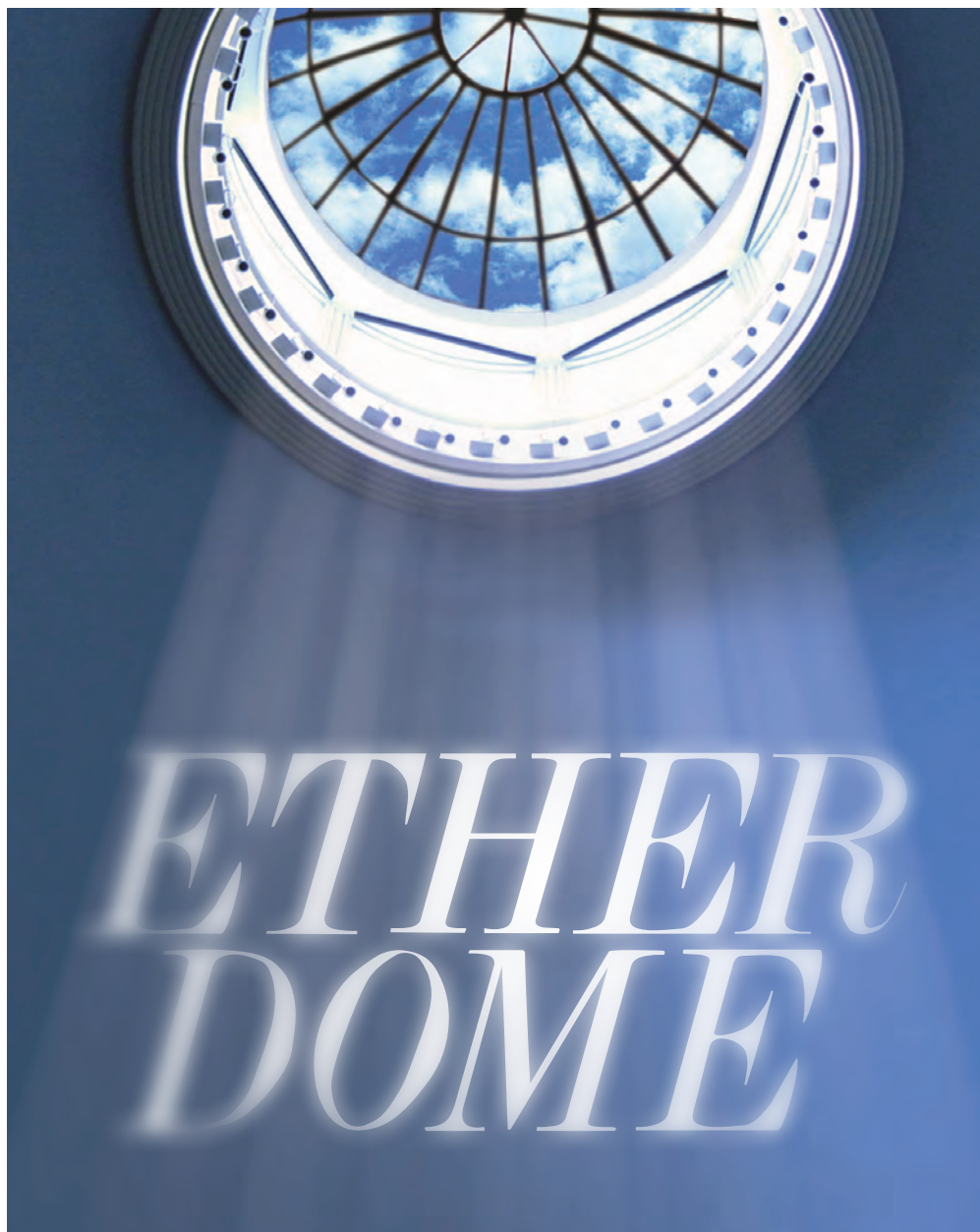


# STUDY GUIDE



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BY  
**ELIZABETH EGLOFF**

DIRECTED BY  
**MICHAEL WILSON**



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# *Study Guide Objectives*

## **COMMON CORE STANDARDS IN ENGLISH LANGUAGE ARTS**

### **Reading Literature: Key Ideas and Details 3**

- Grades 9-10: Analyze how complex characters (e.g. those with multiple or conflicting motivations) develop over the course of a text, interact with other characters, and advance the plot or develop the themes.
- Grades 11-12: Analyze the impact of the author's choices regarding how to develop related elements of a story or drama (e.g., where a story is set, how the action is ordered, how the characters are introduced and developed).

### **Reading Literature: Craft and Structure 5**

- Grades 9-10: Analyze how an author's choices concerning how to structure a text, order events within it (e.g., parallel plots), and manipulate time (e.g., pacing, flashbacks), create such effects as mystery, tension, or surprise.
- Grades 11-12: Analyze how an author's choices concerning how to structure specific parts of a text (e.g., the choice of where to begin or end a story, the choice to provide a comedic or tragic resolution) contribute to its overall structure and meaning as well as its aesthetic impact.

### **Reading Literature: Craft and Structure 6**

- Grades 11-12: Analyze a case in which grasping point of view requires distinguishing what is directly stated in a text from what is really meant (e.g., satire, sarcasm, irony, or understatement).

### **Reading Literature: Integration of Knowledge and Ideas 7**

- Grades 9-12: Analyze multiple interpretations of a story, drama, or poem (e.g. recorded or live production of a play or recorded novel or poetry), evaluating how each version interprets the source text (Include at least one play by Shakespeare and one play by an American dramatist).

## **CONNECTICUT STANDARDS IN THEATRE**

**1: Creating.** Students will create theatre through improvising, writing and refining scripts.

**5: Researching and Interpreting.** Students will research, evaluate and apply cultural and historical information to make artistic choices.

**6: Connections.** Students will make connections between theatre, other disciplines and daily life.

**7: Analysis, Criticism and Meaning.** Students will analyze, critique, and construct meanings from works of theatre.

**8: History and Cultures.** Students will demonstrate an understanding of context by analyzing and comparing theatre in various cultures and historical periods.

# *Guidelines for Attending the Theatre*

## **GUIDELINES FOR ATTENDING THE THEATRE**

Attending live theatre is a unique experience with many valuable educational and social benefits. To ensure that all audience members are able to enjoy the performance, please take a few minutes to discuss the following audience etiquette topics with your students before you come to Hartford Stage.

- How is attending the theatre similar to and different from going to the movies? What behaviors are and are not appropriate when seeing a play? Why?
  - Remind students that because the performance is live, the audience can affect what kind of performance the actors give. No two audiences are exactly the same and no two performances are exactly the same—this is part of what makes theatre so special! Students' behavior should reflect the level of performance they wish to see.
- Theatre should be an enjoyable experience for the audience. Audience members are more than welcome to applaud when appropriate and laugh at the funny moments. Talking and calling out during the performance, however, are not allowed. Why might this be?
  - Be sure to mention that not only would the people seated around them be able to hear their conversation, but the actors on stage could hear them, too. Theatres are constructed to carry sound efficiently!
- Any noise or light can be a distraction, so please remind students to make sure their cell phones are turned off (or better yet, left at home or at school!). Texting, photography, and video recording are prohibited. Food and gum should not be taken into the theatre.
- Students should sit with their group as seated by the Front of House staff and should not leave their seats once the performance has begun. If possible, restrooms should be used only during intermission.

# AN INTERVIEW WITH THE PLAYWRIGHT ELIZABETH EGLOFF



Playwright Elizabeth Egloff is a Farmington native and Trinity College graduate. After studying poetry in school, she went into publishing before focusing on writing plays. While earning a graduate degree at Brown University, Egloff discovered that playwriting was not just for men, but that she could offer her own unique perspective as a female playwright. She pursued this passion and graduated with an M.F.A from the Yale School of Drama. Her first play, *The Swan*, premiered at Yale Repertory Theatre and was later produced at the Public Theatre in New York. It has since been performed across the United States and internationally. Her plays have been produced at regional theaters throughout the country and include *The Devils*, *The Lovers*, *Phaedra*, and *Peter Pan and Wendy*. Egloff is an Emmy nominated screenwriter and has won the Helen Merrill Award, the Lila Wallace Foundation Writer's Award, the Oppenheimer Award, and the Kesselring Prize. Dramaturg Shirley Fishman sat down with Egloff to discuss writing and the production process of *Ether Dome*.

**Shirley Fishman:** What inspired you to write a play about the circumstances of the discovery of anesthesia?

**Elizabeth Egloff:** I got a phone call from Michael Wilson in the summer of 2005. He was the Artistic Director of Hartford Stage at the time, and the theatre received a grant from the state of Connecticut to commission a play inspired by local historical events. One day while he was walking in Hartford's Bushnell Park he came upon a statue of Horace Wells. He asked a friend who he was. That's when the idea for the play started.

He talked to me about writing a play about Horace Wells, a dentist in Hartford who had something to do with the discovery of ether — that he was robbed of the credit by his student and that nobody knows what really happened. He thought that the story might be a great idea for a play.

**SF:** Why did Michael think you would be the right person to write this story?

**EE:** He knew that I had grown up in Farmington, CT, where Morton's wife lived before they married. I went to school in West Hartford and college in Hartford. And I was steeped in the Hartford view of the world and of itself. I was thrilled to take it on — I love plays about history and politics.

As I researched, I became hypnotized by the story of the four men who were at the center of the ether controversy: Horace Wells, William Morton, Dr. Charles T. Jackson and Dr. John C. Warren who were esteemed surgeons at Massachusetts General Hospital, one of a handful of respected medical schools in the country.

Wells had been investigating ways to alleviate his patients' suffering during dental surgery. He witnessed a man who injured himself after inhaling laughing gas. When he saw that the man felt no pain, he wondered if the gas could be used on his patients. He successfully experimented with the gas, and Morton suggested he demonstrate the procedure in Mass General's operating theatre. The stakes for Wells' demonstration in the hospital's dome were very high. When it failed, it launched a medical competition that would change history and the destinies of those four men.

Jackson claimed he had given Morton a vial of sulphuric ether so that he could painlessly extract his wife's tooth. Morton took both Wells' and Jackson's ideas and climbed his way into Mass General's dome and into the medical history books. Wells, a sensitive idealist, was irreparably wounded by Morton's betrayal and descended into depression and addiction. Some believed Wells was the inspiration for Robert Louis Stevenson's novel *Dr. Jekyll and Mr. Hyde*.

At a certain point, I realized that there were inconsistencies; the story was different depending on whose version I read. But the brutal fact remained that Morton deserved the credit — he was the one who picked up the ball when no one else did and took it all the way into the end zone. Harvard Medical School and Mass



State of Horace Wells in Bushnell Park, Hartford CT.  
Photo: Aurelia Clunie.

General's library accounts have always credited Morton, but no mention is made about his scandalous past. Jackson receives some credit for helping Morton with research. Their accounts don't mention Wells. After the 2001 publication of Julie M. Fenster's book, *Ether Day*, Harvard began to include small references to Wells, so he's no longer invisible.

**SF:** It's an epic story and incredibly dramatic. How did you create a play from this factual story?

**EE:** In order to put it on stage, I needed to decide whose story it was. After many drafts, it finally came to me that it's Horace's story; his struggle and downfall frames the play. There were so many people involved, I had to compress a number of Mass General doctors into Drs. Haywood, Bigelow and Gould. These three men, along with Jackson, became the chorus of the play. The factual events occurred between 1845–1870, but I collapsed the story, into one year. The arc of the story hasn't changed since my first draft.

**SF:** *Hartford Stage commissioned the play, but the first production was at the Alley Theatre in Houston. How did that come about?*

**EE:** I didn't actually have a first draft of the play until 2008. We did a reading in New York in December 2010. Gregory Boyd, Artistic Director of The Alley in Houston, Texas, came to see it. After the reading, he stopped me in the hallway and said he wanted to produce the play. It opened at the Alley the following September.

**SF:** *Were you hoping for a production at another theatre after the play closed at the Alley?*

**EE:** The economic reality of the American theatre is that *Ether Dome*, with 15 actors and a production of size, is a huge investment for a theatre. When Christopher Ashley decided he wanted to produce the play, he reached out to Hartford Stage and Boston's Huntington Theatre, and they decided co-produce the play. It's great — so much of that story happened in Hartford and Boston — it's a natural fit.

**SF:** *What resonance does the play have for contemporary audiences?*

**EE:** It's not just a story about who discovered ether. It's about the values of American society in the 1840s and their attitudes toward medicine, science, religion and human suffering. Until ether was discovered, doctors used herbs, tinctures and ointments they bought from liquor stores. Doctors prescribed remedies like alcohol or laudanum, but couldn't find the right level of sedation or consistency to insure pain relief. By the 1800s, speed was the only relief from pain. Doctors were going through surgery as fast as they could; a leg could be amputated in 2.5 minutes. The problem was that patients could go into shock, and more than half the time they died. Surgery was so abhorrent, patients would rather commit suicide than submit to a medical or dental procedure. If ether had not been discovered, and Morton hadn't found a way to administer it, who knows how long it would have taken for us to develop painless surgery.

When Morton found a way to administer ether, he wanted to charge money for it. At the time, to ask a patient to pay for pain relief went against everything that medical establishment stood for. Today, the idea of providing medicine for free is unheard of. The issue of doctors, drug medicine and the treatment of patients continues to be controversial, and the battle for credit among researchers, hospitals and pharmaceutical companies is still going on.

*Ether Dome* is also the story of men with tremendous hubris. Despite their pursuit of recognition for their contributions to the discovery of anesthesia, Warren, Wells, Jackson and Morton were all brought down by the historic events of October 16, 1846. But they all played their part to bring medicine into the modern age.

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## QUESTIONS:

- Consider your neighborhood and city. Are there any landmarks that pique your curiosity? What stories would you like to uncover about your city's history? In what medium (drama, film, poetry, historical fiction, etc.) would you want to tell it? Create a draft and share it with friends.
- Based on Elizabeth Egloff's description above and your own research, define a "co-production." How does this process differ from other plays performed at Hartford Stage, regional theaters, or producing venues? What benefits do you think lie in shows that are co-produced by multiple theaters? What drawbacks lie in co-productions?
- The medical ethics of the early 1800s prohibited charging money for treatments or pain relief. When Morton tried to patent and sell ether anesthesia, he introduced a rapidly growing model of providing treatment for cost. It was rejected at the time, but has since become normal. Which method do you think is better for patients? Better for hospitals? Better for advancing medicine? Why?

# WHO'S WHO OF HARTFORD AND BOSTON, 1846

By Aurelia Clunie and Alexandra Truppi

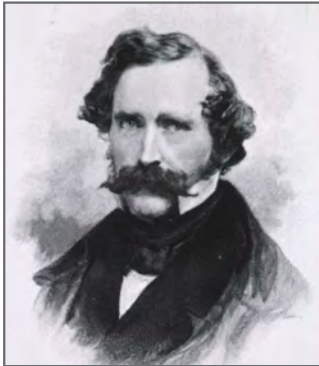
## Hartford Dentistry and the First Anesthesia Experiment

- **Dr. Horace Wells** (1815-1848) was a dentist with a practice on Main Street in Hartford, CT. On December 10, 1844, he attended a presentation on laughing gas by Gardner Q. Colton, and considered the possibility of using the substance to operate without pain. On December 11, Wells underwent the extraction of one of his own teeth while under nitrous oxide induced anesthesia. While demonstrating the use of nitrous oxide at Harvard Medical School in 1845, the patient woke up and Wells was disgraced in front of Boston's dominant medical community. Wells ultimately became addicted to chloroform, and after throwing acid on two prostitutes in New York City, was imprisoned at Tombs Prison. Wells committed suicide by inhaling chloroform and cutting an artery in his leg. He was recognized posthumously by the American Medical Association as the discoverer of anesthesia. His discovery of anesthesia and fall from grace are depicted in *Ether Dome*.



Presumed portrait of Horace Wells. Courtesy of the Lyman Maynard Stowe Library, University of Connecticut Health Center.

- **William Thomas Green Morton** (1819 – 1868) was best known for introducing sulfuric ether to the medical community. Morton apprenticed Dr. Horace Wells and Dr. Charles Jackson, both of whom shared with him



William Thomas Green Morton. Courtesy of the National Library of Medicine.

- the anesthetic properties of nitrous oxide and sulfuric ether, respectively. Morton claimed to have attended Baltimore Dental College, but never graduated from dental college or medical school. In 1843, he married Elizabeth Whitman on the condition from her father that he study medicine. On October 16, 1846, Morton administered ether in the first recorded anesthetized surgery at Massachusetts General Hospital. Morton kept the substance secret and attempted to patent it under the name "Letheon." While his patent was revoked, Morton appealed multiple times to the U.S. Congress for compensation and sole recognition as anesthesia's discoverer. Morton refused medicine's prestigious Montyon Prize, which in 1850, was awarded to him and Charles Jackson jointly. In 1852, he received an honorary degree in medicine from Baltimore's Washington University.
- **Faith Trumbull Wadsworth** (1769-1846) was the niece of John Trumbull, the famous Revolutionary War painter. She married Daniel Wadsworth, a wealthy Hartford philanthropist, in 1794. Horace Wells extracts her tooth in the first scene of *Ether Dome*.
- **Gardner Q. Colton** (1814-1898) was a Vermont native who, in 1844 at New York's Broadway Tabernacle, debuted his "Grand Exhibition," demonstrating the effects of inhaling nitrous oxide gas. Initially a medical student struggling to pay tuition, Colton seized the opportunity to tour

## TIMELINE OF HISTORICAL EVENTS

by Aurelia Clunie and Conor Proft

- 1723 – Pierre Fauchard publishes *The Surgeon Dentist, A Treatise on Teeth*, and becomes the "Father of Modern Dentistry."
- 1760 – After emigrating from England, John Baker becomes the earliest known medically-trained dentist practicing in America.
- 1760-1780 – Issac Greenwold is the first American-born dentist to practice in this country.
- 1772 – Historian Joseph Priestley discovers the gas nitrous oxide.
- 1776 – Paul Revere practices dentistry, and becomes the first to identify a person post-mortem using dental records.
- 1789 – The first patent for porcelain teeth is obtained by Nicolas Dubois de Chemant, a Frenchman.
- 1799 – Englishman Thomas Beddoes advocates the medical application of gasses and arranges for their study at his recently opened laboratory, the Pneumatic Institution.

- 1800 – Humphry Davy writes the pamphlet *Researches, Chemical and Philosophical; chiefly concerning nitrous oxide* about his observations of the gas.
- 1801 – *Treatise on Human Teeth*, by Richard C. Skinner, is the first book on dentistry published in America.
- January 21, 1815 – Horace Wells is born.
- August 9, 1819 – William Thomas Green Morton is born.
- 1833 – The Crawcour brothers bring amalgam to the United States. A decades-long controversy erupts over using this mercury-based alloy in fillings.
- 1836 – Horace Wells moves to Hartford, Connecticut.
- 1838 – Horace Wells marries Elizabeth Wales. One year later, Elizabeth gives birth to their son, Charles.
- 1839 – Charles Goodyear develops vulcanization, a process that hardens rubber. This leads to the development of Vulcanite dentures.
- 1840 – The Baltimore College of Dental Surgery is founded.

his successful “Grand Exhibition” on the New England lecture circuit. In the mid-1800s, lecturing was a popular form of entertainment and public education. Horace Wells attends Colton’s lecture in *Ether Dome*.

### Other Influential Hartfordites of the Mid-19<sup>th</sup> Century

- **Dr. John M. Riggs** (1811-1885) was a dentist practicing in Hartford, CT. A former apprentice to Horace Wells, Riggs discovered “Riggs disease,” a form of gum disease, and is known as the father of modern periodontics. John M. Riggs performed the initial anesthetized tooth extraction on Horace Wells in December 1844.
- **Daniel Wadsworth** (1771-1848) was a wealthy philanthropist who founded America’s first public art museum, the Wadsworth Athenaeum, in 1842. He collected works by famous artists including history paintings by John Trumbull and Hudson River School landscapes by Thomas Cole.
- **John Trumbull** (1756-1843) was a 1773 Harvard graduate and served in the Revolutionary War as General Washington’s aide. Trumbull studied painting in London with Benjamin West and returned to the United States as a celebrated painter. Known for his depictions of the Revolutionary War, Trumbull was commissioned by Congress to paint works in the Capitol’s rotunda.



The plaque commemorating the location of Wells’ office where Dr. John Riggs extracted Wells’ tooth while under the influence of nitrous oxide. Main St., Hartford, CT. Photo: Aurelia Clunie

### Members of Dr. Warren’s Thursday Night Club

- **Dr. John Collins Warren** (1778-1856) was a founding member of Massachusetts General Hospital and its first Chief Surgeon. He also founded the *New England Journal of Medicine*, was the first Dean of Harvard Medical School, and served as the third president of the American Medical Association. He performed the first surgery to use ether as an anesthetic, depicted as the central event of *Ether Dome*.



John Collins Warren, M.D. Engraving by T.B. Welch. Courtesy of the National Library of Medicine

- **Dr. Charles Jackson** (1805-1880) was a physician,



mineralogist, and geologist. He is remembered for his involvement in multiple conflicts over scientific discoveries that were credited to others but for which he claimed responsibility, including the low explosive material known as guncotton, the telegraph, and the digestive actions of the stomach. His conflict with William Morton over the discovery of the anesthetic uses of ether is depicted in *Ether Dome*.

Portrait of Charles T. Jackson, M.D. by Damoreau. Courtesy of the National Library of Medicine

- **Dr. Louis Agassiz** (1807-1873) was a biologist and geologist who served as a professor of zoology and geology at Harvard University. Agassiz founded the university’s Museum of Comparative Zoology and made major contributions to the related fields of ichthyology and glaciology. Agassiz’s

scientific reputation has been somewhat tainted, however, by his writings on polygenism (a theory that posits that the human races grew from different origins) and his resistance to Darwin's theory of evolution.

- **Dr. Henry Jacob Bigelow** (1818-1890) was a surgeon and professor at Harvard University. In November 1846, the *New England Journal of Medicine* published an article by Bigelow titled "Insensibility During Surgical Operations Produced by Inhalation," in which he detailed the operation performed by Dr. Warren with the help of ether administered by William Morton. For the publication's 200<sup>th</sup> anniversary in 2012, readers voted Bigelow's article the most important in the journal's history.



Henry Jacob Bigelow, M.D. Massachusetts General Hospital Archives and Special Collections

- **Dr. Augustus Gould** (1805-1866) was a physician as well as a professor of botany and zoology at Harvard University. Gould served as president of the Massachusetts Medical Society but was also known for his work in the field of conchology, the study of mollusks. He co-authored *Principles of Zoology* with Dr. Louis Agassiz.
- **Dr. George Hayward** (1791-1863) performed the second public surgical procedure and the first amputation with the aid of ether anesthetic.
- **Dr. George Parkman** (1790-1849) was a member of one of Boston's wealthiest families and a Harvard University graduate who received his medical degree at the University of Aberdeen in Scotland. Parkman worked with Dr. John Collins Warren on the publication of the *New England Journal of Medicine* and was a proponent of humane methods of psychiatric treatment. He was also known for his many real estate dealings in Boston.

#### Other Influential Bostonians of the Mid-19<sup>th</sup> Century

- **Daniel Webster** (1782-1852) represented Massachusetts in the United States House of Representatives and Senate, and served as Secretary of State under Presidents William Henry Harrison and Millard Fillmore. In *Ether Dome*, William Morton and his wife, Lizzie, live next door to then-Senator Webster.
- **Henry David Thoreau** (1817-1862) was an author, poet, and historian known for his fierce opposition to slavery and his writings on natural history and philosophy.
- **Oliver Wendell Holmes** (1809-1894) was a Cambridge, Massachusetts-born physician who graduated from Harvard but is remembered more for his poetry and other literary writings, many of which used Boston as its subject matter. While serving as a professor of anatomy and physiology at Dartmouth College, Holmes coined the term "anesthesia," meaning "lack of sensation," in a letter to William Morton.

- **Ralph Waldo Emerson** (1803-1882) was an essayist, poet, and leading Transcendentalist who mentored fellow writer, Henry David Thoreau. A Boston native, Emerson attended Boston Latin School and Harvard University. After graduating from Harvard Divinity School, he briefly served as pastor of Boston's Second Church, was a member of the Boston School Committee, and served as chaplain to the Massachusetts state legislature before leaving the clergy. Emerson spent the majority of the remainder of his career as a traveling lecturer.



Ralph Waldo Emerson

- 1842 – Dr. Crawford Long uses sulfuric ether to anesthetize two patients at his small Georgia practice, but neither publishes nor publicizes the results of this work.
- 1842 – Horace Wells takes on William Morton as a student. The two enter a business partnership to promote Wells' invention of gold dental platework in Boston. They meet Dr. Charles Jackson for advice on securing the patent.
- October 1843 – Wells and Morton solicit Dr. Charles Jackson, a leading chemist and geologist, for an endorsement of Wells' gold plate product.
- October 1844 – Wells and Morton end their partnership. Wells returns to Hartford while Morton stays in Boston.
- 1844 – The Wadsworth Athenaeum opens in Hartford, CT.
- December 10, 1844 – Horace Wells attends a laughing gas demonstration by Gardner Q. Colton.
- December 11, 1844 – Having obtained a bag of nitrous oxide, Horace Wells anesthetizes

himself at his office and Dr. John M. Riggs, another dentist practicing in Hartford, extracts Wells' tooth. Wells reports, "It did not hurt me more than the prick of a pin. It is the greatest discovery ever made!"

- 1845 – Horace Wells performs a demonstration of his nitrous oxide technique at Harvard. The demonstration, however, goes poorly, and the dentists, doctors and students in the audience are not convinced that the drug has been effective.
- October 16, 1846 – William T.G. Morton conducts the first successful public demonstration of the use of ether anesthesia for surgery at Massachusetts General Hospital's operating theater.
- 1846 – Over the course of seven years, William Morton makes four separate appeals to Congress for compensation of \$100,000 and recognition as the discoverer of inhaled anesthetics.
- November 4, 1847 – Obstetrician James

## THEMES FOR WRITING AND DISCUSSION

### Altruism vs. Ambition

by Alexandra Truppi

Practitioners in the fields of dentistry and surgery swear oaths to protect their patients and uphold high ethical and moral standards. In Elizabeth Egloff's *Ether Dome*, Dr. John Collins Warren embraces his profession's values. A vision of humane care was a major motivator for both Egloff's fictional portrayal of Dr. Warren, as well as the real-life man, who in 1811 was one of the founders of Massachusetts General Hospital, the third hospital in the United States to offer round-the-clock medical treatment to the general public. Hartford dentist Horace Wells shares Dr. Warren's sentiments, and believes that "no one should have to suffer" if that suffering can be prevented. The remedy for pain should be "free as the air we breathe," he says (II, 8).

Although William Morton apprentices in dentistry under Horace's instruction and purports later in the play to want to follow in Dr. Warren's surgical footsteps, it is clear from early on in *Ether Dome* that William is driven more by his personal ambitions than the altruistic ideals of his mentors. William is fixated on becoming rich and famous, and believes that Horace should embrace the renown that comes with scientific innovations. When Horace develops a new denture that offers more comfort than other existing designs, William is more fixated on the potential benefit to Horace's finances than on the benefits to patients.

WILLIAM: You'll be making so much money, you could move to Asylum Hill — and have your own driver — and your own carriage —

HORACE: Mrs. Wells and I are nothing more than a pair of church mice, and we like our little nest, just as it is.  
(I, 1)

Horace firmly believes that those who are called by God to work in medical fields must do so selflessly with no interest in their own personal gain: how can they care for the poor and disadvantaged if they have never been poor or disadvantaged themselves? This religiously-based philosophy guides both Horace's own practice and the medical ethics he tries to impart to William. "Dr. Wells says that doctors are supposed to be poor. If you want to cure your patient, be as poor as he is, because that's the only way you'll ever understand what's making him sick" (I, 3).

When Horace agrees to send William to open a new dental office in Boston, William is ecstatic — not over the opportunity to bring high quality dental treatments to Bostonians, but over how being able to call himself "a Boston dentist" will elevate his own social status. When he arrives in Boston, however, he finds that the elite society he envisioned would embrace him as a peer is unreceptive. At a meeting of Dr. Warren's Thursday Evening Club, William tries to blend in and ingratiate himself to the group. He flatters Dr. Charles Jackson, considered one of the foremost scientific minds in the country, and appeals to the scientists' sense of honor by declaring surgeons to be godly men. "In the same



Left to right: Ken Cheeseman, Richmond Hoxie, Gregory Balla and Bill Kux



way that Jesus called His apostles, he called you to be surgeons,” William notes, “Saying, ‘drop all your wealth and all your pride, and follow Me, for I will make you healers of men’” (I, 3). William attempts to elevate the other men’s perception of him by exaggerating his dental training and proclaiming that they can expect great things from him. “I’m going to invent something huge. Gigantic,” William boasts. “Something that will change the world, change history.” But when Dr. Bigelow inquires as to what he plans to invent, William is at a loss. Unlike Horace Wells, who invented new dentures to improve patients’ quality of life, and Dr. Warren, who founded a hospital to extend healthcare to the masses, William lacks an altruistic source of inspiration. William answers Bigelow’s question honestly: “I don’t know yet” (I, 4).

As attendant members of Dr. Warren’s club decry the absent Dr. Parkman’s preoccupation with real estate — “he’s closing on another tenement in the South End!”— William remains unfazed by the doctors’ disdain for medical professionals who grow wealthy off other pursuits. Instead, the opportunity to meet with these impressive members of Boston society only inspires William to want to join their ranks. He abandons his obligations to his previous mentor, Horace Wells, and begs Dr. Charles Jackson to take him on as his new protégé. “Dr. Jackson,” he begs, “Do you think I could be a surgeon? Would you teach me to be a surgeon? I’ll mop your floors! I’ll clean the laboratory! Please,



Tom Patterson and Liba Vaynberg

Jackson, I absolutely must be a surgeon” (I, 3). The small allowance from Horace with which William arrived in Boston was intended to support him while getting Horace’s new Boston office off the ground; before long, William has spent the money on new clothes and grooming products to help him fit in with Boston’s elite. When he buys a home just outside of Boston, he flaunts his new friendship with his well-known next door neighbor, Senator Daniel Webster, and increases his efforts to persuade Dr. Jackson to teach him. “You’re a surgeon — a chemist — a geologist,” William tells Dr. Jackson. “You’re an inventor... The Government Patent Office does anything you tell it. That makes you famous — *and you’re a professor at Harvard*” (I, 6). Despite Jackson’s initial disinterest in taking him on, William’s efforts to associate himself with Jackson, who some refer to as “the genius of Boston,” are successful. Jackson becomes William’s teacher, thus raising William’s status by way of association.

Although he is not a trained physician and does not even have a formal degree in dentistry, other members of Jackson’s circle soon begin referring to William as “*Doctor*” Morton. William’s aspirations grow with the success of an anesthetic compound he claims to have created and he adopts the title of “Doctor” to lend credibility to his decision to charge licensing fees for use of the compound. When Dr. Warren and others object to the fees and claim that it is unethical to require patients to “pay to *not* suffer,” William draws a sharp distinction between the doctors’ altruistic priorities and his own personal ambitions. “Gentlemen, this is my invention, and I own it,” he declares. “I don’t know what you doctors have against making money — as if Hippocrates is going to rise up from the grave, and scold you” (II, 4). William insists there is no conflict of interest in profiting from something designed to help people, but Dr. Warren’s principles

Simpson of Edinburgh, Scotland, discovers the anesthetic properties of chloroform. Less flammable and longer lasting than ether, chloroform becomes a leading anesthetic in Britain.

- 1848 – Horace Wells commits suicide in New York’s Tombs Prison.
- April 12, 1861 - The American Civil War begins. Anesthesia via ether and chloroform are used in surgery on battlefields.
- 1864 – The recently formed American Dental Association honors Wells, posthumously, as the discoverer of modern anesthesia.
- 1868 – William T.G. Morton dies.
- 1870 – The American Medical Association similarly recognizes Wells’ accomplishments.
- 1905 – Alfred Einhorn, a German chemist, formulates the local anesthetic procain, later marketed under the trade name Novocain.

forbid him from paying for something that he believes should be available to anyone. He declares that Massachusetts General Hospital “will never sell its soul” to Morton by forcing patients to pay for pain-free medical procedures (II, 4). But William is determined to solidify his own position in history:

Yes, suddenly you’re seeing me, aren’t you? You’re seeing me very clearly . . . And I’m not just a dentist from Hartford, am I . . . I am granting the General free and full use of [the compound] for the life of the patent . . . And I, William Morton, will recognize the contribution that the General has made [to its invention] . . . In return, you — the General — will recognize me for my contribution to the field . . . no — to the Art of Surgery. I will be a recognized Doctor in this hospital — equal to all of you.

(II, 4)

## QUESTIONS:

- In Act I, scene 6, Dr. Jackson states that he is not “famous” but “known.” What is the difference? Does Dr. Jackson care about becoming famous? Why or why not?
- Consider William’s pattern of serving as an apprentice to men who are masters in their fields (dry goods store owner Phineas Cook, dentist Horace Wells, and surgeon Charles Jackson). What does William claim to have wanted out of these relationships? Why did he stop working for Phineas Cook? Compare and contrast this split with William’s falling-out with Horace Wells.
- Did William Morton invent Letheon? How much of his discovery does he owe to Horace Wells and Charles Jackson? Under what circumstances does he consider giving partial credit to others?
- Is ambition a good thing or a bad thing? Why?
- Is it ethical for scientists or companies to profit from discoveries that benefit humanity? Why or why not?

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## REMOVAL OF PAIN

by Alexandra Truppi

*“Four minutes and 28 seconds! You’re still the fastest dentist in Hartford. It makes a big impression when I tell somebody that they’ll scream half as long with you as they would with anyone else” (I, 1).*

William Morton tracks the time it takes for his mentor, dentist Horace Wells, to perform various procedures so he can use the readings as marketing tools. Opium, which contains the pain reliever morphine, is suitable only for helping the patient manage their post-operative pain with sleep, so there is significant pressure to find an alternative to dull or even remove the pain of major medical and dental procedures. With few options available in the mid-19<sup>th</sup> century, William believes that the ability to work quickly will help drive demand for Horace’s services.

But is it even possible to completely remove the sensation of pain? At an event to demonstrate the effects of laughing gas, Horace thinks he may have found the answer. Horace suffers a broken nose while under the influence of the gas, but to his surprise, does not feel any pain. “I broke my nose,” he recounts to Dr. Warren in Act I, scene 4. “But it was remarkable because for about 15 minutes, I felt no pain — absolutely none — which made me think that perhaps the gas was responsible.” Later that night, Horace successfully tested his theory by gassing himself again and convincing a colleague to pull one of his teeth. Soon, he began experimenting on his patients, with positive results. When Horace secures an invitation to share his findings with Dr. Warren’s Harvard Medical School class at Massachusetts General Hospital, he has high hopes that his presentation will be a first step towards revolutionizing pain-management.



18th Century dental key. Courtesy of the Lyman Maynard Stowe Library, University of Connecticut Health Center.

Horace admits that while his discovery of a medical application for laughing gas seems novel, the idea is actually an old one. “Laughing gas has been in existence for 2,000 years,” he says, but it was 75 years prior that Dr. Thomas Beddoes discovered oxygen, “leading to Humphry Davy’s classic text . . . in which [he] first wrote that Nitrous Oxide might be used for pain relief during surgery . . . and that somebody should look into it . . . but not one has looked into it” (I, 4). William Morton’s wife, Lizzie, however, could have educated Horace about the gas’s usefulness for dulling pain, though

hers is of an emotional kind. She and her friends at Miss Porter's school used to make laughing gas themselves, and in a conversation with Horace's wife, Elizabeth, Lizzie explains that her intense physical sensitivity and psychological strain led to her abuse of laughing gas. "Do you want to know something terrible about me?" she asks Elizabeth. "I can't take pain . . . I can't. I scream like a baby. I scream and cry at the tiniest things. If I bump my elbow . . . if the cat scratches me . . . even when I brush my own hair. That's why I can't have babies. I can't. I won't . . . Anyway, that's why I like to get gassed, because when I'm gassed I forget how weak and cowardly and fat I am" (I, 4). When William has to draw on his dental training to pull one of Lizzie's teeth, he is uncertain of how to deal with his wife's hypersensitivity, and seeks out Dr. Jackson's advice:

WILLIAM: Mrs. Morton has an impacted wisdom tooth, and I have to pull it out — but she doesn't want me to touch it. She won't even let me near her. So I was going to give her laughing gas, but I don't know... Have you ever used Myrrh?

JACKSON: ...I say give her a pint of gin.

WILLIAM: I did that yesterday. She drank half of it, threw up, and argued with me all night... Do you have any ideas about what else I could give her? I know what! I could mesmerize her! We go to a mesmerism club in Brighton. Lizzie's very good at it.

(I, 6)

Eventually, Jackson offers a suggestion of using sulphuric ether, a substance with effects similar to Horace's own laughing gas, to put Lizzie to sleep while William cares for her teeth. This fateful encounter leads to William's realization that the ether, to which he later adds an oil from oranges and calls Letheon, could be similarly used during major surgeries. When William demonstrates Letheon's application in Dr. Warren's class at Massachusetts General Hospital, he succeeds in suppressing pain where Horace Wells had previously failed.

William's success raises the question of whether mankind has the right to remove pain, even if the means to do so are developed. Dr. Warren thinks the answer may be "no." "There will never be an end to pain," he says, "because we can't live without God and He can't live without us" (I, 3). William also feels that there are certain situations that mandate suffering. When Lizzie inquires whether William would give her Letheon if she needed it, he answers that he certainly would if she were having surgery. Lizzie clarifies:

LIZZIE: I'm just thinking about... When I go into my confinement... would you give it to me... you know... for the... pain.

WILLIAM: Letheon is for traumatic pain —

LIZZIE: Yes, I know, that's why I'm asking. Would you give it to me, if I were in terrible, terrible pain? If something goes wrong... If the baby's not... coming out...

WILLIAM: But the Bible says —

LIZZIE: God didn't make it, you made it — you can decide — would you give it to me?

WILLIAM: ...but...but...it would be blasphemy.

(II, 7)



Courtesy of the Lyman Maynard Stowe Library, University of Connecticut Health Center.



William may have discovered a remedy for physical pain, but as Lizzie has already explained, physical pain is not the only kind that needs relief. The emotional pain Horace feels over the failure of his laughing gas demonstration, coupled with the sense of betrayal he feels from William's decision not to credit him for his contribution to the discovery of Letheon, send Horace into a downward spiral in which he abandons his dental practice and becomes addicted to inhaling chloroform. "I never wanted to make you... suffer... that was never part of my plan," William apologizes. (II, 7). "Dearest William," Horace says, "You are a selfish, selfish little bastard."

Chloroform bottle courtesy of the Lyman Maynard Stowe Library, University of Connecticut Health Center.

## QUESTIONS:

- Consider Dr. Warren’s story about suffering in Act I, scene 3:

Ten-year-old boys don’t suffer like Jesus — even Jesus didn’t suffer like Jesus! He cried and begged like everyone else, *Please, please, Father! Don’t let me die! Don’t let me die!* And His Father loved the sound of His Son’s agony — because it made Him feel more Godly, and more Fatherly — and love His Son even more — Just as He loves the sound of our screaming and crying — It’s music to His ears — and it makes Him love us even more — and we love to be loved by our Father! So it goes round and round, on and on, which is why there’ll never be an end to pain, because we can’t live without God, and He can’t live without us.

- Why does Dr. Warren think that it may be impossible to completely stop pain?
- How does the pain of failure affect Horace Wells? How does it affect Charles Jackson?
- Research the history of over-the-counter pain medications such as aspirin, acetaminophen, and ibuprofen. Under what labels are these drugs sold? How were these medicines discovered? What kinds of pain are they recommended for? Do they have uses other than the treatment of pain?
- What does it mean to “self-medicate”? Which characters in *Ether Dome* self-medicate? Why?
- What does the “girl in white” symbolize?

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## THE NEW BUSINESS OF HEALTHCARE

by Aurelia Clunie

With his October 16, 1846, demonstration of diethyl, or sulfuric, ether as an anesthetic agent, William T.G. Morton introduced a new era of medical treatment as commodity. While Horace Wells simply wanted to share his discovery with the medical community, Morton saw the possibilities for making a profit. Elizabeth Egloff offers insight into the differing perspectives of the two early in *Ether Dome*.

In Act I, scene 1, Horace Wells is cautious about marketing his newly patented gold dentures. For Wells, quality matters. He hesitates to sell his gold dentures right away to any buyer, preferring to test them out on Mrs. Wadsworth for a period of one to two years. In the 1840s, a salesman’s word mattered, especially if the developer of the product was a professional such as Wells. Flashy advertisements sold quack products and fads. An example lies in Garner Q. Colton’s demonstration of laughing gas. While Wells arguably attends Colton’s lecture for the academic nature of the subject, many in the audience are there to be entertained. Men catcall the girl in white flitting about the stage, and they laugh and jeer when Wells and other men from the audience make fools of themselves after inhaling the gas. Colton rides a fine line. He plays the part of circus barker, giving, the audience the show they came to see while reminding them “GENTLEMEN!! THIS IS NOT AN EVENING OF ENTERTAINMENT! THIS IS AN EVENING OF *SCIENCE!*” (I, 2). While in Act I, scene 3, Dr. Warren refers to the history-altering event as “a neurological lecture,” it is clear that Colton is selling an experience. “Who wants to try it?!” Colton asks, “One Dime! One thin Dime! One thin silver Dime to Cure Your Brain!” (I, 2). In Act I, scene 1, Wells’ wife offers Mrs. Wadsworth a bowl of opium after her tooth extraction to soothe the pain and ease the patient experience. The limited pain relief was initially offered as courtesy, but by Act II, scene 4, William Morton attempts to sell the experience of a pain-free operation to anyone who will buy. Even if he was not taken seriously as a man of science, the historical Gardner Q. Colton left medical school and toured his show, and the laughing gas act proved quite lucrative (Fenster, 48-51).



Replica of William Morton’s 1846 ether inhaler. Wood Library-Museum of Anesthesiology.

William Morton also values a good business opportunity. Morton, who previously tried many lines of business (and is later found to be wanted for fraud and other charges), has set his sights on wealth and fame by any means possible. In Act I, scene 5, Morton suggests he and Horace charge rich people with bad breath 50 cents to a dollar for laughing gas when having their teeth cleaned. “Giving rich people Gas to clean their teeth...Maybe they should suffer a little,” Wells replies.

“But not if we can make some money off them, first,” retorts Morton (I, 5). He constantly seeks some health service people will pay for. He settles on ether.

Although Morton does not have the scientific background to draw his own conclusions about ether, he has the tenacity to market its use. When he first attends Dr. Warren’s Thursday Evening Club, Morton acts appalled at the idea of Samuel Morse patenting Dr. Jackson’s idea.

WILLIAM: Yes! If I stole somebody’s secret invention, I’d go to jail! But he—Samuel Morse—steals the secret of the...Electro-Magnetic Telegraph...from the smartest man in the United States—and becomes a millionaire!  
(I, 3)

By the end of the scene, Samuel Morse serves as a blueprint for Morton’s own actions. The value does not lie with the person who has the initial idea if they keep no notes and do not promote it. The value belongs to the person who capitalizes on the idea. A patent would offer William Morton the power of sole licensure—essentially the chance to own anesthesia.

WILLIAM: I know a man in Farmington who’s invented a 3-story wagon for driving out West. Three stories! And he got a Patent for it! It goes to show a Patent means nothing, anybody can get a Patent if they know Somebody!  
(I, 3)

“Mister” Morton may not have a degree in medicine or dentistry, but he can apply for a patent. The value of putting profit first stands in stark contrast to the prevailing opinion held in the 19<sup>th</sup> Century medical and dental professions. In Act II, scene 4, Morton brings his lawyer, Mr. R. H. Eddy, into the operating room. Dr. Warren is appalled by Eddy’s attempts to license use of the Letheon to the doctors at Massachusetts General.

WARREN: You...You want me to pay...?  
EDDY: No, no, not you—yes, you—but she’ll pay you back.  
HAYWARD/GOULD: Pay for it? / She’s a maid!  
WARREN: ...You want me to sell it to her?  
(II, 4)

This conflict between Morton and the doctors of Massachusetts General represents an initial fissure between health professionals who provide direct medical care and companies who own access to treatment. When Morton offers the ruined Horace Wells a job in Act 2, scene 7, he essentially outlines the beginnings of a pharmaceutical company that treats both patients and hospitals as clients. The notion and insult to their previous relationship outrages Wells, but does not shake Morton’s intent to profit.

By introducing sulfuric ether to doctors, hospitals, and patients, William Morton finally finds a product he can market. With Letheon, surgery under anesthesia becomes a life-giving experience instead of a traumatizing dance with death. Not only does ether change surgical practice, it promises the development of whole industries around surgery and hospitals. In *Ether Dome*, only Dr. Warren sees the effects of this shift at Massachusetts General Hospital.

WARREN: Now the entire world wants to have an operation, and each operation takes 10 times longer, just because it can...So many patients are living through Surgery, Hayward spends all his time ordering more beds, more nurses, more surgeons...  
(II, 8)



Tom Patterson and William Youmans in *Ether Dome*.

## QUESTIONS

- Compare Gardner Q. Colton’s demonstration of laughing gas and present day advertisements or special offers for supplements and health remedies. What parallels do you see? What differences? How has selling “improved quality of life” and/or “the power to change your body” changed in the last 168 years? How has it remained the same?
- Research the history of Listerine mouthwash, originally named for Joseph Lister, who introduced antiseptic practice in operating rooms. While bad breath was common, Listerine’s marketing campaign offered both the problem of “halitosis” and its solution. How does creating a problem and its solution increase profits? What other marketing campaigns use this method? What other marketing tactics did the Lambert Pharmaceutical Company use to promote use of the product?
- In *Ether Dome*, Dr. Gould objects to William’s selling Letheon in the operating room:

GOULD: We’ll make it, ourselves! We’ll figure it out, and make it!

WILLIAM: Even if you figure it out, Dr. Gould, the law will forbid you to use it.

(I, 5)

Research the development and use of generic drugs in the last 30 years. How have pharmaceutical companies retained control over valuable name-brand drugs? How have generic companies offered nearly identical drugs to new markets? How has access to generic drugs affected the AIDS crisis on the African continent? How has access to generic drugs in the United States affected patients’ relationships with health providers? What are the pros and cons of using generic drugs for patients?

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## FOR FURTHER EXPLORATION

### MASSACHUSETTS GENERAL HOSPITAL AND THE ETHER DOME

by Alexandra Truppi

At the beginning of the 19<sup>th</sup> century, the Pennsylvania Hospital and New York-Presbyterian Hospital were the only general hospitals (those serving a wide range of medical, surgical, psychiatric, and maternity needs for civilian patients) in the United States. A marine hospital for sailors and the Boston Dispensary, which administered to the poor, were Boston’s only large-scale medical offerings, so there was great need for a general hospital. In 1804, merchant William Phillips designated \$5,000 in his will for the creation of one, with the work to begin as soon as someone would take on the task. Soon thereafter, in 1810, Rev. John Bartlett, Chaplain of Boston’s Almshouse, began a fundraising campaign to build a hospital that would not only provide medical care but also offer opportunities for practical medical education. Bartlett was joined by Dr. John Collins Warren and Dr.



The Bulfinch Building of Massachusetts General Hospital houses the Ether Dome.



The Ether Dome at Massachusetts General Hospital allowed natural light to aid visibility in operations.

James Jackson, two professors of medicine at Harvard Medical School, who proposed the creation of the hospital in a letter to affluent members of Boston society. Their support lent valuable credibility to Bartlett’s idea, and in 1811, the Massachusetts legislature issued a charter for the incorporation of Massachusetts General Hospital (MGH). From there, fundraising efforts expanded, drawing individual donations ranging in size from 25 cents to \$20,000. Four acres of land in Boston’s west end, known as Prince’s Pasture, were designated for the hospital’s construction.

MGH opened its doors and admitted its first patient on September 3, 1821. Warren was named MGH’s first surgeon and Jackson its first resident physician; through Warren and Jackson’s affiliation, MGH became Harvard

Medical School's first teaching hospital. William Phillips also served as the first president of the MGH Corporation from 1814 until 1826 (he also served as Lieutenant Governor of Massachusetts from 1812-1823) and named the hospital as a beneficiary in his will. Today, those who include MGH in their estate plans are recognized and honored by the hospital as members of the Phillips Society.

The first building constructed for MGH at Prince's Pasture was the Bulfinch Building, named for its architect, Charles Bulfinch. The building includes the now famous Ether Dome, an amphitheater that originally served as MGH's operating room and was the site of William Morton's demonstration of the use of ether as a surgical anesthetic. Today, the Ether Dome is used for medical conferences and presentations and Harvard Medical School faculty meetings. It is a registered National Historic Landmark and is free and open to the public. MGH also houses the Paul S. Russell, MD Museum of Medical History and Innovation, which preserves the history of MGH's unique contributions to the field.

### Massachusetts General Hospital By The Numbers

Today, MGH:

- Operates **4** health centers (in Charlestown, Chelsea, Revere, and Boston's North End neighborhood) in addition to its main campus in downtown Boston.
- Offers **5** multidisciplinary care centers, focusing on cancer treatment, transplants, heart disease, vascular medicine, and digestive health.
- Admits approximately **48,000** inpatients.
- Handles nearly **1.5 million** outpatient visits.
- Records more than **90,000** emergency room visits.
- Performs more than **38,000** operations.
- Delivers more than **3,600** babies annually.

MGH also:

- Is the largest hospital-based research program in the United States with an annual research budget of **\$786 million**.
- Employs more than **24,000** people, including nearly **4,500** registered nurses.
- Includes **25** buildings in its main campus in downtown Boston.
- Was ranked as the **#2** hospital nationally and **#1** in New England in *US News and World Report's* 2013-14 "Honor Roll of America's Best Hospitals."

### QUESTIONS:

- William Morton's demonstration of anesthetic ether was a landmark moment in medical history. What other innovations and discoveries have occurred at Massachusetts General Hospital? How did these achievements impact the field of medicine?
- Who serves as Chief of Surgery at Massachusetts General Hospital today? How are his or her responsibilities similar to and different from those of Dr. John Collins Warren, the hospital's first surgical chief?
- Research MGH's annual Ether Day celebration. Who is honored on Ether Day and how?
- What criteria were used to create the rankings in *US News and World Report's* "Honor Roll of America's Best Hospitals"? In what medical specialties did MGH receive its highest ratings?
- MGH was Harvard Medical School's first teaching hospital. What other hospitals are also now connected to Harvard? What learning opportunities and experiences do medical students engage in at MGH?
- Research the work of MGH's Division of Emergency Preparedness. How do MGH staff train and prepare for major medical emergencies? How did the hospital apply its plans to respond to the Boston Marathon bombings in 2013?

# SURGERY--A VIOLENT PROFESSION

by Aurelia Clunie

The prospect of undergoing surgery before anesthesia and antiseptics was a horror-filled one for patients. Cutting into the body to alleviate sickness brought the possibility of infection or even death, and promised excruciating pain. Before the widespread understanding that microorganisms such as bacteria caused illness and infection, little care to cleanliness was taken. To operate, doctors wore black, unwashed overcoats stained with blood, pus, and matter from previous surgeries. The coats provided protection for the surgeons from getting a patient's bodily fluid on their clothes,



“The Dentist” – A 17th Century depiction of dental surgery. Courtesy of the Lyman Maynard Stowe Library, University of Connecticut Health Center.

but no precautions were taken for the sake of the patient. Doctors' instruments were any range of cleanliness. A patient would be strapped or held down on the operating table by strong men, but, throughout the procedure, surgeons could hear and sometimes feel the patient's screams and thrashing. Without the ability to “render the patient insensible,” surgeons traditionally administered opium, liquor, or mesmerism (hypnosis) to alter the patient's mind, rather than alleviate pain in the body. These methods brought their own dangers—either a weak effect or death by overdose. In some cases, a tourniquet or ice was used to numb the area as much as possible. In any case, the patient had to decide how to handle the physical and mental trauma of watching their own operation.

Surgeons, too, were subjected to the horrors of the operating theater. In his book *Etherization With Surgical Remarks*, Dr. John Warren of Massachusetts General Hospital remarks, “What surgeon is there, who has not felt, while witnessing the distress of long painful operations, a sinking of the heart, to which no habit could render him insensible! What surgeon has not in these times been inspired with a wish to find some means of lessening the sufferings he was obliged to inflict!” (p.1). By the mid-19<sup>th</sup> Century, speed in the operating room was prized. A leg amputation could be completed in less than three minutes. To the patient who was awake, the physician who could complete a procedure in as little time as possible offered the least amount of suffering. Yet this speed came at the expense of accuracy. Physicians had little time to lend the care of a healing hand. Insufficient anesthetic agents, coupled with the lack of sanitary conditions, made surgery a terrifying prospect. Some patients chose to die from their conditions or commit suicide rather than go under the surgeon's knife. Nevertheless, surgery as a practice goes back thousands of years.

## ANCIENT SURGERY

The history of dental and surgical procedures reaches back to the Neolithic and pre-Classical ages. The first evidence of a surgical procedure is that of trephining, or cutting a small hole in the head. This procedure was practiced as early as 3000 BC and continued through the Middle Ages and even into the Renaissance. The initial purpose of trephining in ancient cultures is unknown, although some hypothesize it may have been used to rid the body of spirits. The practice was widespread throughout Europe, Africa, and South America. Evidence of healed skulls suggests some patients survived the procedure. Trephining continued in Ancient Egypt as a method of treating migraines. In South America, ancient Mayans practiced dental surgery by filling cavities with precious stones including jadeite, turquoise, quartz, and hematite, among others. It is supposed that these procedures were for ritual or religious purposes, rather than health or cosmetic reasons.

Ancient Greeks also performed some surgical procedures including setting broken bones, bloodletting, draining lungs of patients with pneumonia, and amputations. The Greeks had new, iron tools at their disposal, yet the risk of infection or death was still high. Hippocrates' theory of four humors influenced medicine for hundreds of years. He claimed that the humors (black bile, yellow bile, phlegm, and blood, which coincided with the elements earth, fire, water, and air, respectively) exist in the body, and bloodletting (or the draining of blood), among other procedures, balanced them. Ancient Roman physician Galen was heavily influenced by the Greeks. He served for three years as doctor to Roman gladiators and as the Emperor's surgeon, gaining hands-on surgical experience. Romans continued with trephining, amputations, and eye surgery. Beginning in 900 AD, Al-Zahrawi, a famous Islamic surgeon, wrote books focused on orthopedics, military surgery, and ear, nose, and throat surgery, further influencing Islamic and Western medical



Early bronze age trephined skull. Photo: High Contrast.



practitioners.

## THE MIDDLE AGES AND RENAISSANCE

Surgeons of the middle ages through the 18<sup>th</sup> century were often barber-surgeons who would travel and perform minor procedures including tooth extraction, bloodletting, and treating war wounds. Rather than studying at universities like physicians, surgeons learned through apprenticeship and observation, as a blacksmith would. Surgery, without adequate anesthetics and antiseptics, remained dangerous and was seen as “a lesser profession.” Some women performed surgical operations until the 1700s when surgical study landed squarely within university training.

Andreas Vesalius, one of the founding fathers of modern surgery and a professor in Padua in the 16<sup>th</sup> century, completely shifted how human anatomy was understood. Prior to this point, much anatomical knowledge was based on animal dissection—the prevailing method. When dissection of human cadavers was done, physicians observed while servants cut. Vesalius was the first to suggest the hands-on approach of human dissection by physicians and surgeons. His study of human anatomy corrected ideas held from Greek and Roman misconceptions based on dissection of animals. In 1543, he wrote the groundbreaking *De Humani Corporis Fabrica Libri Septem*, which became the most comprehensive anatomy text at the time and the basis for 200 years of anatomical study.



Portrait of Andreas Vesalius. *De Humani Corporis Fabrica Libri Septem* p.xii)

16<sup>th</sup>-century French army surgeon Ambrose Paré also greatly influenced the development of surgery. Paré developed an emollient of egg yolk, rose oil, and turpentine for gunshot wounds, which was better than the previous practice of cauterizing (burning shut) wounds with boiling oil. Paré also brought the resurgence of ligating, or tying off, blood vessels during amputation to stop hemorrhage more effectively. While he made strides in the medical field, his motto, “I treated him. God cured him,” reflected the common medical perspective that doctors could only do so much.

## MODERN SURGERY

While shifts in anatomical knowledge empowered surgeons, many procedures remained out of reach. Physicians could not attempt complex internal surgery or prolonged operations. With the widespread use of anesthesia in the late 1800s, patients no longer had to fear the pain of an operation. However, the threat of infection still meant death for some. In 1865, Joseph Lister, who believed microorganisms could cause disease, developed his method of “listerism.” Lister recommended antiseptics, or the removal of bacteria from instruments, wounds, and the air above the patient. His process consisted of using carbolic acid as a sterilizing agent, but it was cumbersome and many surgeons who did not accept germ theory refused it. By the 20<sup>th</sup> century, asepsis, or the prevention of bacteria from entering a wound or sterile environment, gained prominence. Through methods such as boiling, using autoclaves, and chemical antiseptics, sterile operating environments could be achieved. Physicians began wearing white coats, and clean linens dressed beds and operating tables. This final shift allowed for advancements in internal surgery and success in the surgical procedures we see today.



“The ‘surgery’ of Theodorico Borgognoni” c.1400. Courtesy of the Lyman Maynard Stowe Library, University of Connecticut Health Center.



“Instruction in surgery – scene in the operating amphitheatre of the Massachusetts General Hospital, Boston – administering ether to a patient” depicts surgery c. 1888. Courtesy of the National Library of Medicine.

## QUESTIONS:

- Imagine you are a physician before the advent of anesthesia. You have a patient who requires, but is refusing, surgery. How might you convince your patient to undergo surgery? What methods might you use to allay their fears?
- Andreas Vesalius recommended surgeons themselves dissect cadavers in order to become experts in human anatomy. In what other areas does the motto “Do it yourself” serve the student?
- Initially, both anesthesia and asepsis were slowly accepted by the prevailing medical communities. Few physicians believed the common substances nitrous oxide and sulfuric ether could be used for serious scientific purposes. Few also believed that microorganisms caused infection and illness. What were the social effects of taking decades to accept these scientific discoveries?

# THE OWNERSHIP OF DISCOVERY

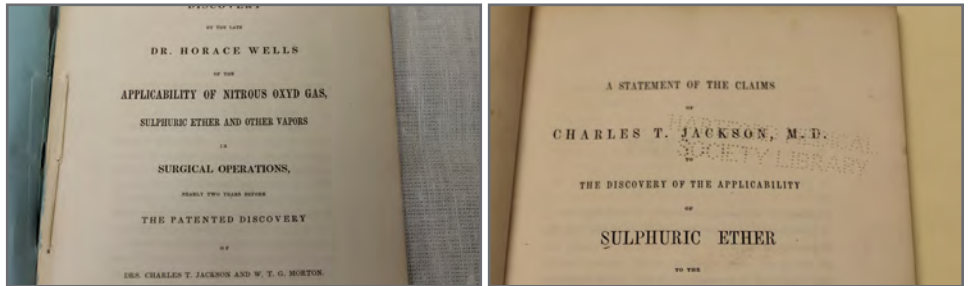
by Alexandra Truppi

Congratulations, Young Scientist! Your years of hard work, research, and experiments have paid off: You have made a major scientific discovery or invented a product that will likely revolutionize your field. So what do you do now?

## GET PUBLISHED!

It is time to share your findings with the scientific community and the rest of the world. Maybe you are interested in receiving some feedback on your work thus far. Or demonstrate to those who fund your research that they should continue to do so. Or maybe you want your discovery to be applied to new techniques in your field. Maybe you want to leverage your work into a faculty position at a major research university. Regardless of your specific long-term goals, publicizing your work through publication in a scientific journal is a valuable way of achieving them.

In *Ether Dome*, William Morton demands the respect of the doctors at Massachusetts General Hospital and claims that his discovery of a surgical anesthetic he calls Letheon makes him their equal. Soon after Morton's demonstration of Letheon's effectiveness, Harvard University's Dr. Henry Bigelow published articles about Morton's discovery in the *New England Journal of Medicine*.



Pamphlets arguing for the recognition of Jackson and Wells respectively. Courtesy of the Lyman Maynard Stowe Library, University of Connecticut Health Center.

Bigelow's support lent important credibility to Morton's claim that he deserved full credit for discovering Letheon. Similarly, acceptance by a peer-reviewed journal is essential for scientists seeking validation for their work from the scientific community. But note, Young Scientist, that it is not enough to simply be published — the specific journal in which you publish is critical. For example, Thompson Reuters publishes annual "impact factor" ratings data for journals in the biomedical sciences. A journal's impact factor is largely based on the number of times papers in that journal were cited by other papers. The higher the impact factor, the more influential and respected the journal.

So how do you get a journal to publish an article about your work? Of course, the experiments themselves must be rigorous and thorough, with good controls and sound statistics. But just as important is something that William Morton realized in 1846. According to Dr. Allison McMullen, Operations Director at *American Journal Experts*, a company devoted to helping scientists get published, a scientist's "experiments need to tell a compelling story. The splashier the discovery and the sounder the science, the better the journal" in which the work can get published. "Impact factor and publication are everything in a scientist's career," says McMullen, "so scientists typically aim high and go through multiple rounds of rejections and revisions before publishing."

## APPLY FOR A PATENT!

You have invested significant intellectual and financial capital in your work. Now you want to make sure that no one else can claim credit for your specific discovery or make money from it. Secure your intellectual property rights by patenting your innovation!



19th Century apparatus for administering ether. Courtesy of The Lyman Maynard Stowe Library, University of Connecticut Health Center.

In *Ether Dome*, patents are a sore spot for Dr. Charles Jackson, who is credited with the original ideas for multiple inventions that were then patented by someone else. For example, Jackson claims that Samuel Morse stole his idea for the electro-magnetic telegraph. "Morse followed me around for days, like a fox chasing his prey" Jackson recalls (I, 3). Without accurate notes of his own work, however, Jackson was unable to prove to a judge that he had the idea before Morse. As a result, Morse received a patent for the invention, with no official credit going to Jackson. In Act I, scene 6, of *Ether Dome*, Jackson provides William Morton with a vial of sulphuric ether and advises Morton to use it when he removes his wife Lizzie's tooth. "I use this when I can't sleep,"

Jackson explains. It is not long before Morton makes a small modification to the ether and demonstrates its use in surgery, an application Jackson had not considered. Morton acquires a patent for the newly named Letheon, enraging Jackson. Ironically, unbeknownst to Morton or Jackson, a Georgia surgeon named Crawford Long was already administering ether for surgery as early as 1842. However, Long's work was undocumented, so Morton was able to receive a patent in 1846. It is Morton's demonstration of ether's effects at Massachusetts General Hospital that is remembered as a moment that revolutionized the medical field.

So what can and cannot be patented today? Harvard University's Office of Technology Development says that "for an idea to be patentable, it must consist of statutory subject matter. United States patent law permits the granting of a patent on the following statutory subject matter:

- A process, such as a method of applying a vapor barrier for silicon materials.
- A machine, such as a new instrument to deposit uniform layers of metallic compounds.
- An article of manufacture, such as an assay kit for an infectious disease or class of diseases.
- A composition of matter, such as a new molecule (characterized by amino acid sequence or base-pairs) or a new chemical compound.
- New and useful improvements of the above.
- Any distinct and new variety of plant which is asexually reproduced.
- Any new, original, and ornamental design for an article of manufacture."

Scientists whose work has resulted in something they believe fits the criteria can submit an application to the United States Patent and Trademark Office (USPTO). The USPTO reviews patent applications and issues a "first office action" (an initial reply to the application,) generally within 12-18 months. These initial replies most commonly reject the scientist's claims of invention and cite existing patents or scientific papers as references. The inventor and his or her lawyer, an attorney who specializes in patent law, must then negotiate with the USPTO over whether the invention is new (never before invented), useful (a new application or an improvement on previous applications), or non-obvious (whether the invention yields some new or unexpected results). The entire process of securing a patent can take anywhere from 18 months to ten years, with costs ranging from \$10,000 to \$25,000.

### **WIN PRIZES OR GET GRANTS!**

The doctors in *Ether Dome* view the Montyon Prize as a prestigious validation of revolutionary scientific work. According to Dr. Warren in Act I, scene 3, "The Montyon is a prize given by the French. It goes to the man who has accomplished more in Science than any other Man, that year — A Man who, through Science, has changed the world." Established in 1820, the Montyon was actually four financial awards given to scientists who found solutions to medical challenges. The amount of money awarded was at the discretion of the French Academies of Science, but was intended to be proportional to the size of the scientist's discovery. With winners such as Louis Pasteur and Pierre and Marie Curie, the Montyon was considered a preview to the Nobel Prize.

The real-life William Morton won a Montyon Prize worth a total of 5,000 francs, but rejected the prize because it was awarded to him jointly with Dr. Charles Jackson. The French Academy of Science decreed that the funds be split equally between the two men, giving credit to Jackson's contribution to the discovery of Letheon. Morton did receive several other international awards, however, from Great Britain, Sweden, and Russia. Morton petitioned the United States Congress four times in hopes of receiving recognition of his achievement, but had no success. He did, however, receive a \$1,000 honor from the trustees of Massachusetts General Hospital.

Today, it is more common for researchers to receive grants that fund their ongoing work than financial rewards for work already done. In the biomedical sciences, the National Institutes of Health (NIH) is the primary source of government-sponsored funding in the United States. The NIH's Research Project grants, known as R01s, can provide hundreds of thousands of dollars to a lab, covering everything from equipment and supplies to the salaries of technicians and postdoctoral fellows who assist the primary investigator. R01 grant applications require lead investigators to describe their research plans for the next several years in detail: the work they plan to do, how existing data and research support their hypothesis, planned protocols, expected results, and alternate interpretations (e.g., how the data could be otherwise interpreted and what the scientist plans to do if the experiments do not go as planned), as well as the conclusions they hope to draw from their work. The NIH awards R01 grants to many different types of research organizations, including

colleges and universities, small businesses, for-profit corporations, and foreign and faith-based groups. The application process is rigorous, with only the top 10-15% receiving this important funding. “For a lab to be successful,” Dr. McMullen says, the lead investigator “typically needs to secure at least one R01 grant,” plus a few additional smaller grants as well.

### QUESTIONS:

- How did Horace Wells and Charles Jackson fund their research? How were their funding sources similar to and different from scientists today?
- Horace Wells received a patent for dentures he designed. How long did it take for him to secure the patent? Would the dentures fit the criteria for a patent today?
- In addition to the suggestions from Dr. Charles Jackson, William Morton was influenced by Horace Wells’s experiments in which he used laughing gas as anesthesia, but even Horace admits in Act I, scene 4, that the idea originally came from Dr. Thomas Beddoes and Sir Humphry Davy. Who deserves credit for the creation of surgical anesthesia: William Morton, Dr. Charles Jackson, Dr. Horace Wells, Dr. Thomas Beddoes, or Sir Humphry Davy? Why?
- William Morton was represented by R.H. Eddy, Esq., in his application for a patent for Letheon. What kind of law was Eddy known for practicing? How did Eddy demonstrate that Morton was the inventor of Letheon when his claims were challenged?
- To be hired for a university faculty position, scientists generally need to have published multiple articles in peer-reviewed journals. Research Thompson Reuters’s “impact factor” data. Which journals have the highest ratings? At what rate do these journals publish submissions?
- Patents for pharmaceuticals are only issued for a limited amount of time. Which drug patents are set to expire in the next year? How might the expiration of a drug’s patent impact the company that manufactures that drug?
- In 2013, the United States Supreme Court ruled that human genes cannot be patented, thus revoking the patents on the BRCA1 and BRCA2 genes held by Myriad Genetics. Which arguments did Myriad Genetics make in its original patent applications? Why did the Supreme Court come to a different conclusion than the United States Patent and Trademark Office? What is the impact of the court’s decision on doctors and scientists working with patients who have the BRCA1 and BRCA2 genes? How would this work have been impacted if the court had upheld Myriad’s patents?
- Research the dispute over the creation of Facebook between Mark Zuckerberg and Cameron and Tyler Winklevoss. In 2004, the Winklevoss twins claimed in a lawsuit that Zuckerberg stole their idea for a social networking site called ConnectU to create his own site, Facebook (the founding of Facebook and resulting lawsuits are depicted in the 2010 film, *The Social Network*). What were the differences between ConnectU and The Facebook (as it was originally called) when the sites first debuted? How were they similar? Who deserves credit for creating Facebook?

# SUGGESTED ACTIVITIES

## Persuasive Essay/Acting

William Morton, Dr. Charles Jackson, and Dr. Horace Wells all made cases to the French Academies of Science that they deserved to win the Montyon Prize for their individual discovery of a compound to relieve patients of surgical pain.

- **Part 1:** Choose one of these characters and write an essay from his perspective in support of his assertion that he should win the Montyon Prize. Use statements and events from *Ether Dome* and your own research to support your arguments.
- **Part 2:** Form groups of three that include one student depicting William Morton, one Horace Wells, and one Charles Jackson. Have each student actor perform their essay as a monologue in front of the class, which will act as the Montyon Prize committee. After each character has made his case for why he is deserving of the prize, the committee must cast ballots for who should receive the money.

## Scenes That Aren't There – Two-Person Dialogue

In Act 2, scene 5, while William Morton is in Boston, Phineas Cook pays his wife a visit and reveals to her that William has a seedy past.

PHINEAS COOK: Mrs Morton. Your husband is wanted in 14 states! For fraud—conspiracy to commit fraud—larceny--conspiracy to commit larceny—grand theft— writing false checks—counterfeiting—breach of promise to 4 young ladies—

LIZZIE: It's not true! It's not true!

PHINEAS COOK: But he won't be charged with any of these crimes, because he is a National Hero. He's everyone's darling. He is the Man Who Conquered Pain...

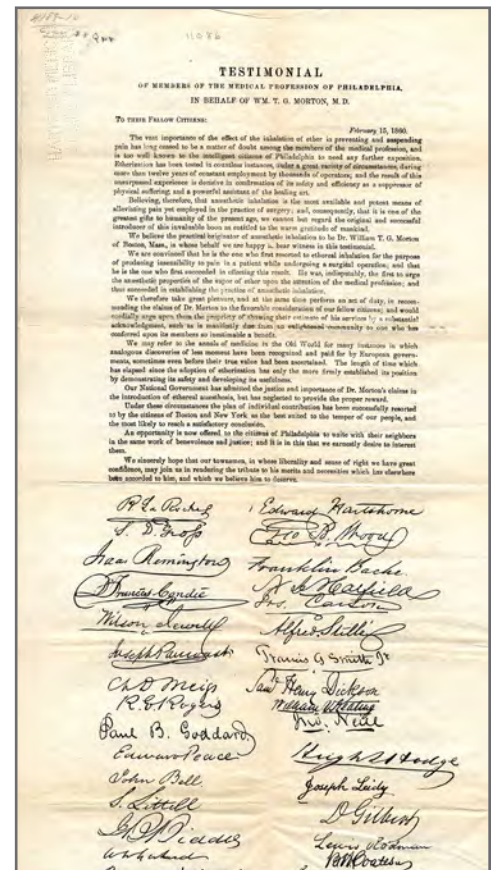
LIZZIE: Go away! Go away!

PHINEAS COOK: Mrs. Morton, all I want is my \$5,000—

LIZZIE: I don't have it! I don't have it!

- In pairs, create scenes between William and his wife in which William returns home from Boston and she confronts him about Cook's visit. Remember, William has celebrity and social capital, but no assets in his own name (all in his father-in-law's name), Cook claims William owes him \$5,000, and Lizzie is pregnant. In the scene, show how William's relationship to his wife is different from his relationship to Dr. Warren and the other doctors at Massachusetts General Hospital. How do the Mortons discuss money and lies differently than the doctors in the *Ether Dome*?

▲ Rehearse the scenes and perform them for the class. Ask the class to reflect on the resolutions of each scene.



Courtesy of the Lyman Maynard Stowe Library, University of Connecticut Health Center

## INFORMATIONAL CREATIVE WRITING

Imagine it is the year 1845 and you are Dr. Charles Jackson. You have decided to further investigate the uses of sulphuric ether, but you need grant funding to support your work. Create an application for an R01 grant from the National Institutes of Health's R01 using the following outline:

- Description of the project you will undertake
- Potential Strengths and Weaknesses of the approach you will use
- Brief biography of the principal investigator (Dr. Charles Jackson)
- Potential impact on society of the study's outcomes
- All investigators' strengths and weaknesses in this area of research (Dr. Charles Jackson as principal investigator, plus any assistants—perhaps William Morton?)
- The aims of the research study or project
- The significance and/or innovation of the project
- Step-by-step details of the approach to be used

## Persuasive Letter to Congress

William Morton sought \$100,000 compensation and credit for the discovery of ether anesthesia. William Morton, Dr. Charles Jackson, and Horace Wells each had a claim to introducing anesthesia to the medical community of Boston. At the time, many prestigious doctors and significant members of society wrote letters and pamphlets on behalf of the man they believed deserved the credit. Imagine you are a Boston doctor or a member of elite society and write an open letter of support for either William Morton, Dr. Charles Jackson, or Horace Wells. Give reasons based on the play or your own research that support your candidate's claim to the title of "The Man Who Conquered Pain." Research to find out who your congressmen would be in 1846. What reasons can you give to convince him of your point of view?



Ether Day commemorative painting by Warren and Lucia Proserpi. Massachusetts General Hospital.

## Directing/Visual Art

The moment that William Morton anesthetized patient Edward G. Abbott before Dr. John Collins Warren removed a tumor from Abbott's neck was immortalized in the Ether Dome in 2001 when Massachusetts General Hospital unveiled a 10' by 7' painting of the event. Analyze this painting:

- Who are the **characters**?
- What is the **setting**?
- What is the formal **title** of the painting? Do you think the title captures the story being told? If you were to choose a new title, what would it be?
- Where is the **focus** of the painting? How do you know?

In a small group, create a **tableau** (a frozen image that tells a story) that replicates the painting. Pay special attention to the characters' **facial expressions** and **body language**, as well as the **levels** at which the characters are frozen. Next, think about the **moment before** the scene depicted in the painting. What was happening and where was the focus? What about in the moment before that? What happened in the moment that followed the painting and where was its focus? What about after that? Consider:

- Where the characters are standing.
- Their facial expressions and body language.
- How the characters' body language and their arrangement in levels can shift the viewer's focus to different parts of the image.

Create two "before" tableaus and two "after" tableaus. Perform them in order with the group's tableau replica of the painting in the middle.

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