anatomie*

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[80] John Doughty, "Autobiography," [Manuscript], John Doughty Papers, Bentley Historical Library, University of Michigan-Ann Arbor, 2.

[81] Doughty, "Autobiography," 3-4.

Descriptive.[82] His lectures on every aspect of human anatomy, beginning with medical terminology. Students then studied the human skeleton from the top of the head to the feet. Ford used his extensive collection of specimens to demonstrate before the class, holding up each bone and structure to show his engrossed students. The course then moved to the circular system, organs, and nervous systems.[83] William Breakey was fond of Ford's lectures, saying, "Ford was one of the best teachers of general anatomy that the time period produced."[84]

Physiology teaching was young when the University of Michigan opened its medical school in 1850. Generations of American medical educators were of the rationalist tradition. These earlier teachers lacked the means to study the function of organs and the human body and took to theorizing. The theorists clashed with the pure empiricists, who saw the study of physiology as a pointless and trivial pursuit. The rationalists were descendants of the Edinburgh medical education system, who saw value in body systems, believing that there were singular causes to all diseases without any scientific basis.[85]The Paris Clinical School, which grew in popularity during the first quarter of the nineteenth century, saw physiology as futile. The Paris School believed that doctors did not need to know why a treatment worked; instead, they only needed to know what a treatment did and what the treatment was. This later mindset meant that physiology, the study of the body and body part functions in their normal

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[82] Corydon Ford, "Personal Library List," [Manuscript], Corydon Ford Papers, Bentley Historical Library, University of Michigan-Ann Arbor, 1-2.

[83] Corydon Ford, "Anatomy Notebook: Synopsis of Lectures," [Manuscript], Corydon Ford Papers, Bentley Historical Library, University of Michigan-Ann Arbor.

[84] William Breakey, "The Department of Medicine and Surgery in the Fifties," *The Michigan Alumnus* VII, no. 63 (April 1901), 273.

[85] Scientific basis, in this sense, means without scientific observation. Physicians and scientists from the 1600s to the late 1700s needed to be equipped with the knowledge and equipment to study physiology. More cadavers, medical colleges, microscopes, chemistry labs, etc., all allowed for a better understanding of physiology. The exponential growth of readable material, including periodicals and textbooks, streamlined medical knowledge and opened the door for physiological research.

state, was unnecessary. A significant separation between the United States and France was over the principle of physiology. While many Americans were considered “empiricists,” physiology was never excised from American scientific and clinical thought. By the 1850s, the study of physiology became a regular component of medical education, and Professor Ford was deeply well-versed in it.

Professor Ford was familiar with the streams of medical science and used them to teach his students the current understanding of physiology. Staying on top of scientific discovery was one of Ford’s six tenets of medicine, taught to every student, stating, “Keep pace with the science. The sick have a right without great danger of neglect.”[86]Ford’s physiology courses integrated several sciences, including chemistry, anatomy, pathology, and cellular biology. In Ford’s physiology lectures, the students learned the science behind salivation, secretions, absorption, nutrition, excrement, and the formation and physiology of blood cells.[87]Cellular biology was a crucial part of Ford’s physiology lectures. The structure of cells was covered where students learned cell structure, including the existence of a cell wall, cytoplasm, nucleus, nucleolus, and other organelles within the cell.[88] Cell division was explained by Ford, showing the process and the physiological changes in cells that occurred throughout the division process.[89] Students learned the science of absorption in cell study and

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[86] Ford's four heads of medical practice were: Duty to Patients, Duty to the Profession, Duty to the Public, and Duty to yourselves. There were six duties to patients, the first being: 1. Examine your patients carefully; they have a right to this. 2. Fulfill your appointments faithfully. 3. Write your prescriptions carefully, as the patient's safety requires it. 4. Give directions carefully and see that you are understood. 5. Deal honestly with the sick; you have a duty to them and their friends. 6. Keep pace with the science, as the sick have a right without great danger of neglect.
Corydon Ford, “Duty to Your Patients,” Corydon Ford Papers, Bentley Historical Library, University of Michigan-Ann Arbor.

[87] Corydon Ford, “Synopsis of Physiology Lectures,” Corydon Ford Papers, Bentley Historical Library, University of Michigan-Ann Arbor.

[88] Benjamin Thompson, “Student Notebook, 1865-66,” [Manuscript], Benjamin Thompson Papers, Bentley Historical Library, University of Michigan-Ann Arbor.

[89] Modern scientific advancements have brought about the discovery of various structures within cells, known as organelles, each of which serves a specific purpose. Mitochondria, for instance, is considered the "power plant" of cells, while eukaryotic cells are characterized by a defined nucleus and contain a Golgi Apparatus

the science of secretion. Student notebooks show lectures on the different body fluids and the cells contained, including lymph, blood, chyle, saliva, bile, and others.[90]Ford explained the different cellular makeups of body tissues and pathological changes within them.[91]

Doctor Zenas Bliss, who later became a major scientific contributor during the Civil War while running the Camden Street Hospital in Baltimore, saw the value in Ford's physiological lectures. In his 1855-56 school year dissertation titled *Cells and Cell Life*, he wrote that cells "may be regarded as the fundamental components of all organized structures."[92]Without proper means to understand driving forces like genetic code contained within the cell, Bliss, like many scientists, including Ford, attributed the function of a cell to "vital forces" or "vital causes."[93] Bliss understood that the protein formation in the cell came from within and that protein deposits composed the shape and function of the cell.[94]Bliss knew through his conferencing with Professor Ford that the cell was crucial to chemical and structural changes within the human body.[95]Bliss wrote that man is composed of cells

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responsible for protein transportation and an Endoplasmic Reticulum that folds and transports proteins. While many of these organelles have been known to exist since the onset of the Civil War, their specific functions were only discovered much later. For instance, the mitochondria were first observed by Albert von Kolliker in 1857, but their function remained unknown until the twentieth century. Similarly, the Golgi Apparatus was only officially discovered in 1898, while the Endoplasmic Reticulum was first noted in the late nineteenth century. Though the basic physiology and function of cells were understood, the lack of advanced microscopes prevented scientists from truly studying these structures. Nonetheless, it was well-known that cell division was central to human life.

[90] Thompson's entry from October 5, 1866, "Student Notebook."

[91] Ibid, October 9, 1866.

[92] Zenas E. Bliss, *Cells and Cell Life,* [Dissertation], (Ann Arbor: University of Michigan, 1855), 1c.

[93]Vitalism, an influential theory in the nineteenth century, played a significant role in comprehending the underlying driving force behind all forms of life. It gained widespread acceptance among the faculty members of the University of Michigan and sought to attribute a force or energy beyond the realm of chemical and physical forces. However, as chemistry emerged as a science, it raised several questions regarding the driving force of life. Jons Jakob Berzelius, a prominent chemist of the time, emphasized the need for a force that could propel life and maintain its order. Corydon Ford, a supporter of Johannes Muller and author of the acclaimed physiology textbook *Handbuch der Physiologie*, published in 1844, believed that vitalism, or the soul, was the central unifying force of animal life.

[94] Bliss, *Cells and Cell Life,* 3.

[95] Ibid, 18.

working in a unified manner to drive the human body, including the conduction of nerves and the creation and death of blood cells.[96]

A student's understanding of Cell Biology reflects on both the professor and the school's curriculum. Common notions about the education that Civil War surgeons received seem to be something that would discount topics like cellular function. Cell Biology was covered at the University of Michigan nearly ten years before the Civil War commenced. The understanding of cells is pivotal to the study of human biology. During the Civil War, the study of physiology and medical science changed so drastically that the knowledge of cell biology and physiology served as a foundation for understanding changes in the human body. Cellular composition and cell death are significant markers of disease, and chemical effects on cellular tissue are a component of pathology.

While lectures were an essential part of learning anatomy, nothing was more important than dissecting cadavers. The thought of dissection was a difficult one for nineteenth-century Americans. David Carson Rankin, attending during the 1862-63 term, wrote to his fiance, "It is difficult to dissect the dead but necessary."[97]Rankin consistently reported to his future wife that cutting up the dead was not pleasant, but he needed to do it in order to learn the systems of the body. Dissection, while unpleasant for some, was a fascinating and fulfilling time for others. James Lamb, in 1853, wrote to his sister Sarah Lamb, "I was never in any place that is so exceedingly interesting as the dissecting room."[98]Lamb told his sister he could spend six months at the dissection table if given the opportunity. While there is no record of Sarah's reaction, the context from James's letter

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[96] Ibid, 23.

[97] David Carson Rankin to Maggie, October 27, 1862, Ann Arbor, David Carson Correspondence, 1862-1863, Michigan in the Civil War, Bentley Historical Library, University of Michigan-Ann Arbor.

[98] James Lamb to Sarah Lamb, January 15, 1853, James Lamb Letters, 1853, Bentley Historical Library, University of Michigan-Ann Arbor.

shows that his sister was somewhat disturbed by his enjoyment of dissection. She asked him, "How can I stand it?" he responded, "It is interesting for me to see where there is an arm in one place, a leg another, a skull another, etc."[99]Eventually, even disturbed students like Rankin appreciated his time in the dissection room. Just weeks after writing about the unpleasantness of the experience, he wrote, "I love to examine each nerve and bone and get a correct knowledge of the human frame."[100]

Ford directed the four afternoon hours spent in the dissection lab. Ford first demonstrated the dissection, and the students followed suit.[101]The dissecting room in the original medical building was in the school's attic and slowly expanded with the growing medical school. [102]Students packed into the small space from 1 to 4 pm every afternoon save for Tuesdays.[103]In the laboratory, four students were assigned to one cadaver, and in 1862, during David Rankin's fall term, there were sixteen bodies spread around the lab for dissection.[104] There were times when more students flooded the room. Rankin recalled one January 1863 day that seventy students were milling around the dissection room, which he said was only three times larger than his fiance's parlor.[105]

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[99] James Lamb to Sarah Lamb, January 15, 1853.

[100] Davis Carson Rankin to Maggie, November 12, 1863, Ann Arbor, David Carson Rankin Correspondence, 1862-1863, Bentley Historical Library, University of Michigan-Ann Arbor.

[101] Breakey, "The Department of Medicine and Surgery in the Fifties," 273.

[102] Ibid, 266.

[103] A series of classes were scheduled to be conducted over a period of one year, commencing at the start of October and concluding by the end of April, with a break during Christmas. The student body was divided into two groups, wherein one section was engaged in studying anatomy during the first half of the year, whereas the other half would attend the dissection lab in the afternoon. After the break, the groups would switch their respective subjects. The alumni of Michigan, who had completed their Doctor of Medicine degree, had undergone each applied science course twice.

[104] Rankin to Maggie, October 27, 1862.

[105] David Carson Rankin, January 16, 1863, David Carson Rankin Correspondence 1862-63, Michigan in the Civil War, Bentley Historical Library, University of Michigan-Ann Arbor.

Work in the lab continued to become more congested as the school's remarkable success brought many students.[106] The difficulty in obtaining enough cadavers for students forced university professors to take extreme steps to obtain class materials.[107]Victorian Era Americans had strong feelings about both dissection and the obtaining of cadavers. Numerous American states avoided legal measures allowing for the designation of bodies for science. The gross unpopularity surrounding cadaver usage and the threat of violence about the practice meant secrecy was a necessity. Suppliers faced not only social ramifications but legal as well. Upon graduating from medical school in 1852, Edmund Andrews was appointed Demonstrator of Anatomy under Professor Ford. The Demonstrator was like a graduate assistant, aiding in the laboratory and classroom with little to no pay. Andrews commonly referred back to his primary job of gathering subjects for dissection. Graverobbing was illegal during Andrews's time as a demonstrator, beginning in 1852, but he still needed to fulfill his obligations. He commented on the irony that while serving as an employee of the State of Michigan, the state required him to find bodies, but while doing so, he was committing crimes that were to be punished by the state.[108]Andrews was limited to few legal options. He could take bodies from the state prison in Jackson, Michigan, roughly forty miles from Ann Arbor. Unclaimed bodies and pauper's graves were occasionally available for

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[106] The University of Michigan, "A History of the Department of Medicine and Surgery," *The Michigan Alumnus* XIV, No. 133 (April 1908), 291-292.

[107] The inaugural class of the medical school in the academic year 1850-51 was composed of a total of ninety students. The following academic year of 1857-58 saw a nearly doubled enrollment of one hundred and seventy-three students. During the Civil War, the enrollment numbers experienced an exponential growth, surging from two hundred and forty-two students in the academic year of 1860-61 to four hundred and fourteen in the academic year of 1864-65. The task of obtaining sufficient space and cadavers for dissection was a daunting one, yet the professors always found a way to overcome the challenges posed by this endeavor.

[108] Minnie K. Brown, "History of the Class of '49," *The University Alumnus* VI, no. 54. (May 1900), 337.

material acquisition. Andrews wrote that the "chief end of my official existence was to buy, steal, dig up, or in any other manner procure subjects for the dissecting room."[109]

Andrews quickly figured out that the best way to procure dissection subjects was through his industriousness. Edmund Andrews learned that nobody spent the money to investigate the loss of a pauper cadaver.[110] He refused to dig up or steal bodies from Ann Arbor, not wanting to infuriate the local populace. Instead, he found several agents in various cities that could supply him with some of the needed specimens, like one agent in Buffalo, New York, who provided bodies for $25 each.[111] The lead physician at the Wayne County Almshouse notified Andrews of a pauper burial, and he dispatched a team of local stable workers to dig the body up. Dr. Andrews often had to dig up bodies himself. The first winter of his employment, in 1852, he dug up thirteen bodies from the frozen Michigan ground, sometimes being chased by the local constables. Dr. Ford told Andrews that "arrangements to escape detection must be made. After a body is received, it must be boxed, carted, and transported. All by unreliable persons who must be bribed!"[112]

The dissection as a requirement set the University of Michigan apart from most medical schools that made dissection a requirement. In his 1840 essay on improving medical education, Andrew Boardman wrote that many medical schools made practical education optional.[113]Students were not required to attend courses in surgery or practical

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[109] Edmund Andrews to William Breakey, 1901, Chicago, in *The Michigan Alumnus* VII, No. 63 (April 1901), 274.

[110] Ibid, 274.

[111] Ibid, 275.

[112] James Tobin, "Such Horrible Business," Heritage Project: the University of Michigan, accessed September 8, 2023, https://heritage.umich.edu/stories/such-horrible-business/.

[113] Andrew Boardman, *An Essay on the Means of Improving Medical Education and Elevating Medical Character* (Philadelphia: Haswell, Barrington, and Haswell, 1840), 17.

anatomy.[114]Boardman observed that students rarely learned to conduct a post-mortem examination and could not comprehend scientific data.[115]William Rothstein, in his definitive discourse on medical education, wrote, "Most medical schools in the early nineteenth century offered practical anatomy as an optional course."[116] By 1848, only twenty-five schools required training in practical anatomy. Deterring schools from requiring practical anatomy was the difficulty in obtaining materials. There was no lack of interest in practical anatomy among the great medical school professors of the nineteenth century, but simply a lack of infrastructure needed to perform the task. Anatomy, specifically practical anatomy, was a vital part of making American medicine a science and a profession.[117]

Public outcry kept the medical profession from becoming a legitimate science. Schools were not keen on upsetting the local populace. Public backlash surrounding the use of the disinterred led to violent attacks on physicians in numerous cases, most famously the New York Doctor's Riot of 1788. The 1788 response to a recently exhumed corpse sent five thousand rioting through the streets of New York, leaving at least three dead. Doctors were hunted down and attacked in their dissection rooms.[118] New York passed the Anatomy Act of 1789, a law forbidding the removal of the deceased, and many states followed suit. Many American schools failed to obtain materials for the most essential aspect of anatomy education, but Michigan professors found their way regardless of obstacles.

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[114] Practical Anatomy was the official term for a dissection course in most early medical schools.

[115] Boardman, *An Essay*, 17-18.

[116] William Rothstein, *American Medical Schools and the Practice of Medicine: A History* (New York: Oxford University Press, 1987), 34.

[117] Michael Sappol, "The Odd Case of Charles Knowlton: Anatomical Performance, Medical Narrative, and Identity in Antebellum America," *Bulletin of the History of Medicine* 83, no. 3 (Fall 2009), 470.

[118] Caroline de Costa, "The Art of Medicine: American Resurrection and the 1788 New York Doctors' Riot," *The Lancet* 377, no. 9762 (January 22-January 28, 2011), 293.

Ford's anatomy and laboratory courses gave future doctors, especially those who went on to serve as Civil War surgeons, experience in the necessary art of dissection. Ford himself was a practiced dissector who regularly honed his craft.[119] His students learned a wealth of knowledge from their beloved professors to aid them in their future careers as military and citizen physicians. The professor continually reworked his lectures, and his notes show that the professor never repeated the same lecture year after year. Students were instead privileged to have a professor who consistently worked the modern findings of science into his lecture material. Dr. Ford continually challenged his preconceived notions about science and his natural philosophy.

Ford worked with Silas Douglas to give students instructions on microscopy. Douglas regularly used the microscope in his lessons several years before Ford. However, his lecture notes for the 1854 session show that the anatomy professor exposed his students to the device in his classroom.[120]Ford used the microscope to show his students the microscopic structure of bone.[121]The inclusion of the microscope in Ford's lectures shows that students received instruction on the device from multiple professors. The medical school advertised microscope training in its annual catalog, stating that students would receive training in the "examinations of various tissues of the body using Microscopes."[122] The faculty understood the scientific importance of the microscope and wanted students to gain repeated exposure to the instrument. Ford would later create a twelve-part instruction course on the microscope, teaching students how to stain examination materials and differentiate between cell types,

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[119] Corydon Ford, "Dissection Notes," [Manuscript], Corydon Ford Papers, Bentley Historical Library, University of Michigan-Ann Arbor.

[120] Ford, "Synopsis of Anatomy Lectures,1854"

[121] Ford's notes state that this was his twelfth anatomy lecture for the 1854 term. In parentheses, he wrote that twenty students came up at one time, lining up to view the bone structure under the microscope. Ford "Synopsis of Anatomy Lectures, 1854,"

[122] University of Michigan, *Catalogue of the Officers and Students of the University of Michigan: 1854-5* (Ann Arbor: E.B. Pond, Printer, Argus Office, 1855), 36.

including blood, bones, kidney, muscle, epithelial, and spinal cord cells. The university had always been a proponent of funding for microscopes. The school sanctioned Charles Achilles Spencer, America's premier microscope maker, in 1856. William Benjamin Carpenter, a British zoologist and physician who wrote the first significant textbook on microscopes, wrote that Charles Spencer's devices rivaled even the best in Europe.[123]The University of Michigan's Spencer microscope, now in the Smithsonian's National Museum of American History, cost the school $469, the equivalent of $17,017 in 2024 dollars. The exorbitant price the school was willing to pay shows its understanding of the importance of technology. As shown earlier, Silas Douglas provided students with his $170 Grunos Microscope, which cost Douglas the equivalent of $5,191 in 2024 dollars. Modern technology is central to modern scientific education.

Surgery

Applied scientific coursework brought students into contact with surgery. Surgery was a standard course taught at most medical colleges, the extent of which varied. The University of Michigan's surgery course taught by Dr. Moses Gunn benefited from the timing of the school's opening. The university opened medical school just four years after the discovery of anesthesia. Dr. Gunn held a full-time surgical practice and was a pioneering surgeon when the practice was still unexplored. In 1846, after the discovery of general anesthesia, the world of surgery was opened up to discovery. Before the 1846 discovery, surgery was somewhat limited in scope and rarely prescribed. The procedures were too dangerous in two ways: patients experienced unbelievable pain and risked exposure to potentially lethal or maiming infections like gangrene, erysipelas, pyemia, and other

[123] William Benjamin Carpenter, *The Microscope and Its Revelations* (Philadelphia: Blanchard and Lea, 1855), 704

infections.[124]Surgery was a last resort for most patients who wanted to avoid the excruciating procedures while fully conscious. There was little desire to be cut open under the watchful eyes of a medical school class as several aids held a patient down and mercilessly cut into them. This problem was solved when the medical school opened in Ann Arbor.

Like many of the professors at Michigan's medical school, the students strongly admired Professor Gunn. Gunn commuted from Detroit twice weekly to lecture and hold his surgery clinics.[125]The professor was a tall and commanding figure. William Breakey remembered Gunn's presence in the room as confident while impressing students with his ability and personality.[126]Henry Hurd remembered Gunn had wasted no time at the beginning of his lectures. While the students chattered loudly, the professor would talk over them as soon as he stepped into the classroom. Gunn had attended Geneva Medical College while a recently graduated Corydon Ford worked as an Anatomy Demonstrator at the school. The pair dreamed of teaching medical school and fixing the broken medical education system and spent hours talking about their ideal future medical college.[127] This drive carried Gunn forward to teach medical students while voraciously honing his craft of surgery.

Professor Gunn's reputation as a prominent surgeon made him popular among medical school staff. He was a pioneer in the study of dislocations, using cadavers to solve the issue of hip dislocations correctly. Gunn was the first to understand that the tendons block easy

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[124] Erysipelas, a cutaneous infection caused by Streptococcus pyogenes, was a common medical condition during the Civil War. Pyemia, on the other hand, was a type of septic infection usually spread by staphylococcus bacteria, resulting in pus formation. Staphylococcus and Streptococcus are bacterial pathogens that can cause infection and sepsis. Diseases like pyemia are known to spread through the action of these pus-forming bacteria, which poison the blood. Pyemia results in a metastatic infection that can cause damage to other organs in the body. During the Civil War, pus was perceived as a positive sign of healing. However, modern research suggests this view is flawed, as pus is typically absent from lethal necrotizing soft tissue infections. Despite this, early surgeons favored the formation of pus without realizing that this could lead to the spreading of horrific infections.

[125] Breakey, "Department of Medicine," 271.

[126] Ibid, 271.

[127] Jane Augusta Gunn, *Memorial Sketches of Doctor Moses Gunn* (Chicago: W.T. Keener, 1889), 16.

relocation and that chronic dislocations were a genetic issue. In an 1859 publication titled *Luxations of the Hip and Shoulder Joints, and the Agents which Oppose their Reduction,* he published findings that helped establish his name in the mainstream.[128]His career as an educator helped establish his reputation as a surgical expert. His work in surgery and university took place during a time of unexplored frontiers in surgery. With the discovery of anesthesia, there was room for more adventurous and experimental surgeries.[129]His constant work in the school clinic and private surgical practice allowed him to publish his cases consistently. He was even consulted in cases by experienced physicians, like the famous Uriah Upjohn, whose brother was a regent at the University of Michigan. Upjohn referred to Gunn, a patient with a malformed inferior maxilla, on March 19, 1853. Gunn resected the abnormal growth and carefully using predetermined angles and a small saw to fix the malformation. The patient survived and later lived with a normal jawline.[130]

Gunn operated out of the University of Michigan Surgical Amphitheater and Clinic, publishing his numerous surgeries. Through these publications, it is possible to understand the surgical training these students received. On April 13, 1851, a twenty-five-year-old patient presented with another deformed maxilla. Students observed as Gunn applied the proper dose of chloroform for anesthesia and gently cut the mass out of the patient's face. Gunn ligated the facial artery, and a flap of skin closed after some adjusting, and he healed

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[128] Moses Gunn, *Luxation of the Hip and Shoulder Joints, and the Agents which Oppose their Reduction* (Detroit: Rains, French & Way, 1859), 1-5.

[129] The advent of anesthesia proved to be a crucial milestone in the field of surgery, as it enabled surgeons to perform more intricate and time-consuming procedures with greater ease and accuracy. Before its discovery in 1846, the foremost surgeons were distinguished by their speed and proficiency, often opting for quick and relatively routine procedures such as the extraction of bladder stones, the drainage of infected abscesses, and the occasional amputation. However, the advent of anesthesia transformed the surgical landscape, unlocking new possibilities for medical practitioners to deliver superior patient outcomes and expand the scope of their craft.

[130] Moses Gunn, "Prof. Gunn: Selection from Surgical Notes," *The Medical Independent* 3, no. 2 (April 1857), 67.

aside from a slight contraction of the cheek muscle.[131] During the medical school's inaugural term, a twenty-year-old Irishman entered the clinic with a decaying portion of his humerus. The ball of the arm had suffered from necrosis, and anchylosis nearly fused the joint. Students observed as their professor carefully dissected the mass and adhesions found in the joint and sutured the wound back up. The patient was kept in the clinic to recover as he developed a case of erysipelas that Gunn treated with quinine and fed the patient a diet of broth and hot wine. Two weeks later, the patient left the clinic, cured.[132]

Students learned by watching Gunn that surgery should be the last resort for most medical cases. Samuel Parker Cole's notebook lists his days shadowing Gunn at the school's surgical clinic during the 1852-53 session. Cole observed that his professor was not quick to operate but instead drew on past surgical experience and studies to guide his decisions. Cole worked alongside Gunn on November 14, 1852, as a man suffered from necrosis in his left leg following a break the previous summer. There was an accessible hole where bones from a compound fracture had pushed through the skin. Cole helped Gunn probe the area, but the inflammation was too significant despite discovering necrotic bone tissue. The operator sent the patient home to recover further, and once the inflammation was down, they decided to operate.[133]On January 6, 1853, Cole worked with Gunn to observe a male patient suffering from a perceived tumor on the neck, and while Gunn could have operated to remove it, he refrained.[134] The patient was prescribed iodine and "iodide of potassa" and sent home, where

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[131] Gunn, "Surgical Notes," 68.

[132] Ibid, 69.

[133] Samuel Parker Cole, "Samuel Parker Cole Notebook, 1852-53, entry from November 14, 1852,"[manuscript], Samuel Parker Cole Papers, Bentley Historical Library, University of Michigan-Ann Arbor.

[134] Samuel Cole, "Samuel Parker Cole Notebook, 1852-53, entry from January 6, 1853."

he recovered.[135]The next day, Cole observed a patient in the clinic with a significant spot in his eye. Gunn explained to Cole that he could not remove the spot because it was attached to the eye's capillaries and veins, and the delicate operation to clip it out could be damaging. He sent the patient away with orders for a proper diet, exercise, and lower stress in the hopes that the inflammation would recede.[136]Several months later, the patient relayed to the team that the spot had gone. Gunn taught his students to operate only when necessary. The students, however, learned that expediency when surgery was necessary was vital to a good outcome. Gunn told students, "An operation should be resorted to early if at all."[137]

The medical school exposed medical students at Michigan to various surgeries and procedures during their years in the department. Gunn was typical of the nineteenth-century surgical specialist in that he operated on all areas of the body. Specialization in surgery or medical areas did not become commonplace until after the Civil War. Students saw and aided in surgeries on any part needing an operation. Samuel Parker Cole helped Gunn remove a patient's eye in enucleation. The patient presented with a fungal eye infection on January 7, 1853. Modern drugs make ocular fungal infections more treatable, but in 1853, Gunn told his students of the risks surrounding them. There were no emergency treatments, and the spreading infection would cause swelling enough to push the eye from its socket. Cole was able to help Gunn remove the eye using various instruments of different sizes.[138]Gunn exposed the students to several eye surgical procedures, including removing cataracts and other ophthalmic surgeries.

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[135] The notes are not detailed extensively, but a "neck" tumor was likely an enlarged thyroid. During cases of hyperthyroidism, the thyroid becomes very enlarged. What Cole described as the "iodide of potassa" is potassium iodide. Potassium iodide is still a prescribed treatment for hyperthyroidism.

[136] Cole, "Samuel Parker Cole Notebook, 1852-53, entry from January 7, 1853."

[137] Benjamin Thompson, "Benjamin Thompson Notebook, 1865," [Manuscript] Benjamin Thompson Papers, 1865-1886, Bentley Historical Library, University of Michigan-Ann Arbor, 217.

[138] Cole, "Samuel Parker Cole Notebook, entry January 7, 1853."

Students learned cutting-edge techniques from Professor Gunn. Gunn covered early forms of plastic surgery in his courses. Students learned to correct cleft palates.[139] They helped Gunn as he rebuilt the nose of a man who suffered catastrophic damage from a scrofula infection.[140]Surgeries in the school clinic included amputation, resection, excision, dissection, and other procedures. In the clinic, students and professors regularly removed tumors, and sometimes, the curious outcomes of surgeries made their way into print, as reported in the 1851 New York Journal of Medicine. While operating on a facial tumor in the school clinic, Gunn and his students cut the tumor out from a branch of facial veins. Gunn severed the veins in the process, and the patient collapsed from syncope. Gunn conversed with his students and concluded the cause of dizziness to be air blowing into the exposed facial vein.[141]

General Medical Education:

Abram Sager was one of the original cast of professors. 1850 graduate Robert Kedzie remembered him as "exact and methodical, most scholarly, but loaded down with so much learning as to make him hesitate."[142]Sager was one of the original Michigan scientists who came to the state in 1837 to help Douglass Houghton research the young state. Sager collected thousands of botanical and zoological specimens that found their way to the new state university in Ann Arbor. In addition to his natural science interests, Sager was a deep researcher and had an overwhelming interest in medical science. He was known for his

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[139] Benjamin Thompson, “Benjamin Thompson Notebook, 1865,” Benjamin Thompson Papers, Bentley Historical Library, University of Michigan-Ann Arbor.

[140] The patient had suffered from tonsillitis, but the infecting agent, likely a form of bacteria, spread it to the mucus membranes. He suffered horrific damage, including the destruction of his nasal cartilage. The students helped Gunn remove the last pieces of dead tissue. They followed with the reconstruction of the patient's nose. Cole, "Samuel Parker Cole Notebook, undated entry,"

[141] Moses Gunn, “Syncope from Entrance of Air Into the Facial Vein,” *New York Journal of Medicine* 8, no. 3 (May 1852), 356-357.

[142] Robert Kedzie to William F. Breakey, February 19, 1901, Michigan Agricultural College, in “The Department of Medicine and Surgery in the Fifties,” in *The Michigan Alumnus* VII, no. 63 (April 1901), 275.

detailed medical drawings exhibiting craniology, neurology, and embryology.[143] From 1842 to 1850, Sager taught Zoology at the university before taking on the subject of obstetrics, diseases of women, and diseases of children once the medical school opened. The well-rounded Professor Sager represented the integration of multiple sciences that the new Michigan Medical School sought.

Sager headed one of the central primary care departments of the University of Michigan Medical School in the 1850s and 1860s. Dr. Alonzo Palmer took charge of the school's Practice and Theories of Medicine in 1860, but from 1852 to 1860, he taught the Materia Medica course. When Palmer took over the Theory and Practice of Medicine course in 1860, he took over what would later be known as Internal Medicine. Palmer taught the general connection between all university study areas and trained his students to work as general practitioners and medical scientists. The seasoned Samuel Denton taught Internal Medicine and Pathology from 1854 to his death in 1860, upon which Palmer took his place. Jonathan Adams Allen briefly taught Pathology for the first four years of the school's existence, while Denton taught physics. A scandal saw Allen ousted in 1854, and Dr. Denton occupied his position.

The primary care departments of the school, Practice, and Theory of Medicine (later known as Internal Medicine), Physiology, Pathology, Materia Medica, Obstetrics, and the Diseases of both Women and Children were standard fare at most American Medical Schools.[144] While the University of Michigan advanced in applied science classes and worked to integrate clinical study into the curriculum, many primary care lessons were questionable.

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[143] Breakey, "Department of Medicine in the Fifties," 276.

[144] I will continuously refer to The Theory and Practice of Medicine as Internal Medicine for better understanding. Some schools, and briefly at Michigan, also referred to this course as "Institutes of Medicine." These courses covered the basics of practicing medicine. They gave students an overview of disease and other ailments. These courses involved the standard treatments they should prescribe in conjunction with the courses on Materia Medica. Internal Medicine is still a central tenet of modern medicine and is referred to as a primary care specialty. Primary care refers to daily medical care that patients receive for common issues.

Professors at Michigan taught courses before the acceptance of Germ Theory, and many of the harmful effects of commonly prescribed drugs were either dismissed or ignored. There is difficulty in attributing value to courses that taught students to prescribe purgatives, emetics, and poisonous drugs like mercury, lead, and substantial doses of opiates. Despite the modern understanding of the harm done by heroic medical methods, there is still value in primary care courses if examined from a different perspective.

The University of Michigan graduates all had completed three years of an apprenticeship before or while attending the school. The preceptors who guided the medical student through his three years were proponents of heroic methods that were mainstream in the years before the Civil War. The aftermath of rationalist medical theories and the widespread teaching of men like William Cullen and Benjamin Rush left their mark well into the nineteenth century. Sweating, blistering, vomiting, laxatives, purging, bleeding, salivating, and many other dangerous side effects of the medicine were seen as proof that the drugs were working. As the university professors subscribed to much of this thinking, the medical students saw these treatments under the watchful preceptor's eye in a clinical setting.

Heroic medicine was still the accepted method of treatment heading into the Civil War. Doctors hauled around medical kits filled with bottles of poison to give patients at the first sign of illness. Doctors still mainly subscribed to the Miasmatic Theory of medicine. Civil War surgeons would later ascribe camp diseases to the putrid air hanging over swamps or the poorly ventilated field hospitals. While modern Germ Theory has put the Miasmatic Theory to rest, there were some desirable effects surrounding this thinking. During the Civil War, hygiene became a focal point in army camps and hospitals. Hospital physicians no longer kept patients in old, dirty, cramped buildings requisitioned for army use. Massive hospital cities were established in the latter half of the war to keep patients separated. Doctors slowly caught on to the invisible poisons that passed from patient to patient and recognized

that cleanliness was the path to decreased infection and disease. Surgeon General William Hammond published a manual on hygiene, directing better drainage and latrine systems for encampments, pushing cleanliness above all else. Hospital studies showed that boiling medical instruments and using clean, unused bandages prevented infection.

The shift from Miasmatic Theory and Heroic Methods to a more modern system of medicine occurred during the Civil War and the years immediately after. The doctors who installed this new method of therapy, which would focus on clinical study, hospital medicine, Germ Theory, antiseptics, and other modern amenities, came from doctors trained in the old methods. No doctor who was a guiding force in leading medicine from one era to another was an expert in anything other than the old ways of treatment. All medical schools and medical textbooks taught the old scientific theories in the years before and during the Civil War. Students were taught to prescribe medicines that were more likely to kill a patient than cure them. Regardless of their educational background, the doctors who created and shifted to the modern era of medicine did the impossible; they discarded a considerable part of medicine that was once scientific fact.

The changes during and after the Civil War forced doctors to approach medicine differently. Doctors became more scientific in their approach. In this process, they developed a hypothesis and viewed the data to prove or disprove their perceived outcome. During the war, surgeons were entitled to scientific study on many patients. Medical beliefs and treatments changed drastically during the conflict. Doctors started questioning the cause of disease spread and conducted experiments to curb the rise of sickness and other diseases. With gangrene being a common army hospital disease, doctors started to hypothesize and experiment with potential treatments. Early perceived antiseptics began to see use to combat the spread of gangrene using chemicals like bromine, nitric acid, iodine, chlorine, and other

therapies.[145]This even became the case for Michigan graduates like Edmund Andrews with his research on the spread of gangrene and potential deterrents to spread.[146]Andrews also performed similar experiments to fight the spread of erysipelas, which was expected after surgical treatment. He used an iron tincture, which was used on every surgical patient, and he had "observed the powerful effect of this remedy in cutting short the disease after it has commenced."[147]These are examples of a change in the scientific process that no longer allowed for blind acceptance of previous rules or theories.

Reading through the notebooks of University of Michigan students before the Civil War makes it easy to consider their lessons' downfalls. Professors taught many tenets of practice that would be obsolete by the turn of the century. Even as late as 1865, Doctor Alonzo Palmer was a strong proponent of powerful emetics for many diseases. For chronic gastritis, his main recommendation was treatment with calomel given either orally or through enema form.[148]Palmer recommended rest, warm drinks, and strong pain relievers for dysentery. For persistent cases, Dr. Palmer told students to prescribe Dover's Powder and Opium.[149] Dover's Powder was a traditional treatment dating back to the late 1700s, and the drug contained ipecacuanha, a powerful purgative that promoted vomiting, opium, and potassium sulfate.[150] Jonathan Adams Allen, who preceded Alonzo Palmer as the Materia Medical professor, gave students his favorite emetic recipe and proposed they make heavy

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[145] H.S. Hewitt, "Report on the Military Medicine, surgery, and General Conduct of the Medical Department of the Army of the Ohio from May 1, 1864, to September 8, 1864," in *The Medical and Surgical History of the War of the Rebellion, Vol I,* Pt. I, 313.

[146] Edmund Andrews, "Hospital Gangrene," *The Chicago Medical Examiner* II, no. 10 (October 1861), 513-516.

[147] Edmund Andrews, "Erysipelas," *The Chicago Medical Examiner* II, no. 10 (October 1861), 516-520.

[148] Benjamin Thompson, "Benjamin Thompson Notebook, 1865," [Manuscript] Benjamin Thompson Papers, Bentley Historical Library, University of Michigan-Ann Arbor, 18.

[149] Thompson, "Thompson Notebook, 1865," 37.

[150] Dover's Powder usually had the dual action of forcing a purge through vomiting and sweating.

use of it: 1 grain of Tartar Emetic; ½ Dram of Ipecac; 1 Dram Tincture of Squills; and 4 oz of warm water.[151]While the proposed treatments seem horrifying to the average modern-day citizen, these were commonly prescribed treatments based on scientific beliefs held by most of the medical community.

The value in the pre-Civil War University of Michigan student notebooks is not in the prescribed treatments or beliefs surrounding disease causation. The value in studying the lessons from courses like Internal Medicine, Obstetrics, Materia Medica, Theory and Practice of Medicine, and Pharmacology comes from understanding the overlooked portions of these early courses. Medical students at Michigan were taught to approach medicine as a whole, consisting of pathology, symptoms, physiological changes, chemical changes, chemistry-based treatments, anatomy, and other areas of science. All of these areas and their connection together were essential parts of advancing medical science. The study of chemistry, physiology, pathology, and other areas was central to conducting scientific experiments or conceiving a hypothesis and determining a conclusion. At the University of Michigan, there was value in the traditional primary care courses medical students took. That value was outside of the blatant lessons learned.

Alonzo Palmer's Courses of Internal Medicine and Materia Medica

Outside of the three major applied sciences of chemistry, anatomy, and surgery, students took primary care courses, which are considered part of clinical medicine. The primary care courses at medical schools were usually the same throughout the United States before the Civil War. Students took a class that covered the most commonly confronted diseases. This course, traditionally called the Institutes of Medicine or the Practice and Theory of Medicine, gave students a brief overview of known diseases and the tools for

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[151] Tartar Emetic is a potent and toxic compound known as antimony potassium tartrate. The compound is used to force vomiting, which, in conjunction with Ipecac, would make one violently ill. Daniel Hall, "Daniel Hall Notebook, 1852," [Manuscript] Hall Family Papers, Bentley Historical Library, University of Michigan-Ann Arbor, 186.

diagnosing them. The short time spent in medical school forced professors to rush through common diseases with little more than symptom overviews and possible treatment options. One example shows Samuel Dickson of Jefferson Medical College covering Typhoid Fever in the winter of 1863. Students of Dickson's were taught to look for "chilliness," "nausea with a swollen tongue," and "skin of the head that feels tight."[152]Dickson's lectures typically focused on possible symptoms of a disease with a brief list of possible treatments, which often included cathartics and emetics.[153]Professors like Dickson had little time to work on the science behind most of these ailments, and he only periodically explained the possible physiological changes occurring within a disease.

All American medical schools had students take courses in obstetrics and children's diseases. The name of the class varied among schools, with some referring to the course as Obstetrics and the Diseases of Women, which was then taught in conjunction with diseases of children. Obstetrics had practical applications for nineteenth-century doctors, who would likely perform several births in their medical careers as local physicians overseeing the health of pregnant women. Medical students before the Civil War rarely received first-hand experience in the procedures described by their obstetrics professors. Nineteenth-century women rarely felt it appropriate to subject themselves to a room full of young men for observation.[154]Few medical colleges could access hospital clinics offering students practical experience in this area. Instead, students were instructed in obstetrics using plaster models or other forms of representation.

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[152] Ephraim.A. Santee, “E.A. Santee Lecture Notes from Jefferson Medical College, 1863-1864,” Historical Medical Library, The College of Physicians of Philadelphia, 19.

[153] Santee, “Santee Lecture Notes,” 60.

[154] William Rothstein, *American Medical Schools and the Practice of Medicine: A History* (New York: Oxford University Press, 1987), 35.

All medical students were instructed in Materia Medica, a subject akin to pharmacology. This subject differed from pharmacology because it covered most therapeutics and focused on all known or possible treatments. In Materia Medica, coursework bordered scientific study and practical clinical medicine. By the time the University of Michigan opened its medical school, most students would have been familiarized with The Dispensatory of the United States of America, which carried instruction in known chemicals, plants, herbs, and other substances possible for prescription.[155] Medical students were all subject to an apprenticeship under the guidance of a practicing physician who made ample use of the possible substances for prescription. The coursework at medical colleges in Materia Medica served as additional instruction in possible therapeutic options, helping students narrow down possible treatments for specific illnesses or injuries.

Internal Medicine and Materia Medica would undergo the most remarkable change during and after the Civil War among the typically provided medical school courses. The believed causes of many diseases would change as doctors became more scientifically inclined. At the University of Michigan, diseases like dysentery went from being taught as a miasmatic disease in the 1850s to a zymotic disease by 1866.[156]Medical schools would gradually move away from the teaching of heroic methods, including the prescription of emetics, purgatives, and other harmful treatments.[157]By the start of the Civil War, medical schools were the center of the movement, opposing heroic medical treatment methods.[158] Medical schools then served as drivers of change, often questioning the scientific consensus that is consistently part of the medical field. The constant change in information and

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[155] George Wood, Franklin Bache, *The Dispensatory of the United State of America* (Philadelphia: Grigg & Elliot, 1839), v-x.

[156] Zymotic Diseases was another term for contagious diseases. These diseases were no longer believed to have been spread from unhygienic conditions or Thompson, "Benjamin Thompson Notebook, 1865-1866," 35.

[157] Kenneth Ludmerer, *Time to Heal: American Medical Education from the Turn of the Century to the Era of Managed Care* (Oxford: Oxford University Press, 1999), 5.

[158] Rothstein, *American Medical Schools,* 62-63.

scientific beliefs meant that the two central courses in any medical school constantly changed. The value in this area came from the approach to science at the University of Michigan.

Samuel Denton and Alonzo Palmer taught internal medicine coursework in Michigan before the Civil War. Samuel Denton was educated at Castleton Medical College before starting a medical career that eventually brought him to Michigan in 1837. Before taking on the role of professor at the new medical school, he served as a senator in the Michigan legislature from 1845 to 1848. While students remember his courses, his successor, Alonzo Palmer, is generally remembered for his primary care courses. Palmer integrated his approach to teaching, combining his knowledge of therapeutics with his understanding of the human body as a whole. Palmer was an enjoyable lecturer who kept up with current scientific discoveries and literature. He was a proponent of auscultation, palpation, and percussion.[159]By 1860, he was one of the first doctors in Michigan to start using thermometers in diagnosis, teaching the practice to his students.[160]

Palmer's teaching shows an integrative approach to studying disease and medicine. His lectures presented the pathology of a disease, being the cause and effect of the ailment. This "cause and nature of disease" was included with lessons surrounding the physiological changes occurring, which he considered the "Pathological Anatomy" of a disease.[161] Palmer recognized the importance of science in studying internal medicine and therapeutics. He impressed upon his students the importance of the dissection and post-mortem examination as a primary mover in advancing scientific knowledge. The professor taught his students that medical science revolved around empiricism and rationalism, requiring empirical observation

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[159] This is the practice of listening to the lungs, heart, and other organs, which is now regularly done using a stethoscope.

[160] Horace Davenport, *Not Just Any Medical School: The Science, Practice, and Teaching of Medicine at the University of Michigan, 1850-1941* (Ann Arbor: the University of Michigan Press, 1999), 11.

[161] John Alexander Campfield, "J.A. Campfield Student Notebook, 1860-61," [Manuscript] Bentley Historical Library, University of Michigan-Ann Arbor, 4.

while basing scientific questioning on rationalism.[162]According to Palmer, the rationalistic understanding of disease guided the decision to prescribe a particular remedy, while empirical observation confirmed or denied the physician's hypothesis. Students were taught that every aspect of the human body is subject to changing matter, whether chemical, physical, or vital properties. Through this widespread understanding, chemistry, and therapeutics were essential aspects of the study.[163]

Alonzo Palmer was a generalist in terms of scientific knowledge. This was the standard expectation for most medical school professors in the years leading up to the Civil War. Palmer first taught Materia Medica, beginning in 1854, after the dismissal of Jonathan Adams Allen. His knowledge of Materia Medica, pharmacology, and internal medicine guided his understanding of the mechanism of action for prescribed therapies. Palmer taught that knowing the chemical mechanism was important, but on equal footing with knowing the effect of any prescribed medicine. The scientific explanation for therapeutics' chemical and physical effects involves understanding chemistry and physics.[164] The principles of exosmosis and endosmosis were part of his pharmacology lectures.[165]He taught his students that all medications had a pharmacological effect that produced its outcome by making changes, whether those changes were physical or chemical.[166]The first two months of Palmers' 1860 lectures on Materia Medica were almost solely focused on pharmacology, physics, chemistry, and the reasons specific effects were achieved.

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[162] Campfield, "J.A.Campfield Notebook," 5.

[163] Ibid, 6.

[164] Ibid, 17.

[165] These two scientific principles involve understanding how osmosis works. Osmosis is the movement of a solvent from a low solute concentration to a higher solute concentration. This occurs across a permeable membrane. It is an integral part of understanding chemical action within the human body and shows that Palmer worked to integrate all areas of science into his lectures.

[166] Campfield, "Campfield Notebook," 30.

While Palmer used a scientific approach to teaching internal medicine and the biology surrounding therapeutics, he did promote many of the accepted therapies of the day. The most thorough record of what Palmer taught his students is included in the Benjamin Thompson notebooks, kept at the Bentley Historical Library. While most of Thompson's notes are from the years immediately following the Civil War, the therapies were likely the same for his early career at Michigan. Palmer taught Thompson's class that an imbalance of intestinal secretions caused gastritis and could best be treated with low doses of calomel.[167]For some cases of stubborn gastroenteritis, he told his students to prescribe turpentine enemas, something now known as a hazardous procedure.[168]For patients suffering from peritonitis but having a strong and regular pulse, Palmer recommended that his students bleed the patient.[169] He only recommended bleeding during the early stage of the disease, when the pain came on suddenly with a fever and chill.[170]His fellow professors at the university were condoning Palmer's recommended prescriptions. In 1866, the school's Materia Medica professor, Samuel Arnor, taught students that drugs like calomel were indicated in cases of "bilious

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[167] Calomel is a mineral made of mercury chloride. High doses of the drug led to vomiting, sweating, cramping, and diarrhea. Chronic use of calomel could lead to the loss of teeth and degeneration of facial bones. University of Michigan clinical students before the Civil War once examined a patient who was a daily user of calomel, and all her teeth had rotted out from purging the harsh drug. In the years before and immediately after the Civil War, Calomel was viewed as a sort of "miracle drug." Medical school lectures from the nineteenth century show that this compound was recommended for numerous ailments, including gastritis, syphilis, various cancers, gout, and other diseases. Calomel is now known to be highly toxic Thompson, "Benjamin Thompson Notebook, 1865-1866," 18.

[168] Thompson, "Benjamin Thompson Notebook, 1865-66," 32.

[169] Ibid, 48.

[170] Even by the 1830s, the practice of bloodletting was on the decline. Professors at the University of Michigan rarely recommended the procedure. In 1828, French doctor Pierre-Charles-Alexandre Louis published his findings that bloodletting made little difference in cases of inflammatory disease. His findings were published in the United States in 1836. This study was instrumental in driving the decline of the practice. Alfredo Morabia, "Pierre-Charles-Alexandre Louis and the Evaluation of Bloodletting," *Journal of the Royal Society of Medicine* 99, no. 3 (March 1999), 158-160.

fever," cholera, and constipation, writing that calomel is "indicated when we wish to unlock the bowels and increase the secretions of the liver."[171]

The medical students who graduated from the University of Michigan articulated the knowledge received in the Internal Medicine courses by writing a thesis to graduate. One of the best reflections of medical student knowledge comes from medical school theses. Second-year students were all required to write and defend a medical essay every two weeks during the school year. Students defended their essays every other Saturday during the school year. Graduate students defended a final thesis based on the teaching of and collaboration with their professors as a requirement to graduate. The thesis conveyed the instruction students received. The research and recollection used in the thesis required students to engage with the current science of their time. Michigan medical students had access to every scientific advancement in their chosen area. In conjunction with professor collaboration, they were given access to one of the most progressive medical libraries in the country. The professors avoided using the library endowment on textbooks and encyclopedias; instead, they used the money to subscribe to medical periodicals and purchase past issues.[172]

The graduate theses from Michigan students give a good insight into their science and medical training. The students wrote the thesis as they prepared for their final graduate examinations. Students who intended to graduate had completed the required three years of apprenticeship. For students attending from 1858 onward, they had completed rounds in clinical instruction at the St. Mary's Hospital in Detroit, along with school clinical cases. They had first-hand experience to help guide their writing and utilize their education. The medical school thesis is also a good visual of nineteenth-century medical science. Studying the University of Michigan theses from 1854-1865, we can directly witness the changes in

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[171] Thompson, "Benjamin Thompson Notebook, 1865-66,", 50.

[172] George Dock, "The Medical Library of the University of Michigan: Address at the Founder's Day Celebration, February 22, 1907," *The Michigan Alumnus* XIII, no. 122 (March 1907), 241-242.

medical science around the time of the Civil War.[173] The University of Michigan became immensely popular for aspiring medical students during the Civil War. Many matriculants had served in the Union Army Medical Department during the war and used their experience in new medical science to write their theses. Later, graduates also used cutting-edge medical studies from military research to inform the presentation of their final project.

Doctor Bolivar Barnum was one of the school's older medical students when he graduated in 1854. Born in 1822, the thirty-two-year-old graduated after presenting his thesis titled "Pathology of the Constituents of the Blood." While attending medical school, he completed his apprenticeship under Dr. J. Andrews in the small Southwestern Michigan town of Paw Paw.[174] Barnum saw the blood as incredible proof of God's existence, recounting Leviticus 17:11: "For the Life of the flesh is in the blood."[175]According to Barnum, blood is the most useful of the body's abundant cells. The cells carry the necessary nourishment for the other cell types throughout the body.[176] The medical student believed blood to be an essential part of overall pathology and physiology, which he saw as part of disease understanding. Barnum illustrated a healthy blood cell with the right balance of fibrin, albumin, electrolytes, and corpuscles.[177]He believed that a faulty lymphatic system and a failure to recycle the necessary blood components were disease markers.[178]Barnum learned

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[173] The parameters here represent the time when the medical school was officially established. Alonzo Palmer is a central player in the University of Michigan Medical School, but he did not start teaching there until 1854. These theses were written when the most famous group of professors was present: Abram Sager, Alonzo Palmer, Corydon Ford, Moses Gunn, Silas Douglas, and Samuel Arnor.

[174] University of Michigan, *Catalogue of the Officers and Students of the University of Michigan: 1853-54* (Ann Arbor: S.B. McCracken, Book and Job Printer, 1854), 13.

[175] Bolivar Barnum, "Pathology of the Constituents of the Blood," [Thesis] (Ann Arbor, University of Michigan-Ann Arbor, 1854), 1.

[176] Barnum, "Pathology of the Constituents of the Blood," 2.

[177] Barnum uses the term saline matter to describe electrolytes. Corpuscles is a commonly used nineteenth-century medical term for blood cells. Ibid, 3.

[178] Ibid, 4.

that the manufacture of blood cells was connected to the Osseous system, which in turn supplied the body's other systems.[179]He was highly critical of therapeutic bleeding as he recognized the detrimental effect this could have on the body, something he deemed to be contrary to nature.[180]

Barnum's 1854 thesis shows his whole-body approach to medicine. The blood underwent significant changes that were observable during the course of the disease. Blood observation using a microscope could understand pathological changes in it. According to Barnum, there were treatment options for some issues with the blood. For instance, he promoted injecting a saline solution into the blood during dehydration.[181] Blood was used to observe physiological changes during the disease. Modern medical standards undoubtedly see blood observation as a testament to overall health and is typically the first line of diagnosis. What can be discerned from Barnum's work is that the students were well aware of the importance of blood in all body areas, including oxygenation, nutrition, disease, and other regions. Seeing blood as a pathological signal for diseases in other body parts shows that he connected health to body chemistry. The thesis presented all areas of education he received at Michigan, including internal medicine, chemistry, materia medica, anatomy, pathology, and physiology.

Dr. Addison R. Stone graduated from Barnum's medical school class and began practicing medicine upon graduation. He saved the record of his first-ever patient, Mr. Elwell, who was treated by Dr. Stone for a broken Tibia and Femur on April 20, 1854.[182] At forty, he would join the 5th Michigan Cavalry, where he served with distinction. Addison Stone's thesis,

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[179] Red Blood Cell production takes place within the bone marrow.

[180] Ibid, 8.

[181] Ibid, 27-28.

[182] Addison Stone, “Medical Record of April 20, 1854,” [Manuscript], Stone-McCalmont Papers, 1832-1930, Michigan in the Civil War, Bentley Historical Library, University of Michigan-Ann Arbor.

"Erysipelas," covered a topic that was both covered in class and highly relevant to his Civil War service. Stone took pride in his thesis, keeping a copy with him for the rest of his life. Erysipelas, a form of cellulitis, is an infection caused by Streptococcus pyogenes. The disease infects the skin's upper dermis, reaching the lymphatic vessels. The bacteria enter the skin through a break caused by trauma, animal bites, abrasions, blisters, or other wounds. The disease exhibits a raised red plaque or rash, possibly accompanied by a fever, chills, and other flu-like symptoms. Patients can experience bouts of extreme pain. By modern standards, the disease is treatable but requires antibiotics, sometimes extreme measures like bedrest and I.V. Penicillin, which doctors lacked in the nineteenth century. Surgical methods spread through the infection along with wounds or general uncleanliness. Athlete's Foot creates a higher risk of Erysipelas infection, posing a high risk to soldiers marching over long distances with few changes of socks.[183]Erysipelas, which could be fatal, were incredibly common during the nineteenth century and the later Civil War, coming from military hospitals or poor living conditions.[184]

Dr. Stone first described the symptoms of erysipelas in his thesis, stating that the infection had a "livid and, in many instances, a yellow tint."[185]The symptoms of erysipelas were differentiated from other skin infections, including the sensation of the disease, and he noted that the disease can reach the lymphatic tissue. Stone remarked on the different phases of the disease, where it could eventually reach necrosis, covering the physiological and cellular changes that occurred. According to Stone, the disease could result in "constitutional" symptoms, meaning fever, chills, soreness in the joints, "frequent pulse," and other deeper

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[183] Dr. F.W. Roberts, a Michigan Dermatologist, states this would be a standard entryway for erysipelas. Civil War soldiers were generally unhygienic and could not change their socks or clean their dirty ones. Long marches in damp socks aggravated the potential of Athlete's Foot and Erysipelas infection.

[184] The Union Army recorded 6,507 cases of Erysipelas from June 1863 to June 1864, killing over 400 men.

[185] Addison R. Stone, “Erysipelas,” (M.D. Thesis: University of Michigan-Ann Arbor, 1854), 1c.

issues that can occur with harmful Erysipelas infections.[186]Many of Stone's perceived causes of erysipelas are pseudo-scientific nineteenth-century ideas. Risk factors for the disease he listed as "intemperate living, especially addiction to spiritous liquor," along with a "bilious or irritable temperament."[187] While he erroneously believed that personality and alcoholism consumption could lead to an infection, he also attributed local wounds, contusions, surgeries, and other irritations as an entryway for infection.

Stone named four types of Erysipelas: Phlegmonous, Odematous, Erratic, and Gangrenous. The Phlegmonous strain is now likely seen as cellulitis, a different form of infection that can be life-threatening. Odematous, according to Stone, had symptoms of common Erysipelous with red, raised skin and a shiny and stretched look on the surface. He attributed Erratic Erysipelas to the feeble and bedridden, which is likely a different form of infection altogether. According to Stone, unhygienic conditions are the most significant risk factors for the last form, Gangrenous.[188]In his thesis, he outlined the factors in diagnosing the disease. According to Stone, the physiological and anatomical changes that occurred during the spread of disease were integral for understanding the course of illness and what to expect next. Dr. Stone differentiated erysipelas from other skin diseases like Roseola.[189]

Dr. Stone's treatments for erysipelas should come as no surprise, considering his believed cause. As humoral imbalance was thought to be a central cause of the disease, he recommended fixing the inequality. According to Stone, cathartics, emetics, and other

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[186] Stone, “Erysipelas,”5-6.

[187] This assessment is based on the four humors. The four humors are blood, phlegm, black bile, and yellow bile. A bilious temperament led to a "choleric disposition." This disposition comes from the four temperaments: Choleric, Sanguine, Phlegmatic, and Melancholic. Choleric personalities were associated with an imbalance in favor of Yellow Bile. Hence someone being labeled a "bilious" personality.

[188] Stone, “Erysipelas,” 15.

[189] Ibid, 20.

harmful remedies could help the constitution.[190]A diaphoretic to induce sweating was another prescribed treatment. A “solution of acetate or citrate of ammonia, nitrate of potassa” made into an effervescing solution was the best drink to offer to create the desired sweating effect.[191]Bandaging was only beneficial in cases where the patients could stand it.

Conclusion

The University of Michigan was set apart from other schools in terms of the level of applied medical training that graduates received. While the class lists were similar to most American medical colleges of the era, Michigan students were trained in an elaborate chemical lab. They spent countless hours dissecting and learning with one of anatomy's outstanding teachers. The chemistry, anatomy, and surgery professors at the University of Michigan took a modern approach to building their curriculum and coursework. The students learned surgery from an experimental and experienced surgeon, Moses Gunn. Gunn's exploits were a rarity in what can be considered the beginning of modern American surgery.

The student experience at the University of Michigan Department of Medicine and Surgery conveys an arduous program that endowed them with many ideal skills. Michigan, like most schools, did not readily reject applicants. While acceptance rates were high, graduating was only the privilege of a few hardworking and intelligent students. The University of Michigan medical diploma is a good barometer for the graduating physician's intellect and capability. They had endured a medical school curriculum that challenged them to pursue scientific pursuits they likely had never participated in. Laboratory coursework was a large portion of their schooling, and they were the first American medical students to experience a sizeable laboratory course. They were of the few who were required to dissect

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[190] Ibid, 23.

[191] Ibid, 25.

cadavers in order to earn their degrees. They shadowed a surgeon who treated different cases and exposed them to several different fields of surgery.

Anatomical training was crucial for those serving in the Civil War Medical Departments. Anatomy was, and still is, the most crucial course any medical student takes. These doctors learned anatomy through hands-on experience at the University of Michigan. Dr. Corydon Ford integrated physiology into their lessons, giving these students an integrative look at medicine and understanding how medical systems relate. Physiology was essential to the scientific changes that occurred during the Civil War. Changes in the Union Army Medical Department required medical and scientific thinking, making physiology akin to understanding. The questioning and experimentation in the Union Army Medical Department required doctors to know and understand physiology to examine causation or challenge preconceived thoughts about diagnosis or disease. Michigan medical graduates were better suited to handle all of the scientific changes as they had received one of the first modern medical educations offered in the United States.

Doctors who graduated from the University of Michigan had learned essential skills like surgery and the application of integrative medicine. The surgical abilities learned from an innovative professor like Moses Gunn granted his students a chance to contribute to a budding field of medicine. The internal medicine work, taught mainly by Alonzo Palmer, gave students an intuitive distribution of all areas of science needed to understand medical science. While many heroic treatments were less than ideal, they were still taught to view any ailment in its parts, breaking it down into chemistry, physiology, pathology, cellular biology, and other crucial areas of science. The medical school graduates were suited to adapt to the coming medical changes that occurred during the Civil War and the years after.

Chapter Six: ： “Their Hearty Response to Call to the Colors”: University of Michigan Medical School Graduates and the Civil War

The Civil War catalyzed change in American society. It was the first total war, mobilizing the economies of both sides to contribute fully to the effort. The totality of the war filtered down to all areas of American life, forcing change. No area of American life was more affected than the medical field. With over 6.5 million recorded medical cases of disease and wounds treated by the Union Army during the war, the evolution of medicine came out of sheer necessity.[1]

The necessity for change also equated to an opportunity for medical practitioners. Before the Civil War, the medical field was highly individualistic and antiquated, mainly due to lacking opportunities to modernize medicine. Hospitals were sparse, and the lack of large-scale clinical facilities kept the United States far behind their European counterparts. Like the general medical field, medical schools were unregulated and primarily driven by money over scientific progress. Medical school graduates and apprenticeship-trained doctors entered their careers with a dearth of experience or training. The Civil War became an opportunity to alter the trajectory of medicine in the United States.

When the Civil War began in April 1861, the professionals of the Army Medical Department were ill-prepared for the eventual magnitude of the conflict. The pre-war medical department consisted of one thousand staff members, of whom only one hundred and thirteen served as assistant or full surgeons.[2]The Army Medical Department at the war's inception was driven by seniority over merit. The seniority system allowed for stagnation as the department's head, Thomas Lawson, was a relic of the War of 1812. Lawson ran a tight ship and was notoriously frugal in the typical way of military bureaucracy. The Army Medical Department was described as "criminal and scandalous" at the war's beginning. George Templeton Strong wrote that the department was "paralyzed by the routine habits acquired in

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[1] Alfred Bollet, *Civil War Medicine: Challenges and Triumphs* (Tuscon: Galen Press Ltd, 2002), 23.

[2] Robert Reilly, “Medical and Surgical Care During the American Civil War, 1861-1865,” *Baylor University Medical Center Proceedings* 29, no. 2 (December 2017), 139.

long dealing with an army of ten or fifteen thousand and utterly unequal to their present work."[3]The department that oversaw just sixteen thousand men was soon to be overwhelmed when President Abraham Lincoln called for seventy-five thousand volunteers in April 1861.[4]

Lincoln's call for volunteers was met by state regiments forming across the Union, each with one surgeon and assistant surgeon.[5]A conglomeration of doctors of varying quality and training was forced into a dire situation. Surgeon General Thomas Lawson died on May 15, 1861, thrusting unprepared Clement Finley into the leadership role. Finley was another bureaucrat whom George Strong referred to as "Utterly ossified and useless."[6]A new group of volunteer surgeons surrounded Finley and his professional army medical officers with no background in military medicine. The military had not adequately vetted volunteers, and many unqualified and inexperienced civilian doctors entered the ranks. In the chaotic rush to war, some "surgeons" were appointed on a political level with no medical experience.[7]The rise of medical factions in the United States led to homeopaths, Thomsonian doctors, and other pseudoscientific specialists trying to serve as army surgeons.[8]The chaotic nature of the early medical department was catastrophic.

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[3] George Templeton Strong was an American attorney who helped found the United States Sanitary Commission in June 1861. George Templeton Strong, *The Diary of George Templeton Strong: The Civil War, 1860-1865* (New York: The MacMillan Company, 1952), 181

[4] Abraham Lincoln, *Presidential Proclamation, April 15, 1861*.

[5] Mary Gillett, *The Army Medical Department, 1818-1865* (Washington D.C.:Center of Military History, 1987), 154.

[6] Finley graduated from the University of Pennsylvania School of Medicine in 1818 before joining the military. His work in the Army consisted of garrison duty as a surgeon and army examiner. While he was Lawson's successor based on seniority, there was little preparation for the management of the Army Medical Department, primarily upon the expansion of the ranks. Strong, *The Diary of George Templeton Strong,* 181.

[7] Bollett, *Civil War Medicine: Challenges and Triumphs,* 28.

[8] Ira Rutkow, *Bleeding Blue and Gray: Civil War Surgery and the Evolution of American Medicine* (Mechanicsburg: Stackpole Books, 2005), 40-43.

With a flood of new surgeons treating thousands of volunteer forces, the result was disastrous on many levels. The first major battle at Bull Run on July 21, 1861, exceeded all expectations for the Army and the medical department, leading to high casualties and taxation on the medical system. Finley's disorganized medical department forced regimental surgeons to operate their hospitals, where they only treated men of their unit. With the Army's ambulances under the command of the Quartermaster Corps, there was poor communication regarding field medical services.[9] When the Union ranks broke on July 21, the retreating forces used the ambulance wagons to move panicked soldiers, leaving the wounded to suffer in the sweltering heat. Hospitals were overwhelmed with wounded, and some were left empty. Wounded soldiers from both sides were left to suffer, begging any passing riders for help.[10]The wounded who were carried back to Washington found no hospitals set up to treat them. The medical department requisitioned any unsanitary civilian buildings or hospitals to house them.

The surgeons who treated the wounded at Bull Run were largely inexperienced. In the civilian careers of most surgeons, the actual practice of surgery was a rarity, and the war offered an opportunity to garner experience. An 1860 graduate of the University of Michigan Department of Medicine and Surgery, Henry F. Lyster, represents the inexperience of volunteer surgeons. The 2nd Michigan Surgeons, Lyster, was set up near Blackburn's Ford as the Battle of Bull Run raged nearby. He had his first opportunity to operate on a Union soldier with an arm wound. He performed his first amputation but was so fascinated by the dismembered arm that it nearly hypnotized him, examining the tendons and structures of the

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[9] The Quartermaster Department wagons doubled as supply wagons and ambulances. The military did not design the ambulances to transport the wounded comfortably, and often, the movement of supplies overrode the necessity of aiding the wounded.

[10] Horace Cunningham, *Field Medical Services at the Battles of Manassas (Bull Run)* (Athens: University of Georgia Press, 1968), 17.

extremity.[11] A Union Colonel shook him from his stupor and pointed to a Confederate Cavalry unit riding hard toward the hospital. He carried his patient away before the man woke up from surgery. The shock of performing his first major military surgery was an experience common throughout the Union Army ranks.

The scourge of disease in the Union ranks put extreme pressure on the Army Medical Department. Volunteer regiments from across the nation came together to combat the rebellion while simultaneously exposing men to numerous contagions. The congregation of units exposed new units to regional diseases with which they had never been infected. *The Medical and Surgical History of the War of the Rebellion* is America's first significant project to accumulate medical history and statistics. The official records show how quickly disease moved through the young Army. In May of 1861, the Army Medical Department statistics show 2,433 instances of Zymotic Disease grew rapidly to 10,847 June cases in the Atlantic Region.[12] Local diseases in the same region went from 4,414 in May to 14,979 in June 1861.[13] This coincided with a rise from 16,161 soldiers in the region to 48,360. The continuing rise in troop numbers correlated to the rise in disease.

Despite all the setbacks, the war was the catalyst for substantial change. The creation of the United States Sanitary Commission after the disastrous Bull Run campaign of 1861 drove the political response to the medical situation.[14] While the battle statistics were appalling, along with the stories of men dying slowly in the summer heat, the civilian

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[11] Henry Lyster, "Recollections of the Bull Run Campaign after Twenty-Seven Years," in *War Papers Read Before the Commandery of the State of Michigan of the Loyal Legion of the United States,* vol. 1 (Detroit: Winn & Hammond, 1893), 1-18.

[12] *The Medical and Surgical History of the War of the Rebellion, 1861-1865,* vol. 1 p. 1, ed. Joseph Barnes (Washington D.C.: Government Printing Office, 1870), 4.

[13] *The Medical and Surgical History of the War of the Rebellion,* vol. 1 p. 1, 5.

[14] *The Sanitary Commission of the United States Army: A Succinct Narrative of Its Works and Purposes* (New York: The United States Sanitary Commission, 1864), 10.

populace caught sight of the state of military encampments. Men away from home were living in squalid conditions. Encampments became the breeding ground for disease, as men lived in close quarters surrounded by filth. Poor water and food quality rampantly thinned the ranks. The political response by the newly formed Sanitary Commission produced the mentality necessary for change. The war offered ample learning opportunities and, for the first time in American history, a unified medical front pushing for a similar purpose. The controlling arm of military oversight replaced the American Medical Association, an instance where the proposed changes were not open for debate.

Political pressures and the rising number of dead and sick led to the overthrow of the Army Medical Department's old regime. Dr. William Hammond replaced the "ossified" Finley on April 25, 1862. Hammond was a scientific man as much as he was a physician. Hammond centered his life's work on medicine and research. Hammond had conducted numerous scientific studies and laboratory experiments and had written several renowned articles and essays on topics like physiology and neurology. His 1857 essay *Experimental Research Relative to the Nutritive Value and Physiological Effects of Albumen Starch and Gum, when Singly and Exclusively Used as a Food,* won him the American Medical Association Prize for the year.[15] He began his career as an Army Surgeon in 1849 after graduating from the New York College of Physicians and Surgeons. After he resigned from his army commission in 1860, he taught medical students at the University of Maryland before the Civil War, which inspired his re-entry into the service. Hammond's background made him ideally fit to understand the bureaucracy of army medicine while understanding the necessary changes to the Medical Department.

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[15] James Phalen, *Chiefs of the Medical Department of the United States Army, 1775-1940: Biographical Sketches.* (Washington D.C.: Army Medical Library, 1940), 42.

Hammond's appointment signaled a major shift in the Army Medical Department. He was named Surgeon General of the United States Army after the military recognized that merit should overshadow seniority. During the 37th Congress, Senator William Fessenden of Maine adequately argued against seniority over merit for top medical positions.[16] This overlooked moment was instrumental in forever changing the direction of medicine for the Union Army and the United States. Senior army surgeons were no longer viewed as the utmost authority, even in military matters, allowing for the joining of ideas from two different worlds of medicine.

William Hammond's rise to leadership led to significant scientific changes in the Army Medical Department and administrative procedures. The Union ranks were sifted and purged of any unqualified surgeons. Near the end of 1861, the Medical Department recognized the need to clean out the ranks. Hammond oversaw the establishment of medical boards to clear the ranks of unworthy surgeons, and any doctor seeking a commission to the regular Army underwent a stringent written and oral examination. The army regulations and examining boards represented the first major push to set a quality standard for doctors in the United States.

Hammond's overall vision for the Army Medical Department was a scientific one. The new Surgeon General immediately went to work to improve the Union Army's medical system. The new Army Medical Department required doctors to submit clinical data for all cases, including case reports. The new reforms led to the creation of a new hospital system designed by Hammond utilizing public health measures. Hammond's later reforms made chemical laboratories a necessity in military hospitals. As a scientific physician, Hammond pressed the Army Medical Department to make science and medicine the standard for army doctors. Surgeons who were deemed inadequate were reported to the Surgeon General. The

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[16] *The Congressional Globe*, 995-96.

examining boards used a scientific standard for their medical appointments, and the medical department saw anyone who passed the necessary steps to retain or gain a surgeon position capable of understanding pathology and gathering clinical data.[17]

A Shift to Medical Science

Hammond's appointment as Surgeon General set off a cascade of events. On May 21, 1862, Surgeon General Hammond issued *Circular No. 2* as his first major announcement of his new position. The Circular issued an initial template for recording wounds, surgeries, and diseases. Near the bottom of his Circular, it states: "As it is proposed to establish in Washington, an *Army Medical Museum,* Medical officers are directed to diligently collect, and to forward to the office of the Surgeon General, all specimens of morbid anatomy, surgical or medical, which may be regarded as valuable."[18] Establishing the Army Medical Museum was the first significant step in the unified scientific direction of the medical department. All medical knowledge, through case studies, notes, and specimens, was accumulated in a centralized record center, making the Army Medical Museum the first large-scale repository for American clinical data. The massive effort was eventually organized and published in six volumes known as the *Medical and Surgical History of the War of the Rebellion.*

The goal was to minimize harm and death tolls while using science to understand the keys to solving complex medical issues. Sanitation efforts became a central focus in the scientific debate. Using the past as a reference, the medical department outlined the creation of massive hospital systems throughout the United States. The new hospitals were a response to the horrific conditions experienced in the first year of the war. As the war's quick end was

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[17] Shauna Devine, *Learning from the Wounded: The Civil War and the Rise of American Medical Science* (Chapel Hill: The University of North Carolina Press, 2014), 19.

[18] Surgeon General's Office, *Circular No. 2, May 21, 1864,* Washington D.C., National Library of Medicine Digital Collections, https://collections.nlm.nih.gov/bookviewer?PID=nlm:nlmuid-101534229-bk.

expected, there was little planning for the thousands of soldiers who needed hospital care during the war. In the Spring of 1862, George McClellan reorganized his Army for the Peninsula Campaign, and there was a move to prepare proper medical facilities. Hospital ships were readied and wounded filtered back over railways during the campaign, but the system failed when overeager officers sent the ships back without filling them.[19] The sick and wounded piled up as disease and constant fighting during McClellan's ambitious campaign stalled in July 1862. A field hospital was set up near Savage's Station on the Peninsula, where the two-story house quickly filled with wounded. The yard and outbuildings of the property were overwhelmed by wounded, and during the Union withdrawal, the medical department was forced to leave many behind.[20] Photographs of Union wounded laying on the dirt during a hot Virginia summer circulated nationwide.

Surgeons serving in the Western Theater around Shiloh had better success with open-air tent hospitals, which later became the model for Hammond's new hospital systems.[21]Over four hundred Union Army hospitals were constructed during the war using an open-air, well-ventilated, and sanitary-focused system.[22]The sizeable general hospital "cities" were built based on the scientific belief surrounding the Miasmatic Theory of Medicine. They were wooden, pavilion-style hospitals with dozens of wards adorning each general hospital.[23] The new army hospital system allowed for greater organization and record-keeping. While surgeons serving on the frontlines were still subjected to the chaos and heat of combat

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[19] Frank Freemon, *Gangrene and Glory: Medical Care During the American Civil War* (Urbana: University of Illinois Press, 2001), 70.

[20] Rutkow, *Bleeding Blue and Gray*, 95.

[21] Bollett, *Civil War Medicine*, 218.

[22] Ibid, 221.

[23] Surgeon General's Office, *The Medical and Surgical History of the War of the Rebellion,* vol. 1, pt. 3 (Washington: Government Printing Press, 1888), 908.

surgery, the general hospitals allowed for a controlled environment that gave way to clinical studies.

The hospital system changes coincided with the medical department's structure and duties. The Medical Department ousted the regimental hospital system in favor of a brigade-level organization.[24]When Dr. Jonathan Letterman was assigned to serve as Medical Director for the Army of the Potomac in May 1862, he began revamping the entire system. The Medical Department later raised the hospital unit to the divisional level, with smaller field hospitals serving closer to the front. He established a restructured ambulance system and outfitted each ambulance with a head surgeon to maintain quick treatment and removal to a field hospital. Wounded men were treated at a field hospital based on emergency measures and then sent up to a larger hospital for further treatment before moving on to a general hospital. The strict organization of the new hospital and ambulance system created more positions for surgeons, who worked as operators, wound dressers, scribes, pharmacists, and field surgeons.

While preserving life was the main goal of Hammond's department, the push for science was a close second. Every medical department, from field hospitals to general hospitals, was outfitted with medical textbooks, current medical periodicals, and reports from the Surgeon General's office. Hospitals were outfitted with scientific laboratories to conduct experiments to better understand pathological and physiological changes in medicine. Medical technology became a focus of the newly organized department as microscopes, thermometers, stethoscopes, and other modern amenities were supplied for the army medical staff. The Army Medical Museum took advantage of this new technology and even utilized microphotography to study cellular changes in pathology.

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[24] A Civil War brigade was an organized unit usually consisting of two to three regiments. Military doctrine dictated that a regiment number nearly one thousand men, but the constant depletion of ranks from battle, disease, and discharges usually left them well below that number. Brigade-sized medical departments were set to oversee over two to three thousand men.

Medical technology, large hospitals, and chemical laboratories all played a part in the study of anatomy, which was made more accessible with the large supply of bodies for dissection. While the medical department went to great lengths to use science to better the chances of survival, the inevitable downfall of warfare was the high mortality rates. The debate raged around the Miasmatic Theory, as some American doctors started accepting the idea of microscopic "poisons" or pathogens. However, without proper antibiotics or knowledge of Germ Theory, many soldiers died of post-surgical infections. Wounded soldiers often suffered for months in an army hospital before succumbing to their wounds, and their evolving status was recorded daily by hospital staff. Surgeons recorded the symptoms of living patients, and their deaths afforded the scientific opportunity. Men who died of wounds, surgical infections, or disease were then dissected and curiously examined for potential causes, pathologies, and physiological changes that occurred.

Surgeons throughout the Union Army began by keeping records of their post-mortem examinations and specimens in personal notebooks. As the war progressed, the Army Medical Department standardized the dissection process and utilized a pre-determined form that guided the surgeons through the necessary parts.[25] The newly-organized department distributed the duties among so many surgeons that they could carry out post-mortem examinations near the battlefield.[26]The autopsy became central to the clinical studies conducted during the Civil War. Using all the tools at the surgeon's disposal allowed them to study pathology at every level, including cellular and chemical.

The scientific changes during the Civil War were developed by doctors who carried over their private careers into their military endeavors. Doctors who joined the Union Army had come from an ununified medical system. While the medical community took steps to

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[25] Devine, *Learning from the Wounded,* 54.

[26] Ibid, 56.

better organize the medical field, it was not until the Civil War that things truly changed. Doctors of varying backgrounds in training and schooling were thrust into the chaotic shift of their professional field. Adapting to the new scientific changes took the best possible candidates. Surgeons were retained based on their abilities to perform their medical duties while using a scientific lens to contribute to the new efforts of the Army Medical Department. Doctors finally had a place to raise their professional standing as their contributions to the medical history of the Civil War put their names on scientific and medical advancement.

University of Michigan Medical School Graduates and Field Service During the Civil War:

The University of Michigan Department of Medicine and Surgery supplied two hundred twenty-four medical school graduates to the Union Army Medical Department. They served across all campaigns during each year of the war and contributed greatly to the scientific and medical advancements of the Civil War. One hundred and fifteen Michigan graduates who served immediately moved on to service upon graduation. The Civil War served as the greatest possible training experience for recent graduates. Their medical education granted them a superior education as an avenue towards preparing them for the conflict.

Michigan medical school graduates were readily employed as combat surgeons during the Civil War, beginning with the treatment of Michigan's first casualty. Henry Lyster was one year removed from his medical school graduation from the Michigan Medical School when the Civil War broke out. Lyster was immediately appointed as Assistant Surgeon of the 2nd Michigan Infantry Regiment. The inexperienced Lyster followed the 2nd Michigan toward Manassas on July 21, 1861, when the first major action of the Civil War was imminent. On the night of July 18, 1861, Irvin McDowell, commander of the Union Army of Northeastern Virginia, sent Union forces in to probe and locate the Confederate left flank around Bull Run

Creek. Lyster's regiment was part of the force attempting to cross Bull Run Creek when they were met by fierce Confederate resistance.[27]

The Confederate pushed Union forces back, and Lyster was allowed to treat the first wounded Michigan man in the Civil War. Lyster rode behind the battle scene as Union and Confederate artillery exchanged a fierce fire duel. As Union forces fell back, Private Wollenweber of the 2nd Michigan's A Company caught a Confederate bullet on the side of his abdomen and collapsed. Lyster was so eager to treat his first wounded soldier that he rode through the retreating Union ranks and leaped off his saddle to be at Wollenweber's side. With no knowledge of germs or pathogens, Lyster probed the open wound with his little finger. Wollenweber yelled so fiercely that Lyster's horse reared its head in shock. With Lyster hanging onto his horse, the jerking reigns abruptly swayed the surgeon's probing finger. The private screamed loud enough to shock the retreating Union forces, who stopped to stare out of curiosity.[28]The screams and Confederate bullets continued to startle the horse, who pulled on the reins until Lyster finally found the bullet.[29] Lyster flagged down a passing wagon and loaded Wollenweber onto it. Wollenweber survived his first battle, and Lyster learned it was best to treat wounded back away from the zipping bullets.

Lyster had the opportunity to be the first Michigan surgeon to perform an amputation during the Civil War. On July 21, 1861, as the Battle of Bull Run commenced, Lyster set up a field hospital behind the main battle lines. Another Company A man from the 2nd Michigan was carried into his field hospital in a stupor. The man, Private Frederick Waustinberg, had

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[27] Bruce Catton, *The Coming Fury* (London: Phoenix Press, 1961), 447

[28] Frank Woodford, *Father Abraham's Children: Michigan Episodes in the Civil War* (Detroit: Wayne State University Press, 202.

[29] Henry Lyster, *Recollections of the Bull Run Campaign After Twenty-Seven Years: A Paper Read Before Michigan Commandery of the Military Order of the Loyal Legion of the United States, February 1, 1887* (Detroit: William S. Ostler, 1888),8.

his left arm shattered by a Confederate bullet.[30] Stretcher-bearers carried the wounded Waustinberg to the farmhouse, where two brigade medical departments set up their hospital. It was there that Lyster quickly removed the damaged arm. While he was mesmerized by the amputated limb, he focused in time to retreat from the hospital.[31]

The retreat to Washington was something Lyster could never forget. He said, "It is not often in a lifetime that one is permitted to see such a sight as I then witnessed."[32] The crowd "poured down towards Washington at a steady unhalting pace." He was surrounded by soldiers who had just left the heat of the battle. A wounded Zouave officer walked alongside him, and every few steps, he resolved to stop and fight but continued on. When the officer finally stood his ground and demanded the others join him to rally and fight, another cannon resounded behind them. The shattering sound of the gun immediately dissolved his plans, and he continued to run on with the others.

William Breakey, an 1859 graduate, was heavily involved in several major campaigns of the Civil War. Breakey first served with the 3rd Michigan Cavalry in the Western Theater at the Battle of Island No. 10 and the Siege of Corinth before he was transferred to the 16th Michigan Infantry. The 16th Michigan was one of Michigan's most storied Civil War regiments, which served with distinction at the Battle of Gettysburg in 1863. The Medical Department sent Breakey to the Rappahannock, where his regiment awaited him, and his first duty was to sort through the soldiers to determine their fitness for duty. Many volunteer soldiers had suffered from chronic diseases with no treatment or diagnosis, and doctors did not discover their ailments until they arrived to serve in the Union Army. Breakey's duty in

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[30] C.B. Burr, ed. *The Medical History of Michigan,* vol. 2, (Minneapolis: The Bruce Publishing Company 1930), 822.

[31] Lyster, *Recollections,* 12.

[32] Ibid, 13.

filtering through the ranks was a part of new protocols issued on August 3, 1861, by General George McClelland during his time as commander of the Army of the Potomac.[33]The new practice of examining volunteers gave doctors greater experience in diagnosing and understanding chronic diseases.

Breakey's time in the 16th Michigan involved him in heavy action almost immediately. Before General John Pope's disastrous 2nd Battle of Bull Run on August 28, 1862, the Division staff ordered Breakey to set up a field hospital in the area. After days of endless marching, the unit had few provisions, and before getting to work, he set off in search of food. He spotted a lonely cabin in a wooded valley with a smoking chimney. When the surgeon knocked on the door, the exasperated owners, a woman, and her son, feared he was there to clean out their food supply, but he offered them a silver half-dollar, and they accepted.[34] As the boy ran to catch a chicken to slaughter for him, the woman started making him a hoecake when a loud cannon sounded off from the Confederate lines. Breakey looked up at the ridge to see his fellow Union soldiers moving back in for cover, and from the other side of the house, he spotted a line of Confederate cavalrymen.

Breakey quickly grabbed the piping hot cake with his bare hands and a leaky cup full of butter as he ran out the back door. He constantly looked back over his shoulder as he held the cup over his food to catch the melting butter, and as the Confederate cavalry thundered by, he dove between stalks of corn in the family's garden.[35] As the cavalrymen passed, he darted for the woods and made it before the enemy captured him. He quickly hunkered down in a small ravine and ate his food before returning to the Union lines.

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[33] Adjutant General's Office, *General Orders No. 51*, August 3, 1861, Washington D.C.

[34] William Breakey, "Recollection and Incidents of Medical Military Service," in *War Papers Read Before the Michigan Commandery of the Military Order of the Loyal Legion of the United States,* vol. 2 (Detroit: James H. Stone, 1898), 126.

[35] Breakey, "Recollections," 127.

When he returned to the Union lines, Breakey was ordered to set up a field hospital in a cornfield near the fighting. The brigade's medical officers picked a shaded spot near a creek to place their hospital tent when the battle kicked off.[36] With every passing minute of gunfire, the wounded started to trickle in. As an ambulance full of wounded men pulled into the clearing, a Confederate cannonball bounced into the clearing. The ball ricocheted around the clearing before he rolled harmlessly away, and while the crew deliberated moving the hospital, they tried to continue their work. Two more cannonballs immediately rolled into their clearing, and Breakey sent the wounded off back from the firing. The hospital staff quickly packed up and rode off as the Union lines broke and a wall of retreating men swept over them.

Throughout the 2nd Battle of Bull Run, both sides of the fight suffered over twenty-one thousand casualties, with Union forces suffering over eight thousand wounded. For three days, Dr. Breakey worked tirelessly to treat the wounded the stretcher-bearers brought into his hospital. After the Union defeat, Breakey carried a flag of truce over the Confederate side, asking for permission to search for wounded men. With Confederate permission, the doctor and several other Medical Department men walked the battlefield. The battlefield was unlike anything he had ever seen in his life. Dead soldiers lay bloated in the summer heat, and many of the bodies were stripped of their clothing and equipment. Breakey followed a blood trail to a stand of trees where a man lay with his back against the tree. The man smiled, ecstatic to see Breakey exclaiming that it had been over twenty-four hours since he had any water.[37]

Breakey's time as a Civil War surgeon reflects the numerous duties the Medical Department entrusted their staff with. He had served as a field surgeon, with an ambulance crew, as a medical purveyor, and in a general hospital. Before the Battle of Chancellorsville,

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[36] Ibid, 128.

[37] Ibid, 133-134.

the men of the 20th Maine were infected with smallpox. The 16th Michigan loaned Dr. Breakey to the Maine regiment, which was short of medical staff. He spent the days treating the symptoms of the sick men, bringing them water, and changing their clothes. A fire constantly burned, and all the infected clothing, bedding, and anything else that Breakey could burn was thrown into the fire. While Breakey did not know about pathogens then, the medical community knew that smallpox could spread through contact. Smallpox had been one of the first-ever diseases used to study and experiment with vaccines, so doctors understood that contact with smallpox-exposed items could spread the disease.

Just in time for Gettysburg, Dr. Breakey returned to what he called "my first love, the 16th." The regiment marched twenty miles daily before reaching the fateful battlefield at Gettysburg. On July 2, 1863, the regiment was part of four regiments that defended the extreme left of the Union Army at Little Round Top. The regiment was exposed to repeated Confederate attacks, standing next to Brigade commander Colonel Strong Vincent as he was mortally wounded.[38]While the 16th held during a crucial action that kept the Confederates at bay, William Breakey set up a hospital near Rock Creek.

Dr. Breakey worked with his fellow medical staff to quickly lay out the field hospital. The group set up their operating tables, and Breakey immediately went to work, operating from the afternoon of July 2 and well past midnight into the early hours of July 3.[39] The number of wounded forced the surgeons to triage the most urgent cases to the front. Those with slighter wounds waited outside as Breakey and his team operated without rest. The staff moved the most urgent cases to the front, and a group of leading surgeons would confer to determine the necessity of emergency surgery. The staff asked each patient to consent to surgery before they were taken back to the operating table, with the only exception being

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[38] Kim Crawford, *16th Michigan Infantry* (Dayton: Morningside House, 2002), 368.

[39] Breakey, “Recollections,” 141.

unconscious soldiers.[40]Breakey performed numerous duties during his time at Gettysburg. He performed surgeries, recorded medical records, administered medications, and anesthetized patients using chloroform. Breakey amputated both legs from an Artillery Battery D member. He had to watch the man die slowly over the ensuing weeks. After the field hospitals were overwhelmed at Gettysburg, the wounded were moved to any available structures, often being forced to sleep on beds of straw strewn along the floor.[41]

As the field hospitals became untenable, the Medical Department constructed a much larger Division-sized hospital.[42] William Breakey was one of one hundred six surgeons selected by Army of the Potomac Medical Director Jonathan Letterman to stay behind and set up the new general hospital that would become known as Camp Letterman. The hospital was constructed beginning on July 6 to treat over twenty-thousand Union and Confederate wounded contained in field hospitals throughout Gettysburg.[43]The massive city of tents and other structures slowly sifted through the wounded until July 25, 1863, when only four thousand two hundred and sixteen of the wounded who were unfit to travel remained. Breakey continued his work at the sixty-acre hospital after most of the wounded had moved on. His daily rounds kept him busy treating thousands of patients, but this detail allowed him some free time, and his wife came and stayed with him at the hospital.[44]He continued his work until exhaustion forced his resignation in May of 1864. Breakey recollected his time served and took exception to the public conception that the medical men of the Civil War were worthy of major criticism. He stated that the medicine of the Civil War excelled in

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[40] Ibid, 143.

[41] Ibid, 147.

[42] Gregory Coco, *A Vast Sea of Misery: A History and Guide to the Union and Confederate Field Hospitals at Gettysburg, July 1- November 20, 1863* (El Dorado Hills: Savas Beatie, 1988), 174.

[43] Coco, *A Vast Sea of Misery*, 411.

[44] Breakey, "Recollections," 152.

efficiency over any other conflict in history. The mortality rates during the Civil War were far lower than those experienced in earlier conflicts, and Breakey believed it was due to the exceptional doctors who served.[45]

Michigan graduates who served in the Civil War were exposed to many dangers of battle and disease. In the everyday practice of army surgeons, the doctors treated a constant supply of sick men. Samuel Knox Crawford, an 1861 graduate and 50th Ohio Infantry surgeon, wrote to his friend James Guthrie, "The treatment of disease as it occurs in an army does not in any way differ from that prescribed by private practitioners." Rather, the difference was that it was treated "on a larger scale to meet the same end there."[46] Doctors like Crawford treated cases of dysentery, diphtheria, typhus, malaria, and typhoid fever.[47] Dr. James Guthrie, an 1862 graduate, recalled treating the sick in a General Hospital in the Western Theater as a surgeon in the 20th Ohio Infantry. The hospital was overwhelmed with over two thousand sick, and he worked himself to exhaustion with the hospital being short-staffed.[48] Even as the Army strenuously marched toward Atlanta, Guthrie was pulled from the ranks to treat sick patients along the way.[49]

The Michigan graduate surgeons were constantly exposed to the dangers of the battlefield. During the Vicksburg Campaign, between March 29 and July 4, 1863, James Guthrie worked constantly during the long siege. On May 1, 1863, Guthrie was sent with an ambulance team to clear up casualties from the Battle of Port Gibson as part of the larger

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[45] Ibid, 143.

[46] Samuel Knox Crawford to James Guthrie, August 21, 1861, Washington D.C.

[47] Ibid.

[48] James Guthrie, “Diary Entry, February 16, 1864,” James Guthrie Papers, Michigan in the Civil War, The Bentley Historical Library, University of Michigan-Ann Arbor.

[49] James Guthrie, “Diary Entry, February 12, 1865,” James Guthrie Papers, Michigan in the Civil War, The Bentley Historical Library, University of Michigan-Ann Arbor.

campaign. Instead of a horse, the Medical Department gave Guthrie a mule, and he wrote, "It was a pet and peaceable when let alone," but it was quick to startle in the field.[50] As Guthrie crossed the battlefield, he saw the wounded lying on the ground ahead. Before he reached the wounded, a bout of Confederate artillery shot overhead. The startled mule began bucking back and forth. After a final artillery fire, the mule threw Dr. Guthrie over the animal's head and onto the ground. He eventually reached the battlefield and saw the wounded and dead strewn about. His group went to work collecting the fifty-nine wounded left behind and sent them to the rear. Guthrie stayed behind to collect Confederate wounded. As he searched the battlefield for wounded, the click of a gun hammer stopped him in his tracks. He was looking down a barrel at a wounded Confederate lying in the grass. However, once Guthrie identified himself as a surgeon, the soldier begrudgingly lowered the gun as he let the stretcher-bearers take him away.[51]

Dr. Charles Mead was an 1857 Michigan Medical School graduate before serving in the 112th New York Infantry, which led to numerous dangerous encounters. The 112th New York saw limited action until General Ulysses S. Grant took over the Union Army in the East. The regiment was thrown into heavy fighting, seeing action in some of the bloodiest Civil War battles like The Battle of Cold Harbor, The Siege of Petersburg, the Battle of the Crater, and the Battle of Chaffin's Farm. When the 112th moved into action at Petersburg, the campaign evolved into a slog of trench warfare. The men of the 112th lived in trenches that resembled those of the later First World War. Men slept in muddy earthworks, and any attack they made sent them up against a heavily fortified enemy.

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[50] James Guthrie, “James Guthrie’s War,” [Unpublished Manuscript], James Guthrie Papers, Michigan in the Civil War, James Guthrie Papers, 1845-1907, Michigan in the Civil War, Bentley Historical Library, University of Michigan-Ann Arbor, 59.

[51] Guthrie, “James Guthrie’s War,” 60.

Dr. Mead followed the 112th into the trenches on June 22, 1864, and as the field surgeon for the regiment, he lived in the earthworks with the regiment. Mead and his steward had to sleep huddled together to stave off the cold and rain.[52]The pair shared a rifle pit that was so small any movement attracted enemy sharpshooters. If Mead adjusted his blanket in the early morning light, a wave of bullets hit the earthworks above, raining dirt down on him and his steward. One morning, a cup of water was shot from his hands before he could drink it.[53]His work in the trenches constantly put him under strain, and he was often forced to crawl between entrenchments to rescue wounded men.[54]

John Bascom Griswold, an 1863 graduate of the University of Michigan Department of Medicine and Surgery, was nearly killed during the Battle of Nashville from December 15 to 16, 1864. Griswold was first a bugler in the 2nd Michigan before attending the University of Michigan in 1863. After his graduation, he was commissioned as an Assistant Surgeon in the 4th Michigan Infantry Regiment but ultimately served with the 4th U.S. Light Artillery Battery.[55] During the Franklin-Nashville Campaign, he served in the field, gathering wounded and treating them close to the front. On December 16, 1864, as he rode near the fighting, a Confederate artillery piece sounded ahead. A twelve-pound cannonball flew ahead and hit the ground in front of him. Griswold held his breath as he watched the ball roll

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[52] Stewards had an array of medical duties. They generally ran hospitals from an administrative and logistical side. They could also be utilized in many other ways, including as surgical assistants, wound dressers, pharmacists, scribes, and others.

[53] Charles Mead to His Sister, June 1864, Petersburg, Virginia, Charles Mead Papers, Michigan in the Civil War, Bentley Historical Library, University of Michigan-Ann Arbor.

[54] Charles Mead to His Sister, July 6, 1864, In the Field Near Petersburg, Virginia, Charles Mead Papers, Michigan in the Civil War, Bentley Historical Library, University of Michigan-Ann Arbor.

[55]The original 4th Michigan Infantry Regiment was mustered out on June 30, 1864, after years of heavy fighting and reorganized. The reorganized 4th Michigan Infantry Regiment was mustered into service on October 14, 1864. Griswold's official papers from the United States Army state he was an Assistant Surgeon for the 4th Michigan Infantry, but he was attached to the 4th U.S. Light Artillery Battery.

between his horse's legs and pass beyond. He wrote his sister, "A little closer, and it would have dismembered me."[56]

University of Michigan graduate surgeons' battlefield and field hospital experiences appear to be similar in form. The surgeons were largely allowed to operate on patients from the front lines, which by late 1862 was a task reserved for the best surgeons in each regiment. Their work included operating, dressing wounds, running the ambulance teams, keeping medical records, administering anesthesia, working as a pharmacist, and numerous other tasks. The surgeons spent most of their time treating the sick and wounded from behind the front lines of battle. Many surgeons moved throughout different areas of Civil War medicine, working in field hospitals while also managing and practicing in the large general hospitals of the Civil War. The work done in general hospitals equated to much scientific research during the Civil War. While the work done on the battlefield was of the utmost importance, the surgeons' scientific work required a different form of aptitude, which was helped by their University of Michigan medical schooling.

University of Michigan Graduates and Their Utilization of Their Medical Education for the Changing Science During the Civil War:

Chemistry

Civil War medicine was a turning point in clinical medicine, bringing together the applied and analytical sciences, and Michigan medical school graduates quickly showed their value. Surgeon General William Hammond's push for the requisition of Clinical Data encouraged medical staff to accumulate information through chemical analysis. Surgeon Edmund Andrews, a Michigan graduate, used his analytical training to make a significant medical contribution before Hammond's directives were adopted. Andrews paused his

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[56] J.B. Griswold to Mrs. Hattie B. and Miss Hattie B. Griswold, December 28, 1864, Griswold Family Papers, 1837 to 1915, Bentley Historical Library, University of Michigan-Ann Arbor.

teaching career at Chicago's Rush Medical College to serve with the 1st Illinois Light Artillery in the first two years of the war. With a large group of wounded accumulated in dingy military hospitals of the Western Theater, he conducted research on Hospital Gangrene, one of the most destructive forces to ravage soldiers during the war. Andrews used chemistry to analyze the air quality of his hospital and found the air riddled with the "gaseous products of purification," ammonia, sulphurate hydrogen, and other poisonous particles.[57] Microscopic analysis showed that the desiccated dead skin cells from gangrenous wounds were circulating throughout the hospital.[58]

Soldiers wounded on the battlefield suffered immediate exposure to unknown pathogens. Despite the pondering of some physicians, acceptance of Germ theory was in the future. Surgeons used unsanitary instruments to remove shrapnel, bullets, tissue, and sometimes limbs. Surgeons rarely cleaned instruments with a whole load of patients waiting in triage suffering from traumatic and life-threatening wounds. Surviving wounds was hardly a relief as the post-surgical waiting game threatened a slow, agonizing death from infection. Infected patients filled The hospital wards of Edmund Andrews. The early years of the war left the Union Army lacking proper hospital facilities, and the acquisition of empty buildings or old hospitals sufficed as makeshift hospitals.[59] These hospitals lacked proper ventilation, toilets, and waste disposal. With virtually no understanding of the bacterial causation behind the infection, early hospitals commonly reused bandages, sponges, and bedding without first boiling and sterilizing these supplies. Hospitals often lacked beds, and the crowded spaces saw infected soldiers lying side-by-side in miserable conditions, dying a slow and painful death.

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[57] Edmund Andrews, “Hospital Gangrene,” *Chicago Medical Examiner* 2, no. 10 (October 1861), 513.

[58] Andrews, “Hospital Gangrene,” 514.

[59] Ira Rutkow, *Bleeding Blue and Gray: Civil War Surgery and the Evolution of American Medicine* (Mechanicsburg: Stackpole Books, 2005), 129-130.

The brilliant Edmund Andrews observed his patients in the cramped military hospital equipped with his experimental data. He discerned that either the chemical decomposition of dead matter was causing the infection to spread or a specific poison was being passed among the soldiers, able to spread rapidly among open wounds.[60]Andrews was a proponent of the standard nineteenth-century disease theory, which posited that unsanitary air, or miasma, caused most illnesses.[61] Andrews's conclusion that a culprit was being spread through patient contact was a breakthrough for 1861 science. He first recommended the construction of well-ventilated hospitals that cleared the wards of dead tissues and gases from infected wounds. Andrews ordered regular cleaning of his patient's wounds up to three times each day while the wounds were actively discharging pus. He avoided the use of poultices on wounds, the standard prescription in cases of gangrene.[62] Dr. Andrews prescribed cold, wet compresses for convalescing soldiers in his hospital. He ordered staff to refrain from reusing sponges for bathing soldiers. He required boiling all surgical instruments between use and applying nitric acid as an antiseptic. Andrews's 1861 study had merit as it attributed spreading gangrene to an outside force. He concluded that sterilized medical instruments, fresh dressings, and space between patients could avoid future infection. This conclusive study involved using analytical chemistry, microscopy, and toxicology.

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[60] Andrews, "Hospital Gangrene," 514.

[61] The Miasmatic Theory, a prominent disease causation hypothesis in the nineteenth century, posited that all illnesses originate within the body and that symptoms manifest in response to infected air. However, during the Civil War period, certain medical practitioners and researchers, notably Ignaz Semmelweis, a Hungarian physician, began to espouse the idea that diseases stem from external particles and that symptoms represent the body's defense mechanism against infection, aimed at eradicating the offending toxins. Semmelweis's seminal work, *Etiology, Concept, and Prophylaxis of Childbed Fever*, published in 1861, highlighted that postpartum infections in obstetrical wards were transmitted from doctors to their patients. After discovering that the medical staff could significantly reduce the incidence of disease by washing hands in a solution of chlorinated lime between patient interactions, Semmelweis's ideas gained limited attention until Louis Pasteur's Germ Theory emerged, which firmly took hold in medical circles following the Civil War.

[62] Civil War surgeons regularly consulted Frank Hamilton's military surgery manual. In cases of gangrene, Hamilton recommended a poultice of yeast, charcoal, or a combination of both. Frank Hastings Hamilton, *A Practical Treatise on Military Surgery* (New York: Bailliere Brothers, 1861), 196.

The early Civil War study conducted by Andrews was just the beginning of changing medical science during the Civil War. Chemical analysis and microscopy became regular parts of conducting medical studies. General hospitals during the war were all outfitted with chemistry equipment and microscopes. Surgeons used modern equipment to conduct studies on both live soldiers and the deceased who were unfortunate victims of disease and infection. Army doctors used chemical analysis to study pathological changes that occurred in the bodies of the afflicted. Renowned Civil War surgeons, like Joseph Janvier Woodward, wrote sweeping analyses of camp diseases using chemical analysis and microscopy.[63]The official medical history of the Civil War shows chemical analyses used to understand pathology and epidemiology. 1855 Michigan graduate Zenas Bliss ran Baltmore's Camden Street General Hospital during the Civil War, regularly examining and reporting the chemical composition of infected tissues surrounding wounds. The Surgeon General's office preserved Bliss's cases in multiple pages of the official medical history of the Civil War.[64]

Albert Benjamin Prescott was one of Professor Silas Douglas's favorite students, and he used his training in chemistry to direct the course of his military career. In 1860, A.B. Prescott entered the University of Michigan Department of Medicine and Surgery. While most students spent two years in the school before receiving a degree, Prescott stayed on as a student until 1864. He immediately applied to serve in the Union Army and sat for an examination to earn a commission as a Regular Army surgeon. Prescott moved around during the last two years of the Civil War, going from Totten Hospital in Kentucky to the Chief

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[63] Joseph Janvier Woodward, *Outlines of the Chief Camp Diseases of the United States Armies as Observed During the Present War: A Practical Contribution to Military Medicine* (Philadelphia: J.B. Lippincott & Co., 1863), 235.

[64] Bliss worked as a surgeon and researcher during his Civil War tenure. He is cited numerous times in several volumes of the official medical history. Surgeon General's Office, *The Medical and Surgical History of the War of the Rebellion* pt.III, vol.II, ed. George Otis, D.L. Huntington (Washington: Government Printing Office, 1883), 84.

Surgeon at the Foundry Hospital in Louisville, Kentucky. Prescott's rise through the ranks was fast in the late-war period, while numerous surgeons had far more experience.

Prescott saw his work in the chemistry laboratory as a major contributing factor to his quick rise. While Prescott was working for the Union Army, his mind was never far from his beloved Alma Mater. He wrote his favorite professor, Dr. Douglas, in October 1864, stating, "By every attempt to put the word October at the head of a letter I daydream that I find myself walking the old straight & narrow path that leads to the Chemical Laboratory & to the Medical Colledge."[65]He passed the rigid examination necessary to become a Regular Army physician, which was directly tied to the outstanding chemistry course that he took at the University of Michigan.[66] Prescott's prowess in chemistry and scientific medicine made him a desirable candidate to examine other incoming surgeons. While stationed at Foundry General Hospital, he was responsible for examining medical officers and stewards and determining the fitness of Union soldiers.

Prescott was so profoundly adept at chemistry that he was selected to perform chemical investigations at numerous general hospitals. The Army Medical Department selected him as the best possible assistant to aid him in his chemical experiments. Prescott was given his own office with a chemistry lab, writing to Dr. Douglas, "I am still at work at the old trade."[67]He wrote to his former professor, "within a couple of yards of my desk upon which I write is a table with shelves, newly fitted, containing various things-reagents, test-tubes, blow-pipes, etc."[68] He gave Douglas a description of his chemical viles and experiment

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[65] Albert Benjamin Prescott to Prof. S.H. Douglass, October 8, 1864, Foundry General Hospital, Louisville, Douglass Family Papers, 1812-1911, Bentley Historical Library, University of Michigan-Ann Arbor.

[66] Albert Benjamin Prescott to Prof. S.H. Douglass, November 18, 1864, Foundry General Hospital, Louisville, Douglass Family Papers, 1812-1911, Bentley Historical Library, University of Michigan-Ann Arbor.

[67] Prescott to Douglass, October 8, 1864.

[68] Ibid.

preparations. He continued, "As a matter of course, said table is half covered with bottles containing an amber-colored liquid-not brandy, and the microscope is at hand." Every time members of the Medical Department discussed University of Michigan graduates, it was with high praise for their abilities in chemistry and medical science. Prescott wrote to Douglas, "The Ann Arbor reputation, I am happy to say, stands high in this quarter. Dr. Fry-the President of the Board-says those from the U. of M. whom he has met have generally been excellent men."[69]

Chemistry skills from men like Prescott and Andrews were ideal for a modernized Army Medical Department. In instances like Edmund Andrews's experiments with gangrene, the skills gained from his time at the University of Michigan had major scientific implications. While he did not explicitly name the causative agent in gangrene infections, he was on the right track. With his ability to reason through the use of chemistry and his microscope, he determined measures that could stave off the spread of infection, including the use of antiseptics. Prescott's prowess in chemistry was so profound it gave him an immediate advantage. Just months after graduation, he became a rising candidate in the medical department. Prescott did so in 1864 when most of the medical officers were highly experienced. His scientific capabilities allowed him to examine other medical officers while working in the hospital laboratory at numerous general hospitals.

Anatomy

The Civil War changed the attitudes surrounding human dissection and material availability.[70] Access to bodies through wartime casualties of both disease and traumatic

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[69] Ibid.

[70] Devine, *Learning from the Wounded,* 49.

injuries was able to prove the value of dissection.[71]The autopsy became a part of medical science during the Civil War. Bodies were then the property of the Union Army and open to investigation. Military hospitals became scientific centers of discovery and questioning. The work known as the official medical history of the Civil War is filled with post-mortem impressions by Union Surgeons. The value of previous dissection experience cannot be discounted. Graduates who worked under the watchful eye of Professor Ford took their experience to the Army during the war. One example of a Michigan graduate in the Army dissecting comes from a report in the official medical history. Henry Clay May, an 1856 graduate and 5th New York Surgeon, conducted a post-mortem on Private J. Conly of the 90th Illinois Infantry. The eighteen-year-old Conly was wounded in the ankle on November 25, 1863, fracturing his tibia and fibula. The doctors decided against amputation, and he then suffered slowly until dying on March 7, 1864. The post-mortem showed the patient likely died from blood clots to the brain and a possible pulmonary embolism, showing the threat this ailment served for wounds in the leg.[72] Dr. May then sent the wounded leg to the Army Medical Museum, and the medical department made woodcuts for printing. It was cases like May's that helped doctors understand the risk of leaving traumatic wounds rather than amputating the area.

Surgeon Zenas Bliss used his post-mortem examination skills to contribute knowledge surrounding secondary bleeding. Private J. Harris of the 49th Pennsylvania was wounded twice at the horrific battle of Spotsylvania Court House on May 9, 1864. The twenty-four-year-old was shot once in the foot while another ball passed through the greater trochanter of his right leg, passing backward.[73]The wounded Harris spent four days in the Sixth Corps

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[71] Ibid, 7-8.

[72] Surgeon General's Office, *Medical and Surgical History of the War of the Rebellion, Volume II,* pt. III, 583.

[73] The Greater Trochanter is a prominent and easily identifiable bone projection located on the lateral surface of the femur. Harris's wound was situated posterior to the Greater Trochanter and penetrated inward and backward.

hospital before being shipped off to the Camden Street Hospital run by Bliss. Harris appeared to be improving until a massive hemorrhage cost the patient twenty-five ounces of blood. Compression stopped the bleeding, but the patient died on June 29, 1864. Bliss believed the hemorrhage originated from either the sciatic or pudic arteries.[74] Six hours after Harris died, Bliss dissected the body to find his hypothesis correct, that the patient died of a divide between both the pudendal and sciatic arteries.[75] Bliss used the findings of a previous death to inform his hypothesis surrounding the cause of death. Private J. Stafford of the 1st New Jersey, another twenty-four-year-old, died of a similar wound on May 23, 1864, just one bed away from Harris. Bliss deduced that the cause of death from the second patient was the same.[76]

Invaluable skills learned at the University of Michigan allowed graduates to contribute numerous medical specimens and records. Class of 1858 graduate Samuel Chapin served in the 139th Pennsylvania Infantry for the duration of the Civil War. On March 27, 1865, Corporal C.H. Grant of the 43rd New York Infantry was brought into the 2nd Corps Hospital outside of Petersburgh, Virginia. Chapin examined the patient, noting that a foreign body had caused a major fracture of the right elbow joint. Chapin performed an emergency amputation, and the man was sent to a General Hospital. Unfortunately for Corporal Grant, his condition deteriorated over the ensuing months and after the war was over, forcing numerous surgeries. Another exploratory surgery on July 6, 1865, found the culprit for his worsening condition, a necrotic portion of the humerus. The two pieces of bone were

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[74] The Pudendal Arteries supply the Pelvic Cavity with blood.

[75] *Medical and Surgical History of the War of the Rebellion, Volume II,* pt. II, 327.

[76] Ibid, 327.

removed and subsequently sent to the Army Medical Museum. The specimen, no. 3223, was forever preserved in the Army Medical Museum.[77]

Chapin contributed more specimens to the Army Medical Museum. On May 5, 1864, after Private A.R. Davis was wounded at the Battle of the Wilderness, he was brought into the 2nd Division, Sixth Corps hospital where Chapin worked. Davis was a member of the 102nd Pennsylvania, and at 28 years old, he took a bullet wound to his left arm. The wound fractured the left elbow joint, with the ball entering the anterior portion of the arm, going upward and out. Weeks later, on June 17, Chapin noticed that the joint had started to fuse together, a process called anchylosis. He quickly extracted parts of the elbow where he removed five inches of the radius, ulna, and humerus. While Private Davis had been recovering, it was on August 22, 1864, that he died suddenly from a secondary infection. Davis's shattered bone fragments were subsequently sent to and preserved at the Army Medical Museum.[78]

The Union Army Medical Department made the act of scientific contribution the central driver of change. The changes installed by Surgeon General Hammond and his staff mirrored the adoption of the Paris Clinical School. The clinical data gathering represented an opportunity to put America on the same plane as Europe's medical leaders. The rising casualty numbers and high mortality rates were unfortunate outcomes of the Civil War, but from a medical perspective, the growing casualty lists equated to opportunity. The preparation of medical reports, post-mortem impressions, and medical specimens allowed experienced doctors to contribute heavily to the official record of the war.

While doctors like Henry Clay May and Zenas Bliss were just some of the contributing Michigan graduates during the war, they shared similar experiences with the others. University of

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[77] "Case No. 1658, Amputations at the Middle Third of Arm," in *The Medical and Surgical History of the War of the Rebellion, volume II,* part II, 735

[78] "Case no. 1826, Secondary Excisions at the Elbow," in *The Medical and Surgical History of the War of the Rebellion, vol. II,* pt. III, 891.

Michigan graduates contributed countless reports and specimens to America's first major clinical experiment. University of Michigan graduates had been adequately trained in the areas necessary to contribute to the war's medical data. Graduates had worked with professors like Corydon Ford and Moses Gunn, who taught them to examine the body critically for clues surrounding pathology. As Michigan required the students to perform post-mortem examinations, they were experienced enough to perform autopsies upon the new Union Army Medical Department's changes.

Surgery

Working in the University of Michigan surgical clinic and sitting in the surgical amphitheater audience was an invaluable experience for the eventual Civil War surgeons among the students. No area of medicine would grow faster than surgery during the Civil War. The maiming wounds caused by the horrific devices of war would force thousands of surgeons to operate on patients. Many operations during the war were under the pressure of a growing triage line filled with patients in need of lifesaving surgery. Common notions about Civil War medicine equate battlefield wounds with amputations, but surgeries often consisted of other procedures. The official medical history of the Civil War references a sample of sixty thousand two hundred and sixty-six extremity wounds from gunshots. While twenty-nine thousand one hundred forty-three wounds resulted in amputation, twenty-six thousand four hundred sixty-seven were treated with little to no significant surgery.[79] Over 400,000 trauma patients were treated by the Union Army during the Civil War, showing that diversity in treatment was going to be necessary.[80]Learning at the hands of an expert surgeon was ideal preparation for future conflict.

Dr. Zenas Bliss used his university surgical training early in the Civil War. As a Regimental Surgeon in the 3rd Michigan Infantry, he participated in the ill-fated Peninsular

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[79] *Medical and Surgical History of the War of the Rebellion, vol. II*, pt. III, 873.

[80] Alfred Bollett, *Civil War Medicine: Challenges and Triumphs* (Tucson: Galen Press, 2002), 83.

Campaign of 1862. On May 5, 1862, Bliss treated over eighty wounded men, officers, and soldiers outside Williamsburg, Virginia. That night, he operated using a barn door, using the barn as his field hospital. He amputated the foot of one wounded man and two arms in the first wave of wounded. As the wounded piled up, Bliss amputated another forearm and the fingers of several others. The majority of his operations that night involved removing bullets and shrapnel, followed by dressing the wounds. The early engagement at Williamsburg was just the beginning of Bliss' Peninsular Campaign nightmare. The Army of the Potomac established a hospital and evacuation point at Savage's Station on the Richmond and York River Railroad track that ran up the length of the Virginia Peninsula. Poor management by the early medical department sent hospital boats away with few wounded on board, leaving the wounded to grow with nowhere to go. Zenas Bliss spent days in a Savage Station tobacco house operating, using chloroform to anesthetize his patients. Patients needed amputations, excisions, disarticulations, and resections of bone.[81]

University of Michigan medical school graduates who served in the Civil War gained overwhelming surgical experience during the war, using the training from Gunn's classroom. Dr. James Westfall, who worked alongside Samuel Parker Cole in the school clinic before graduating in 1854, served in the 67th Ohio Infantry. On September 1, 1864, Private Atkinson of the 85th Pennsylvania was hit in the right arm by a twelve-pounder cannonball, severely breaking his upper arm and tearing away skin. Dr. Westfall saved the man's life on the operating table as he ligated the axillary artery and carefully removed the arm.[82] The procedure was delicate as he slowly dissected the capsular ligament. At forty-one years old,

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[81] Zenas Bliss, "Second Extract from a Narrative of His Services in the Medical Staff," in *The Medical and Surgical History of the War of the Rebellion vol. I,* pt. I, 86.

[82] "Case number 1592: Amputations at the Shoulder Joint," *The Medical and Surgical History of the War of the Rebellion*, 617.

Private Atkinson had everything working against him. However, Dr. Westfall's quick work kept him alive, and he eventually recovered and was discharged on November 22, 1864.

Sometimes, surgeons had to improvise and use the experimental mindset they learned from Dr. Gunn. Dr. Samuel Chapin, an 1858 medical school graduate, served in the 139th Pennsylvania during the Civil War. Chapin found himself stationed at the front during the Petersburg Campaign when 11th Connecticut Private McDonald's comrades carried him into his hospital.[83]A bullet lodged deep in McDonald's sacrum at the base of his spine. Chapin could not articulate the forceps properly to remove the bullet. Instead, Chapin attached a ramrod screw to the end of a Springfield ramrod and gently slid the ramrod down into the wound. The surgeon felt the bullet and twisted slowly until the corkscrew burrowed into the lead round, which he then lifted out. The medical department printed his procedure in the official medical history of the war, along with a woodcut image of the bullet skewered on the ramrod.[84]

Some of Gunn's students were so adept at surgery that their Army Medical Director cited them in the official record. Medical Director Hewitt of the Union Army of Ohio mentioned Samuel Knox Crawford (Class of 1861) and Charles Safford Frink (Class of 1859 in his operation reports from the Atlanta Campaign. After the appointment of William Hammond as Surgeon General of the U.S. Army, there was a shift in the procedures surrounding operations, where only the best surgeons could operate.[85]Being selected to oversee operator selection and operation approval was an even greater honor.[86]Medical

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[83] As this operation occurred in the summer of 1864, the regiment no longer organized the medical department hospitals. Hospitals were then organized by brigade or regiment. At this time, Dr. Chapin was working at the 2nd Division Hospital of the VI Corps.

[84] "Case number 736: Excisions of Portions of the Sacrum," *The Medical and Surgical History of the War of the Rebellion vol. II*, pt.III, 251.

[85] Rutkow, *Bleeding Blue and Gray,*148.

[86]During times of war, boards of surgeons were established in larger hospitals away from the battlefield to determine the permissibility and advisability of surgical procedures. However, field operators were often

Director Hewitt named Crawford and Frink to the Army of the Ohio medical board.[87]Wounded during the Atlanta Campaign were dealt with swiftly as Crawford and Frink oversaw the quick and efficient surgeries before the evacuation of the wounded by train to Allatoona, Georgia, and Knoxville, Tennessee.[88] Surgical cases inundated the Army of Ohio between May 1, 1864, and mid-September 1864. Crawford and Frink and their fellow surgeons performed eighty-six amputations, twenty-five excisions, and twenty-eight resections.[89]Two of Gunn's students were proficient enough in surgery to oversee these many operations. Samuel Knox Crawford made his way to the Army immediately upon graduating in 1861, with his only surgical experience being the work done in Gunn's clinics and classroom.

University of Michigan graduates had their profound surgical experiences listed throughout the official record. Many graduates were allowed to operate, showing their intellect and surgical ability. Gunn also passed his knowledge to these graduates through his regular lecture courses. The lecture courses covered the basics of diagnosis, treatment, potential complications, and likely outcomes. Students were unlikely to gain nearly the same training from his lectures as from his surgical clinics. Each student notebook highlights the time each student spent with the larger-than-life Moses Gunn. Gunn's capability and experience in many different areas of medicine made him a wealth of knowledge. This instruction would be invaluable for those standing over an operating table during the Civil War. The numerous Michigan graduates who performed military surgery gained their first

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compelled to perform surgeries in emergencies where human life was in danger. In such cases, wounded soldiers were typically transported to larger hospitals where a board of surgeons, considered experts in both surgical and medical knowledge, decided on whether to proceed with the surgical procedure.

[87] H.S. Hewitt, "Extracts from Reports on the Casualties from the Army of Ohio from May 8 to August 24, 1864," in *The Medical and Surgical History of the War of the Rebellion vol. I,* pt. I, 315.

[88] Hewitt, "Report on Casualties from the Army of the Ohio from May 8 to August 24, 1864," 316.

[89] A.M. Wilder, "Extracts from a Report on the Wounded in the Army of the Ohio during the Campaign in Georgia," in *The Medical and Surgical History of the War of the Rebellion vol. I,* pt. I, 319.

exposure to surgery in Gunn's classroom, where they learned from one of the best surgeons of his generation.

Internal Medicine

Michigan medical graduates who served in the Civil War as surgeons used some of the terrible advice they received in their internal medicine classes. Samuel Knox Crawford, the assistant surgeon of the 50th Ohio, wrote to his friend, medical student James Guthrie, in the summer of 1861 from right outside of Washington D.C. Crawford told Guthrie that every morning, the men would line up for sick calls, and Crawford had just the cure for a lineup of sick men. He told Guthrie to "take great care in administering cathartics, as some would admonish you against," he said Guthrie to "depend on it when you come to see thousands of men feeling languid and indisposed if you roll out plenty of pills to them [it will fix the constitution]."[90] Samuel Crawford was of the medical generation who saw a good balance of the body's functions as a key to health. With this mindset, something as simple as a good laxative could keep the body healthy and balanced. Crawford's concept of treatment was expected. Regulation medical kits issued to the Civil War surgeons carried a required allotment of purgatives, cathartics, mercury, and other toxic doses of medicine.[91]

Despite Palmer's recommendation for toxic drugs and heroic methods, his courses were valuable. Palmer's students were introduced to pathology, pathological anatomy, physiology, chemistry, and pharmacology, which he used to explain the human body. Understanding the possible causes and effects of disease and injury on the human body was invaluable. Before the Civil War, there was little interest in topics like pathological

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[90] Samuel Knox Crawford to James Guthrie, August 21, 1861, Washington D.C., James W. Guthrie Papers, 1845-1907, Michigan in the Civil War, Bentley Historical Library, University of Michigan-Ann Arbor.

[91] The 1862 regulation Surgeon's Knapsack held one one-hundred cathartic pills, one hundred and fifty mercury pills, one hundred fifty opium pills, and other drugs. The 1863 standard issue, the Surgeon's Companion field case, was stocked with one-hundred forty-four cathartic and one-hundred forty-four purgative pills. The standard Hospital Pannier, or medicine chest, was stocked with twelve dozen cathartic pills and a large number of purgatives. *The Medical and Surgical History of the War of the Rebellion vol. II,* pt. III, 914-915.

anatomy.[92]Before the war, there was a shortage of materials for conducting studies in pathology. There were few hospitals in the United States or other sites to conduct regular post-mortem examinations outside medical schools. The Civil War changed the shortage issue. Hospital wards were overwhelmed with patients, and the Surgeon General's office ordered surgeons to conduct exams on deceased patients to understand the cause of death. Surgeons and medical staff conducted large-scale medical studies directed by the Surgeon General's Department, requiring doctors to examine the effect pathology and physiology had on the body's anatomy.

University of Michigan graduates like Joseph Thatcher Woods of the 1855 graduating class used the Civil War as an opportunity to understand both pathology and physiology better. Woods was averse to amputation for wounds of the femur. Amputations from the knee to hip had the highest fatality rates, with amputations of the femur carrying a 54.2% fatality rate.[93] Woods became optimistic about using new splinting and treatment methods to save the integrity of the damaged femur. While he worked in the Chattanooga hospital, he wrote, "Amputation is almost never warrantable, but the prospect of success [with splinting] warrants the effort to save the life with the limb."[94]Woods first experimented with the double-inclined plane splint, finding that it was ineffective unless the fracture was near the trochanter.[95]Woods worked diligently to understand the best angles and splints for a more significant effect. Woods found that for wounds surrounding the fractured femur, less

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[92] Pathological anatomy equates symptoms with changes occurring within the body. Empirics in medicine focused on treatments with little interest in cause or effect. Many doctors in America felt there was no need to know why a disease was occurring or what part of the body was affected and how. Shauna Devine, *Learning from the Wounded: The Civil War and the Rise of American Medical Science* (Chapel Hill: The University of North Carolina Press, 2014),6.

[93] *Medical and Surgical History of the War of the Rebellion, vol. II,* pt III, 877.

[94] Ibid, 339.

[95]The double-inclined plane splint resembled an inverted, wide-angled v shape. A set of pegs along the outside edges of the device kept the leg in place. The femur portion was covered with an oval-shaped piece of wood held on by bandages near the knee and the top of the thigh. A cushion lined the length of the splint, and the lower leg was left unbandaged. See figure 209, MSHWR, 345. Ibid, 350.

bandaging was better, along with cleanliness, proper drainage, and fresh air. The standard treatment of packing wounds with lint was objectionable to Woods, who found that the lint stuck to the wound and festered. He learned through unfortunate experience that amputation in many femur wound cases gave the patient smaller odds of survival than if just left to heal with proper support.[96]

Joseph Woods continued to use the large number of wounded and injured men to his advantage. He conducted numerous experiments with various splints, bandages, and diets. He paid close attention to the entirety of the leg, using anatomy, physiology, and pathology to understand the best way to ensure a healthy wound recovery. Woods used his newfound knowledge surrounding leg fractures and made a post-war career in orthopedic medicine. The doctors designed an all-encompassing splinting device that could support all leg injuries, including amputations. As a Civil War surgeon, he was experienced in dealing with abscesses along with skin and muscular infections. He designed his post-war splint to allow proper irrigation and drainage of all infections. His device placed the damaged leg in a hammock running along the bottom of the splint that could be opened in sections to air out any infections.[97] Woods' story conveys an understanding of pathology, physiology, anatomy, and a research mentality. He established a hypothesis, believing that he could create a better opportunity for those with femur wounds to survive without the need for amputation. He tried many methods and splints for the duration of the war, finally using that knowledge to improve his post-war career and orthopedics practice.

While Professor Palmer's lessons on life's diseases offered poor treatment options, he did supply them with a framework to identify common diseases. His students who served in the Civil War saw far more disease than wounds. According to statistics from Ohio State

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[96] Ibid, 412.

[97] J.T. Woods, *Woods' Hammock Splint, for All Fractures of the Leg and Thigh* (Toledo: Toledo Printing & Publishing Co., 1874.

University, it is estimated that two hundred and twenty-four thousand Union soldiers died of disease, compared to one hundred and ten thousand one hundred who died in battle.[98] Between July 1861 and the end of June 1862, surgeons in the Army of the Potomac treated two hundred fifty-eight thousand seven hundred and forty-two cases of disease.[99] In the Atlantic Region alone, surgeons treated four-hundred and eighteen thousand one hundred and seventy-six cases of the disease during the same period.[100] Many of the reported diseases were covered extensively in Palmer's classroom, including Typhus Fever, Typhoid Fever, Remittent Fever, Dysentery, Diarrhea, Erysipelas, Scarlet Fever, Tumors, Cancer, Gout, Scurvy, Gonorrhea, Syphilis, and other diseases.

Addison Stone's thesis on Erysipelas, covered in Chapter 5, stands as a good example of how Michigan graduates utilized internal medicine lessons during the war. Much of Stone's science surrounding Erysipelas seems meaningless. Attributing temperament and humoral imbalance appears to present the modern reader with a useless understanding of the disease. Contrary to this view, analyzing Stone's work can show benefits. Addison Stone recognized that open wounds represented a doorway to infection. During the Civil War, soldiers living in poor conditions and practicing poor hygiene created an ecosystem for Erysipelas infection.

Further, wounds from bullets, shrapnel, and surgeon's tools all created avenues for the infection to spread. Surgical instruments exposed to the infecting agent certainly helped spread the disease. Recorded Civil War cases of Erysipelas show the disease most commonly infected the faces of soldiers, showing that poor hygiene could have been a major

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[98] Jenny Goellnitz, "Statistics on the Civil War and Medicine," The Ohio State University: eHistory, accessed January 1, 2024, https://ehistory.osu.edu/exhibitions/cwsurgeon/cwsurgeon/statistics.

[99] *The Medical and Surgical History of the War of the Rebellion Vol. I,* pt. I, 35.

[100] Ibid, 71.

contributing factor.[101] Either way, knowing that the disease could spread through open wounds with unhygienic conditions, setting patients up for infection was essential to understanding the disease. Stone considered the physiological and pathological changes that occurred throughout the disease.

Medical students in the Department of Medicine and Surgery consistently showed knowledge that would be relevant during the enormous Civil War medical crisis. John Moody Peebles, an 1854 graduate who later served in the 34th Iowa during the war, wrote his thesis on the symptoms and diagnosis of tuberculosis.[102]1854 graduate John Read Bailey, who served with the 8th Michigan Infantry, wrote about the anatomy and physiology of the circulatory system.[103] Of that same graduating class, Ewing Welch Robertson wrote his thesis on gunshot wounds, an important topic for a doctor who would later serve as an Acting Assistant Surgeon during the war.[104]In Welch's thesis, he determined the effects of bullets at different velocities.[105]He outlined the risks associated with firearm wounds, especially secondary hemorrhaging, which was later a common risk factor during the war, killing many convalescing soldiers.[106]Robertson's work gave adequate steps for treating a gunshot wound, first giving students the steps necessary to arrest bleeding in different areas of the body

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[101] *The Medical and Surgical History of the War of the Rebellion Vol I,* pt. II, 55, 61, 124, 138, 151, 163, 176, 217, 221, 224, 225, 226, 227, 294.

[102] John Moody Peebles, "Symptoms and Diagnosis of Pthisis Pulmonaris," [Thesis] (Ann Arbor: University of Michigan, 1854)

[103] John Read Bailey, "The Circulation," [Thesis] (Ann Arbor: University of Michigan, 1854)

[104] Ewing Welch Robertson, "Gun Shot Wounds," [Thesis] (Ann Arbor: University of Michigan-Ann Arbor, 1854)

[105] Robertson, "Gun Shot Wounds," 8-10.

[106] Ibid, 13.

through ligature.[107]Wounds that were obliterated by bullets, according to Robertson, sometimes required amputation with great discretion.[108]

Zenas Bliss, who was in the 1855 class, wrote about cells and cell life, showing a thorough understanding of cellular biology.[109]Louis Whiddon Fasquelle, a surgeon in the 23rd Michigan Infantry, wrote his thesis on Acute Peritonitis. Peritonitis involves inflammation of the peritonium, the membrane enclosing the inner abdominal wall. Fasquelle tracked the symptomatic presentation of the disease while explaining the physiological manifestations of the disease.[110]With his deep knowledge of anatomy, Fasquelle absorbed the lectures of Dr. Corydon Ford, who wrote about intestinal anatomy as if he were an expert in the subject. His expertise came first-hand when examining peritonitis in the dissection lab, where the post-mortem examination impressed the pathology of the disease on his mind.[111]1857 graduate Henry Martin Lilly, later a volunteer surgeon during the Civil War, recounted the importance pressed upon him surrounding the microscope. The microscope had been the instrument driving scientific discovery, according to Lilly.[112]Lilly showed the pathological value of using a microscope. The changes in blood cells that occurred during infection were visible using powerful microscopes, enough to change our understanding of disease.[113]

The Civil War changed many ideas surrounding medicine, including the disease covered by Addison Stone in his thesis. Dr. Elmore Palmer of the 1864 class wrote on the

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[107] Ibid, 18.

[108] Ibid, 25.

[109] Zenas E. Bliss, "Cells and Cell Life," [Thesis] (Ann Arbor: University of Michigan, 1855)

[110] Louis Whiddon Fasquelle, "Acute Peritonitis," [Thesis] (Ann Arbor: University of Michigan, 1855), 2-6.

[111] Fasquelle, "Acute Peritonitis," 19.

[112] Henry Martin Lilly, "Relations of the Microscope to the Medical Sciences," [Thesis] (Ann Arbor: University of Michigan, 1857), 6.

[113] Lilly, "Relations of the Microscope," 11.

same subject, "Erysipelas, its Treatment with Bromide." Palmer went on to the University of Michigan at the onset of the Civil War to gain the medical training necessary to pass his Army Surgeon examination. Palmer saw his ambitions through when he served the remainder of the war, beginning in 1864, with the 29th Michigan Infantry. Compared to Dr. Stone's, his thesis is an incredible contrast between the two eras of medicine. Palmer's thesis reflects the growing scientific knowledge during the war and the new information taught at the medical school during the Civil War.

While Dr. Stone considered Erysipelas to be caused by a humoral imbalance, especially for those suffering from a "biliary" disposition, Palmer was entirely different in his assessment. He wrote that Erysipelas is a "recurring idiopathically seems to form connecting back between the truly zymotic diseases."[114] While Palmer claimed the disease was "idiopathic," he was simply referring to the unknown entity causing it, but he knew it occurred from the "agency of any known poison." This is a magnificent contrast to humoral causation, which was believed ten years before Palmer wrote his thesis. Palmer's pathology and physiology are the same as Stone's understanding, but Palmer completely discounts the cause listed by Stone. According to Palmer, all humoral imbalances had no bearing on whether an infection occurred.[115]Elmore Palmer knew that the disease started locally and came from an entity outside the body, and in a literature review, he dismissed many of the old theories.[116]

Elmore Palmer examined the Army Hospital clinical data surrounding Erysipelas. Patients kept in rooms with those suffering from the disease were far more likely to contract it. However, the treatment of wounds with iodine, glycerine, colloidal silver, or other

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[114] Elmore Palmer, "Erysipelas, it's treatment with Bromine," (M.D. Thesis: University of Michigan, 1864), 1c.

[115] Palmer, "Erysipelas," 6.

[116] Ibid, 9.

substances helped stop recurring infections.[117]He asserted that the disease was of utmost importance to the army surgeon, who no longer sought a remedy but instead wanted to prevent the infection altogether.[118]It was in the doctor's or surgeon's interest to arrest the local infection and eliminate the outside poison causing the infection.[119]Edmund Andrews inspired Palmer to understand the proper use of antiseptics following surgery. Andrews had proposed using Ferric Chloride on recent incisions and surgical wounds. Many doctors believed that this antiseptic treatment had great success. According to Palmer, the use of bromide on Erysipelas patients had a profound effect on arresting the spread of the disease. While the mechanism was unknown, the clinical data showed great promise in his hypothesis that outside forces were at work and a poison needed to be neutralized.

Palmer's thesis shows the move toward Clinical Medicine during the Civil War. While doctors like Stone and Barnum were not required to use case data, the later thesis almost always contained clinical information. For Palmer's thesis, he included a list of cases taken from army records showing that Bromine effectively eliminated the spread of Erysipelas. His first case presented from a Louisiana hospital on December 1, 1862, showed that Private John Keefer's severe Erysipelas slowed upon treatment with bromide. By January 12, 1863, his infection had left him entirely. Palmer presented Private William McCallister's case next. The 31st Ohio private had been miserable, suffering from facial Erysipelas and chronic intestinal issues. When he came into the hospital on March 26, 1863, surgeons treated his face with bromide, and within sixteen hours, the spread had stopped. By April 10, 1863, the infection was gone, and the private had returned to his unit. Private Ebenezer McDaniel of 87th Indiana was admitted to the No. 4 General Hospital on January 6, 1863, with Erysipelas, gone

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[117] Ibid, 11.

[118] Ibid, 16.

[119] Ibid, 21.

through Bromide by February 25, 1863. 14th Michigan Private Daniel Russell was admitted to an army hospital with Diptheria and Erysipelas, which were expediently treated with Bromine. While he was admitted on March 2, 1863, he was cured of his ailment by March 11, 1863.[120]

Palmer's use of clinical data showed the change in scientific thinking during the Civil War. Hypotheses and theories were confirmed or denied using clinical-based information. Doctors started to eliminate ideas surrounding humoral imbalances and personality-caused diseases. The atmospheric putrid gasses that caused disease were replaced by entities outside the body known as "poisons." Palmer referred to Erysipelas as an "idiopathic" disease, meaning the cause was unknown or unexplainable. Regardless, it was just years before doctors had theories surrounding outside poisons confirmed with the advent of Germ Theory. Despite not knowing the cause during the Civil War, the push to understand the outside reason and recognizing that successful treatments existed were crucial changes in American medicine. Palmer's thesis shows that doctors and scientists passed on these ideas to medical students who had access to new, experimental ideas and clinical data from which to research.

Stone and Palmer's theses differ extensively. Where Stone prescribed heroic treatments for Erysipelas, Palmer treated the disease with antiseptics. Stone saw the cause as a gloomy and irritable disposition, while Palmer saw the infecting agent as an outside poison spreadable through patient contact. The similarities in their studies do exist. Stone described the same disease that Palmer would years later. Differentiating Erysipelas from other skin diseases was the primary step in letting doctors treat them. Stone knew the presentation of the disease, the movement, the physiological and pathological changes. While he listed some pseudoscientific causes, Stone did apply cuts, wounds, surgical incisions, and other skin openings as a potential source of infection. The openings in the body as an avenue for

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[120] Ibid, 39-45.

infection were part of knowing that antiseptic application was needed in those places. These were all ideas gathered at the medical school in conjunction with the data furnished by the medical department.

Later, medical school theses and Palmer's erysipelas thesis incorporated a clinical approach. Before attending medical school, Abiel Andrews served as a hospital steward and assistant surgeon in Alexandria, Virginia. Kennedy wrote about a growing concern in military circles: pyemia. Pyemia was seen as a form of blood poisoning, and the term translated to literally mean "Pus in the blood."[121]Pyemia was a leading cause of spreading sepsis. Modern scientists attribute pyemia, now known as bacteremia, to the streptococcus pyogenes. The famous experiments by Ignaz Semmelweis, in which he attributed the spread of Peurperal Fever to a contagion on the physician, were well known in medical circles at the time of the Civil War. Dr. William Detmold, an American scientist, discovered that Peurperal Fever was the same disease as pyemia. As Semmelweiss had concluded that doctors needed clean hands, sterile bedding, sterile bandages, and antiseptics to stop the spread of Puerperal Fever, American doctors applied the same steps to combat pyemia.

Kennedy had seen firsthand the risks surrounding pyemia, which he deemed a killer spread through surgery.[122]Civil War Surgeons first saw pus as a sign of healing but later recognized that the substance could be central to spreading lethal infection. The unhygienic conditions of hospitals and the site where the injury occurred were involved in the infection's origin, according to Kennedy.[123]Kennedy wrote of pus cells as white blood cells, which coincided with an increase in white blood cells in circulation.[124]The free-flowing "laudable

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[121] George Adams, *Doctors in Blue: The Medical History of the Union Army in the Civil War* (New York: Henry Schuman Inc., 1952), 139.

[122] Abiel Kennedy, "Pyemia," [Thesis] Ann Arbor: University of Michigan, 1865), 1.

[123] Kennedy, "Pyemia," 6.

[124] Ibid, 9.

pus" had a detrimental effect on his hospital patients at his posting in Alexandria. Kennedy used data gathered from his time in the hospital to conclude that infection was rapidly passing through the wounds of his patients. Young men who were in good health died slowly and painfully as the infection spread throughout their bodies.[125]Substantial clinical evidence led Kennedy to conclude that poor wound treatment, poor hygiene, and improper bandaging directly led to the spread of infection. Post-mortem examinations showed the abscesses that passed throughout the body upon the free-flowing pus. His investigations showed the involvement of the lymphatic system in the poisoning of the body. Kennedy asserted that the poison was coming from outside of the body, being introduced by some outside agent.[126]

Abiel Kennedy used enough clinical cases to give him a reasonable conclusion. He wrote, "In the treatment of pyemia, the indications are to remove, if possible, the exciting cause," which meant debriding the wound and keeping it clean.[127]Dressings were to be changed frequently, and the injuries were to be irrigated using a clean syringe. Antiseptics, including bromine, iodine, or other antiseptics, were to be applied.[128]While patients were in the acute phases of systemic infection, it was best to support the body entirely, treat the fever with quinine, and never give purgatives.[129]

Kennedy's thesis here represents a near-total shift in scientific and medical thinking. He presented the idea of an external agent causing infection. Kennedy stated that poor hygiene and filthy conditions were contributing to the spread of disease. Letting pus flow as a sign of healing was no longer ideal. Reusing or keeping the same bandages on for days was no longer recommended. He used clinical data to drive him to a conclusion based on a

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[125] Ibid, 20-48.

[126] Ibid, 51.

[127] Ibid, 56.

[128] Ibid, 57.

[129] Ibid, 59.

hypothesis. Clinical data included post-mortem reports and other parameters. The surgeon pushed doctors to avoid heroic methods, no longer promoting cathartics, emetics, purgatives, blistering, and other harmful practices that could weaken the patient. He used scientific techniques to accumulate data, including microscope examination of abscesses and blood cells. The use of chemistry for analysis, microscope study, and post-mortem examinations were all valuable lessons taught at the University of Michigan Medical School. His thesis shows that his professors promoted methods of science that expected graduates during the Civil War years to employ more profound theses like Kennedy's.

Conclusion

The examples used to show the service of University of Michigan medical school graduates and how they applied science to their work just barely touched the surface. Civil War records are numerous and could fill the expanse of an entire dissertation. The Michigan graduate surgeons who served worked in all areas of the Union Army Medical Department. Men like Henry Lyster, William Breakey, Charles Mead, Albert Prescott, and other Michigan graduates were subjected to different areas of Civil War service. Some were there from the beginning, like Henry Lyster, who treated the first Michigan wounded man and performed Michigan's first amputation of the Civil War. Others like Breakey served throughout the war in some of the conflict's bloodiest battles, like the 2nd Bull Run and Gettysburg. Each man was subjected to numerous dangers, like Charles Mead, who was forced to live in the Petersburg trenches, dodging the shots fired by sharpshooters in an attempt to save his wounded comrades. Much of their everyday work, aside from the dangers of the battlefield, meant treating sick patients. They made rounds in hospitals that were overwhelmed with filled hospital beds, treating diseases like dysentery, malaria, typhoid fever, and smallpox.

Aside from the memorable parts of being a Civil War field surgeon, there were also scientific applications. Their background as University of Michigan graduates exposed them

to subjects that advanced science during the Civil War. The work performed in Silas Douglas's chemistry laboratory was instrumental in the scientific and analytical work performed during the war. Surgeons like Edmund Andrews used their work in the college chemistry lab, using modern amenities like the microscope to understand complex diseases like gangrene. Graduates like Albert Prescott used their background in the laboratory to advance their way up the ranks of the Army Medical Department. The work conducted by numerous Michigan surgeons using chemistry and other scientific instruments was submitted and forever enshrined in the history of Civil War medicine.

Chapter Seven:

Conclusion

Conclusion:

This chapter aims to conclude the work of this dissertation by first recognizing the critical areas of study that were initially in question. The conclusion then offers an overview of the findings by following the chronology of the dissertation. This chapter then summarizes the essential findings and the broad understanding of these areas. The analysis is provided to impress upon the historiography the importance of this study, the contributions to the history of this subject, and an address of the study's limitations. Lastly, I present the discussion of future research problems to allow for further expansion of this subject or challenges of the overall premise.

Historians have rarely intertwined medical education and Civil War medicine. Historians have never intensely studied the value of medical education for Civil War surgeons. This research has sought to bring about an understanding of antebellum medical school coursework and its value. Specifically, the University of Michigan courses were of specific interest. Understanding why the medical school at the University of Michigan offered a valuable medical education for Civil War surgeons was central to the study's focus. This was done together with differentiating it from standards of nineteenth-century medical education to observe how medical education at the University of Michigan differed from others in design, making it more valuable. The method of the medical school curriculum came about due to various historical aspects unique to Michigan, along with the personalities who designed and ran the medical school.

Medical Education has been an overlooked aspect in the historiography of Civil War Medicine. Instead, Civil War medical historians have considered medical schools a single-celled organism. Medical schools were all built differently, with some more valuable than others. The University of Michigan Department of Medicine and Surgery was the first to adopt modern

medical school standards in time for training Civil War surgeons. The great advantage of contemporary training came from the scientific value for a Union Army Medical Department focusing on clinical research and the challenging of established science. The University of Michigan offered one of the best courses of study for this impending change.

The state of Michigan was uniquely situated to create a modern medical school. While the University of Michigan's foundation came in 1837, it took until 1850 to establish the medical department, immediately after the American Medical Association issued a referendum for change in 1847. The delay in opening allowed the school to take advantage of proposed changes and adapt to the landscape of mid-nineteenth-century medicine. The distrust in the medical system pushed medical schools to improve, along with the rise in scientific ideologies from France and Germany. Michigan had a rich medical history that began with the work of William Beaumont and Zina Pitcher, with many unsung medical practitioners working diligently in a state that desperately needed doctors. Doctors in Michigan gained a level of work experience that few other states offered. These physicians were a brain trust for the state's first medical college.

The intellectual history of medical education is an essential context for the history of Civil War medicine. The foundation of America's first medical schools came from adherents to rationalist scientific theories. This came from the Edinburgh influence on the earliest medical school founders like William Shippen and John Morgan, along with famous early educators like Benjamin Rush. Rationalist philosophies made practices like "heroic medicine" commonplace. The detrimental suffering caused by proponents of heroic standards drove many Americans away from medical professionals. Distrust in medicine grew as the Paris Clinical School ousted Edinburgh as the leader for medical thinking. The pure empiricism of the Paris School had some value, but the French physicians were against using theory to explain medical phenomena. In the

two decades before the Civil War, the scientific empirical school of Germany started to grow and would ultimately become the world model for scientific research and medical training.

When the University of Michigan opened its medical school in 1850, they were among the first proponents of the Prussian System. By 1850, physicians noted the shortcomings of the Paris School, and the Scientific Empiricists of Europe had started to rise in prominence. Michigan's constitution oversaw the installment of a university system founded on Prussian principles, and the philosophical drive of the school's first president, Henry Tappan, sent the new medical school in the Prussian direction. This adaptation to the Prussian System drove the University of Michigan to build up applied science courses like Chemistry and Forensic Anatomy. The research-based clinical school of Germany took over American medicine during the Civil War as medical department changes ordered Union Surgeons to strive toward scientific advancement and understanding.

The faculty and founders outfitted the University of Michigan was differently becoming modernized medical school. The staff at the university was the first full-time staff paid for by the state. Faculty did not need to bother with filling lecture halls for financial gain. The school received funding regardless of the number of graduates or matriculants. The grant allowed staff like Dr. Silas Douglas to outfit the school with modern amenities like the nation's first significant chemistry laboratory. Henry Tappan, the school's first president, and renowned regent doctor Zina Pitcher were tremendous allies for the budding medical school. The school leadership willingly worked with a staff driven for a modern medical school to improve medical education over striving for financial gain.

The medical college had the ideal group of leaders and professors to create one of the first modern medical schools in time for the Civil War. Professor Silas Douglas was a true

pioneer in chemistry education, where he built the most advanced university science laboratory in the country. Professor Corydon Ford was seen as one of the greatest anatomy educators and assured students plenty of opportunities for dissection. Dr. Moses Gunn was an experienced surgeon who pushed the limits to expand his surgical repertoire and pass his knowledge on to medical students. Dr. Alonzo Palmer was one of the country's best-known and most experienced internal medicine professors by the time of the Civil War. This group and other professors were constantly making room for improvements.

The facilities at the Michigan Medical School were the most advanced during the Civil War. The school was the first to create extensive facilities solely dedicated to chemistry. Students learned introductory and analytical chemistry under the leadership of Silas Douglas. They were outfitted with plenty of cadavers for dissection in the school's cadaver laboratories. Students worked alongside Moses Gunn in the school's medical clinic to learn the practice of surgery. The medical school opened in the years immediately following the discovery of anesthesia, and surgery was rapidly advancing. Moses Gunn stayed ahead of surgical advancements and taught them to his students, many of which many would use their skills to operate during the Civil War. The faculty used library funds to fill their shelves with the most current research while subscribing to the world's best-known periodicals for students to use.

Faculty ensured that Michigan medical school graduates were advanced in scientific reasoning and skills. They had learned to use microscopes in numerous areas of scientific study. They learned the basics of chemistry, toxicology, pharmacology, and analytical chemistry in the laboratory. Using laboratory materials became integral to the shift toward medical science during the Civil War. When Surgeon General William Hammond reorganized the Union Army Medical Department, he made scientific research a goal of his doctors. The medical department expected

Army surgeons to make scientific contributions, and this came through all means of scientific analysis. Reformers outfitted Hospitals with scientific periodicals, chemistry laboratories, microscopes, thermometers, and other modern amenities. Due to its premier facilities, the University of Michigan was the only medical school to train all graduates intensely in the applied sciences.

Many Civil War historians treat antebellum medical education as a valueless undertaking. At the University of Michigan, medical students were taught extensively about the many diseases the Union Army encountered during the Civil War. The prescribed treatments the school's professors taught were not always ideal, but professors trained students to understand the symptomatic manifestations of different diseases. At Michigan, where all the professors worked to incorporate all areas of medicine, the students learned pathology, physiology, and anatomy. How professors trained students to view medical science would be an essential part of conducting physiological and pathological studies during the Civil War. Professors like Dr. Alonzo Palmer's lectures show an integrative approach to teaching, where students learn to understand specific disease markers while understanding the physiological changes occurring with each ailment. This line of thinking was crucial for Civil War surgeons who conducted medical studies throughout the Civil War.

A study of notebooks, letters, and student theses shows that the faculty deeply educated in medical science. Students knew of intricate topics like cell biology, chemistry, surgery, and pathology. Medical school graduates pulled away from the masses of matriculants, showing their abilities as students and their array of knowledge. Professors taught students the manifestations of diseases they faced during the Civil War, including Typhus, Dysentery, Typhoid Fever, Malaria, Erysipelas, Pyemia, Gastritis, Eye diseases, and several others. They learned to seek the

understanding of physiological changes associated with a disease and how to determine the value of treatment. This level of learning is all contrary to historians' beliefs that medical school had little to offer. While value could be elusive at some medical schools, they were not all built the same, and this was especially true at the University of Michigan.

The official record regularly mentions Michigan graduates in the official medical records of the Civil War, along with contributions to periodicals and medical books. Each surgeon contributed value in their unique way, but each could reflect on their training, seeing the value of their education at the University of Michigan. Graduates used scientific understanding and medical knowledge to serve in one of America’s greatest health crises. The experience of their education and wartime work helped them shape a post-war medical system that would forever change America. During the Civil War, thrust these doctors into an overwhelmed medical field that would evolve rapidly throughout the conflict. The Union Army Medical Department shifted entirely away from the pre-war individualistic practice of medicine toward a team-oriented and scientifically driven field. Standing out in this new era of medicine required able physicians. University of Michigan graduates offered value for the conflict in all areas of Civil War medicine. Contributions from Michigan graduates came from all areas of science during the Civil War.

We can start attributing value to antebellum and wartime medical education from the findings. Medical students had received the most advanced scientific education in America before the war. They learned from medical experts in critical scientific areas like anatomy, pathology, physiology, surgery, and others. Historians often neglect the value of education due to the quality of matriculants and the state of medicine before the war. The value of the graduate depended on the school the student attended, along with their mental aptitude and commitment to

science. The zealous medical school graduate was ideally situated to challenge the established ideas surrounding science and medicine. This group of students, the graduates of the University of Michigan, found value in their medical training as a bridge to their Civil War medical careers.

We can sense that the University of Michigan has one of the best medical programs in the country. High acceptance rates do not reflect the medical school graduate who went through two years of grueling education to earn their Michigan doctorate. They learned skills necessary to serve as Civil War surgeons in the field hospital and the scientific laboratory. The knowledge passed on from their professors made them valuable assets to work with the scientific changes occurring during the Civil War. Overall, the study shows the founders of the University of Michigan outfitted the school for a nuanced place in medical history due to the state's medical history, the intellectual history of the era, the faculty, and other staff. The school passed along the changes in medical science to the students, and the faculty constantly evolved their teaching to fit with modern science.

This study should answer some broad questions surrounding the value of Civil War medical education. The evidence presented seems adequate to supplant some common myths surrounding medical education, showing that value was relative to the school or region. This should answer some broad questions surrounding the substance of antebellum and wartime medical school classes. Medical school graduates who served in the Civil War had spent two years in the classroom at various schools, and each had spent countless hours in the classroom. These lessons were not merely forgotten and served as a basis for their medical careers. Medical schooling was not entirely worthless and gave students a foundation of medical and scientific knowledge.

The research conducted here offers valuable contributions to several areas. This shows that medical education is more valuable than previously thought. This can help us understand the Civil War as a moment in medical history and its importance as a conduit for change. The readiness of Civil War surgeons through education can expose some of the more essential parts of pre-war medical education to better understand future preparations for wartime medicine. This study offers value in several other ways. First, this study shows that medical schools were the first major scientific academic institutions in the United States. The era of change in education, the 1840s to 1890s, began before the Civil War, with the war in the middle of these fifty years. Historians generally overlook the medical school innovators from this period due to the overwhelming dominance of the Civil War. Some brilliant innovators were drivers for scientific and medical school change that served to prepare a generation of Army surgeons.

Secondly, this study shows that some schools were eager to prepare quality doctors for their communities. While the history of medical education before the war illuminates the greedy, money-driven medical educators with no desire to take a financial loss, there were innovators driven toward quality over quantity. The University of Michigan fits into this area of study where the quality of the doctor was more important for a state-run school than it was for privately owned proprietary medical schools. Third, this research contributes to the history of the University of Michigan, which supplied a large percentage of its early graduates to the Army Medical Department. This can help fulfill the legacy of the University of Michigan and shine a light on the school's contributions to science and medicine. Finally, this study contributes to the place of treatment in Michigan's state history. This study directly addresses Michigan's rise as a leader in medicine and medical education to the research conducted in this study.

The limitations of this study center on the number of medical schools open for study. Comparing the University of Michigan's quality to other schools required research of other medical colleges. The narrow parameters of both time and scope required narrowing the study be to some of America's oldest medical schools, Harvard University, The University of Pennsylvania, Jefferson Medical College, and one famous proprietary medical college, the Geneva Medical College. There were dozens of possibilities, all within different regions of the country. Still, the older and bigger schools contributed some of the most significant medical and scientific contributors to the Civil War. Comparing the established medical schools of excellent reputation to the University of Michigan required dismissing numerous others.

The original parameters of this study focused on the surgeons who attended the University of Michigan and later served in the Civil War. In the typical trajectory of historical studies, the topic was eventually narrowed to focus on medical education. The Bentley Historical Library at the University of Michigan offered the large majority of research as both Michigan's main historical library and the archive for the medical school itself. There was a wealth of knowledge surrounding the medical school, medical students, graduates, and state history. For the Civil War, the *Medical and Surgical History of the War of the Rebellion* and medical periodicals had to serve as the basis for individual wartime contributions. The MSHWR is a tremendous medical history but often lacks detail. Many contributions listed are only a few words with little reflection or emphasis. As this had to serve as the basis for Civil War research, a wealth of Civil War case reports were left unattended in places like the National Archives, the National Museum of Health and Human Medicine's Otis Historical Archives, and numerous others. As the focus of this study was to understand medical education, over deeply researching

Civil War medicine, the MSHWR, and periodicals had to be the primary source of information for Civil War cases.

Studying scientific and medical education in the Civil War did require a scientific frame of reference. This was needed to understand the value of the school's scientific teaching and medical procedures. The author did have an adequate educational background in the sciences, having once pursued a medical career, but some holes in personal experience required some outside influence. Family members with medical backgrounds, including the author's father, a practicing Dermatologist, the author's wife, a Veterinarian, and other family members working in medicine, were constantly referenced for questions surrounding science and medicine. Consultations filled knowledge holes along with follow-up research in medical textbooks, medical articles, encyclopedias, and other sources. Personal experience allowed me to derive the valuable science of the studied medical education through a personal understanding of science and medicine, which can be fallible. Still, all due diligence must take place to ensure accuracy.

The outcome of this study and the questions pursued offer exciting opportunities for future research. First historians can be inspired to research different medical schools further. Challengers to Michigan's dominance are possible, and that avenue should be explored. Second, along that same line of study, historians can delve deeper into the regional value of medical schools before and during the war. Regional medical schools wituated within their historical, sociological, and cultural situations. Michigan, for instance, had a deep medical history built on scientific research and a frontier lifestyle that created a hardened and experienced medical community. States or regions, examples being the South, the Southwest, and others, all their backgrounds surrounding medical education and Civil War medicine.

A third possible research area would be understanding the substance of individual subject areas before the Civil War. Future research opportunities are available on single subjects such as surgery, chemistry, anatomy, physiology, and others to see how medical school trained students in these areas. The possibility exists to research how these areas changed as the Civil War commenced, comparing the two eras. Through this type of study, historians can conduct research to determine the value of each subject, along with schools offering the best education in each individual subject area.

A fourth question surrounding this area involves the value of medical education versus apprenticeship-trained doctors. The Union Army Medical Department filtered out incompetent doctors, and many who stayed received medical training in private practices. Historians can compare the pre-war careers and Civil War contributions of surgeons trained in apprenticeship to medical school graduates. Through all of these areas of study, historians can better understand the value of medical education before the Civil War and the state of American medicine and medical science before and during the war.

This study has diligently covered the introduced research questions surrounding medical education and the Civil War. The conclusion shows that there was value in Antebellum medical education and that the University of Michigan is one of the top medical schools for training Civil War surgeons. The recollection of this study, as outlined in this chapter, shows the different questions studied and the conclusion of each. There were some limitations in methodology, but the study still feels firmly entrenched in research and analysis. This field presents numerous opportunities for future research and exciting new questions.

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