The Myth of Cleveland Abbe: 

A Review of a Manufactured History of the Creation 

of the National Weather Service

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ABSTRACT

For more than a century, Cleveland Abbe was placed on a pedestal as meteorology’s solitary leader. Lauded by power brokers within the developing United States meteorological community, directors of the Weather Bureau (predecessor to today’s National Weather Service) and the American Meteorological Society, he was cited by many as the father of what is now the NWS, its first director, and issuer of its first forecast. However, a historiographical review of the literature that established the Abbe legend presented here shows the image held of Abbe today was actively manufactured; written, and supported by Abbe himself, his family, the Weather Bureau, and others within the AMS.

We show that Abbe’s role in the creation of the nation’s first federal weather service was elevated while the contributions of others were actively downplayed. The latter applies particularly to Increase Lapham, who worked for two decades to demonstrate how a 24-hour forecast of events could be generated from the collection and analysis of surface data, and whose active solicitation of Congressman Halbert Paine ultimately led to the creation of the first national weather service within the U.S. Army Signal Service on February 9, 1870.

This paper is provided to shed a clearer light on those who contributed to the creation of what is now called the National Weather Service, which recently celebrated its 150th anniversary, and offer insights into how the Abbe myth was sustained as the AMS celebrated its anniversaries at 25-year intervals over its 100-year history.
CAPSULE

The image we hold of Cleveland Abbe today is the result of a concerted effort to elevate his legacy, creating a distorted view of his contributions to the creation of what we now know as the National Weather Service while minimizing the important roles of many others.

1. Introduction

On April 18, 1916, the National Academy of Sciences recognized Cleveland Abbe with the Marcellus Hartley Memorial Medal for “eminence in the application of science to the public welfare.” At that time, the Hartley Medal was one of the most prestigious awards presented by the National Academy of Sciences.

In his nominating speech given at the award presentation, climatologist William Morris Davis spoke of Abbe as the “solitary heir” of 19th-century meteorological scientists like William Redfield and James Espy. Davis placed Abbe on the same level as William Ferrel and Elias Loomis in terms of the scientific prestige that Abbe embodied. He characterized Abbe as the sole force that brought the Weather Bureau into its lofty position nearly 50 years after its creation in 1870 (Abbe, C. Jr. 1916).

Accepting the award on Abbe’s behalf (Abbe was too sick to attend the ceremony), Charles Marvin, then Weather Bureau Chief, noted, “Only a short time ago, when it was learned that [Abbe] had been awarded this medal and he had requested me to receive it for him, I asked him to tell me what to say for him in acceptance. Without a moment's hesitation, he replied: ‘Oh, they do too much for me; they must not forget Henry, Espy, Ferrel, Lapham, and others’” (Abbe, C. Jr. 1916a).
Marvin then read a letter provided by Cleveland Abbe that appeared to give himself the full credit for creating the entire forecast enterprise as they knew it at the time. For example, in describing his issuance of observations and “probabilities” from Cincinnati in 1869, Abbe wrote, “My forecasts were treated very kindly by all. I had anticipated a slow increase in accuracy; I ventured to write my father in New York City ‘I have started that which the country will not willingly let die’” (emphasis added) (Abbe 1916).

This phrase, beginning with the singular “I have started…”, would become the foundation upon which the Abbe legend was built, and was applied to a range of scientific, forecast, and organizational “firsts” attributed to Abbe, including the creation of the first government weather service in the United States (now known as the National Weather Service), the first forecast issued by the weather service, and now America’s “First Forecaster” (Potter 2020).

As we will show in this paper, the presentation of the Hartley Medal to Abbe at the penultimate point of his career and the subsequent publicity it garnered demonstrates how Abbe’s legacy was actively manufactured by Abbe, his family, Weather Bureau colleagues, and the American Meteorological Society. It demonstrates how Abbe’s role in the development of meteorology in the government space was elevated while the efforts of others, especially those of Increase Lapham, were largely overlooked.

We came to this conclusion as a result of a National Weather Service Heritage Project in support of the 150th anniversary of the agency’s founding on February 9, 1870. In our efforts to ensure the timeline depicting the National Weather Service’s history reflected an accurate accounting of those who made fundamental contributions to the National Weather Service’s creation and subsequent growth during its early history, we were struck by the number of inconsistencies in the historical literature, especially those related to 1) the creation of the first national weather service in the U.S. Army Signal Service in 1870, 2) those who played
critical roles in the creation process, and 3) the date of the first official forecast issued by the Army Signal Service.

Seeking to straighten this out, our review of the literature and new source material led to a historiographical summary of the conflicting literature. We found the focus on Abbe as the “father” of the weather service or its first “Director” issuing the first forecast culminating with him described as the solitary hero of the early meteorological community downplayed a wide array of information about others who contributed to the creation and subsequent growth of the National Weather Service’s predecessor agencies.

The goals of this paper are:

1) To provide an accurate timeline of the early history of the meteorological community in the U.S. that summarizes the more recent literature, with a more accurate representation of the important people and their actions related to the creation, development, and growth of the first weather service in the Army Signal Service, with Abbe’s role in this endeavor placed in proper perspective.

2) To show HOW and WHY Abbe received attention and credit that belong to others that could also provide additional insight into the state of the Weather Bureau and the profession of meteorology during its early history in the late 1800s.

3) To shed light on Abbe and his efforts in creating what amounts to a false history as he worked to elevate his own role while successfully diminishing the roles of others, especially the fundamental contributions of Increase Lapham.

In this paper, we present findings that many of the “firsts” attributed to Cleveland Abbe in the literature and published during previous anniversary celebrations for the National Weather Service and American Meteorological Society are simply not true, particularly as they relate to the creation of what would ultimately become the Weather Bureau and then the
National Weather Service. We then review the changing history of the new weather service during its first 50 years that led to the establishment of the Abbe legend, followed by evidence of the role of close colleagues, social networks, and the American Meteorological Society that resulted in a mythological version of Abbe’s role in the creation of the Weather Bureau that persists into modern historical reviews of American weather (e.g., Laskin 1996, Potter 2020).

We conclude with a corrected historical timeline for the 150th anniversary celebrating the creation of the National Weather Service. We then offer some thoughts as to why these Abbe myths were promoted and sustained at a time when meteorology itself was being severely criticized for including the prediction of a future atmospheric state while attempting to establish itself as a credible science that could serve the needs of commerce and public safety.

2. Reviewing the Foundations of the National Weather Service

For more than 100 years, Cleveland Abbe was promoted as the “Father” or “Founder of the Weather Bureau,” (e.g., Evening Star 1916, Washington Post 1916, Los Angeles Times 1916), or the “first head of the U.S. Weather Bureau” (e.g., Clinedinst 1912; American Meteorological Society 2015), “America’s First Weatherman” (Abbe, T. 1955) and now “America’s First Weather Forecaster” (Potter 2020).

A photograph of Abbe, contributed by White House photographer Barnett Clinedinst and submitted to the Library of Congress in 1912 (See Figure 1) contained a citation describing Abbe: “[Professor Cleveland Abbe, first head of U.S. Weather Bureau, head-and-shoulders portrait, facing left] / Clinedinst, Washington, D.C.”. This photograph was used extensively to promote Abbe, including in articles erroneously crediting Abbe as the first head of the
Weather Bureau (e.g., Evening Star 1916) through the next 100 years as shown in the *Cincinnati Enquirer* (Suess 2019). These continued misrepresentations of Abbe’s positions and related role in the creation of what is now the National Weather Service occurred even though Abbe was never the Weather Bureau’s head, Chief, or Director at any time in its history and was not America’s “First Forecaster” but living a dream others also had as they brought the concept of weather forecasting into the American view of meteorology during the 1800s. The Library of Congress citation was corrected in January 2020 when the authors sent a letter to the library’s documents office requesting a correction (see Figure 2).

Abbe has also been cited as “Chief Meteorologist” (e.g., Laskin 1996, Willis and Hooke 2006, Britannica 2020). He was designated as the solitary scientific heir to pioneers like Redfield, Espy, Ferrel, and Loomis (Abbe, C. Jr. 1916), and later described as the equivalent to Vilhelm and Jacob Bjerknes (Reichelderfer 1970), even though Abbe does not appear in “biographical sketches of the leading meteorologists and scientists of the period from 1830-1920” provided as an appendix in the AMS publication *The Thermal Theory of Cyclones: A History of Meteorological Thought in the Nineteenth Century* (Kutzbach 1979).

The reality is vastly different. Long before Cleveland Abbe entered the meteorological community after the Civil War and launched a short-lived private weather service in Cincinnati in 1869, interest and efforts to build actionable weather observation and forecasting systems in the new American colonies and nation can be traced back to the Puritans (Laskin 1996) and the pioneering observational efforts of Benjamin Franklin, Thomas Jefferson, and other colonial men whose interests in the day-to-day weather, establishing climate records, and other scientific endeavors were a basis for cataloging the new continent as it was being settled (Whitnah 1961, Fleming 1990, Laskin 1996). The efforts of William Redfield, James Pollard Espy, Joseph Henry, and Elias Loomis in the early to mid-1800s to use meteorological data for scientific studies and climatological analysis of
the new country are well documented by Whitnah (1961), Fleming (1990), Laskin (1996), and Aviles (2018).

The early recognition of the role of the telegraph to establish an ability to gather weather observations in near real-time, collect the data in a central location, and then apply this collected information to make a weather forecast for the next day is also well known, with Espy, Redfield, and then Loomis, Henry, and Matthew Fontaine Maury popularizing the concept of using this data in the United States not only for climate classification but also for weather forecasting (Whitnah, 1961, Fleming 1990, Laskin 1996, Moore 2015), with Loomis apparently the first in the United States to postulate this effort could lead to forecasting storms (Laskin 1996).

According to Whitnah (1961), similar proposals for taking simultaneous observations and tracking the movement of weather features were proposed and established with varying degrees of success in the first half of the 19th century, such as in New York (1825), Pennsylvania (1839), South Carolina (early 1840s), and Massachusetts (early 1850s). But none of the early efforts could muster the resources, nor the discipline, to organize the networks and transmit data at the same time every day, an important basis required to establish and maintain a real-time weather service for providing situational awareness of weather features that could be extrapolated to make forecasts (Whitnah 1961). During this same period, European efforts to popularize weather were showing some success. According to writer Peter Moore, Britain’s Daily News was the first to carry daily weather reports delivered by telegraph in 1848 (Moore 2015).

Preventing loss of life and expanding commerce along coastal shorelines and on the Great Lakes became key drivers for many early attempts to create a weather service starting in the 1840s. U.S. Navy Lieutenant Matthew Fontaine Maury’s efforts to use ships’ logs to help develop wind charts designed to enhance sailors’ knowledge of the best trade routes
were a major step forward in organizing the meteorological data for transmission and receipt of data that could then be used for analysis and interpretation of prevailing upstream conditions (Whitnah 1961, Gribbin and Gribbin 2003, Moore 2015). Maury’s efforts influenced interest in Great Britain to establish standards for codifying and transmitting weather information. This resulted in the appointment of Admiral Robert FitzRoy (well-known as the commander of HMS Beagle) as Britain’s first official meteorologist in 1854 (Gribbin and Gribbin 2003). FitzRoy would adopt the term “weather forecast” among many other accomplishments in the field of meteorology, even as scientists and journalists started to severely criticize FitzRoy for injecting the notion of forecasting the future into the science of meteorology, a factor contributing to his suicide in 1865 (Gribbin and Gribbin 2003, Anderson 2005, Willis and Hooke 2006).

During this same period in the mid-1800s, Wisconsin naturalist and scientist Increase Allen Lapham – whose scientific interests spanned botany, geology, archaeology, limnology, zoology, and meteorology (Bergland and Hayes 2014) – was an early proponent of the value of meteorology for documenting and understanding the natural environment and related climate of the new settlements in the north-central United States. Lapham began taking meteorological observations in 1827 (Whitnah 1961), learned of Espy’s theory of storms in 1840 (Miller 1931a), and communicated often with Henry and others, thus beginning a 30-year effort to collect weather observations for the purpose of documenting the weather and climate of the north-central territories and then states, and tracking weather systems that would affect Wisconsin and the Great Lakes region. He came to realize, as others did before him, weather systems that affected this area tended to move from west to east. And, based on his many observations and case analyses, Lapham also came to believe that transmitting surface observations in real-time to a central collection site could lead to forecasting storm systems approaching the Great Lakes (Miller 1931a).
In 1850, Lapham urged the establishment of a meteorological observatory where real-time data could be collected, and forecasts prepared and distributed at ports along the shores of the Great Lakes to help save mariners’ lives (Lapham 1850). That same year, Lapham wrote an article for the *Northwestern Journal of Science and Education* supporting this concept in which he quoted Elias Loomis, “Very little argument is needed to prove that our comfort and convenience and not infrequently our lives and property are dependent upon meteorological phenomena” (Lapham 1850a).

Lapham’s actions during the 1850s to test how observations and analysis of barometric lines and related storms could be predicted by measuring the existence and movement of barometric troughs is documented by Bergland and Hayes (2014), Miller (1931a), Fleming (1990), and Lapham himself (1869).

Lapham’s map of one such storm system in March 1859 (a rendition of which is displayed in the Wisconsin State Capitol) was presented in 1868 and demonstrated how Great Lakes shippers could have known about the March 1859 storm system a day before this system moved from the western U.S. and reached the Great Lakes. This effort was scoffed at for its lack of “timeliness” (Miller 1931a). Lapham’s March 1859 map, along with others he constructed, was based on his long-term studies conducted with others, especially Iowa physician Dr. Asa Horr, who provided observations in Dubuque, Iowa, that Lapham combined with observations from Wisconsin to track the west-to-east movement of significant weather events, and Dr. Edward Caswell of Rhode Island, who together with Lapham developed a technique producing barometric lines as a way for representing weather systems moving across the United States (Lapham, J. A. 1910). Like Fitzroy, who was ridiculed for his efforts to provide forecasts and warnings to mariners (Gribbin and Gribbin 2003), Lapham, too, was met with criticism. The *Chicago Tribune* chided Lapham for taking more than 10 years to track the movement of one storm (Whitnah 1961).
After the Civil War disrupted U.S. efforts to bring the concept of a prediction-based weather service to fruition, Lapham’s tests and memorials gathered over a nearly 20-year period would prove instrumental in his efforts to lobby Congress for the development of a government-run weather service (Miller 1931a, Fleming 1990).

Lapham’s efforts are relevant to this discussion about Abbe because their lives would become intertwined over the period from the late-1860s until 1875 when Lapham died. And, although the recognition of Lapham’s accomplishments related to his meteorological studies, including surface analyses and forecast demonstrations in the 1850s, would be accurately noted through the rest of the 19th century, they would essentially disappear in important scientific reviews and from other periodicals in the early 20th century, while Abbe’s exaggerated role would grow and eventually dominate the historical narrative.

3. The Lapham-Abbe Intersection in the late 1860s – Steps Leading to the Creation of the First Government Weather Service on February 9, 1870, and the First Official Forecast on November 8, 1870

Abbe’s entry into the meteorological community in the late 1860s and his efforts to establish a meteorological service as director of the Cincinnati Observatory in 1869 are well documented by Fleming (1990), Willis and Hooke (2006), and Potter (2020) (see Figure 4). Lapham initiated correspondence with Abbe in 1869 after learning of Abbe’s efforts to create a real-time weather service, relaying the knowledge he had gained through his careful analysis of observations over the last two decades that showed how surface data could be used to make a real-time analysis, and maps of barometric lines that could be used as a forecasting tool, a technique which Abbe then used in his own Cincinnati endeavor (Miller 1931a).
Abbe continued to correspond with Lapham (who volunteered as Abbe’s observer in Milwaukee) before, during, and after the three-month demonstration supported by the Cincinnati Chamber of Commerce (Lapham 1869). It was at this time that Abbe boasted to his father, “I have started that which the country will not willingly let die” (Abbe 1916, Fleming 1990, Potter 2020). However, like the unsuccessful state efforts mentioned previously, Abbe’s efforts suffered a similar fate due to a lack of sustainable funding and inconsistent reporting from observers. When Abbe’s financial backing from the Cincinnati Chamber of Commerce ended at the close of the three-month demonstration period, he continued producing weather bulletins at his own expense for an additional six months until he left the Cincinnati Observatory (Potter 2020).

The flurry of activity in late 1869 that ultimately led to the creation of a national weather service within the federal government was accompanied by contentious discussions and debates over 1) where the weather service belonged, 2) who should establish and run the service, and 3) whether it should be supported through commercial interests or within public institutions with government funding. Miller (1931a), Whitnah (1961), Fleming (1990), and Potter (2020) address this debate, on which Lapham and Abbe were on different sides.

When Abbe first engaged Lapham in 1868, he believed the development of a weather service could only garner the necessary resources if the effort was designed and implemented to benefit commerce (Miller 1931a). For the most part, Lapham’s interest in establishing a weather service lay in protecting the lives of mariners on the Great Lakes. His daughter, Julia, wrote in 1916, “Dr. Lapham felt sure that much of this loss [of lives on the Great Lakes] could be prevented by some systematic work and that the neglect of such work was criminal. He undertook to interest moneyed men and politicians in the importance of meteorology to the welfare of the people” (Lapham, J. A. 1916).
In 1869, Lapham acted on his beliefs and submitted petitions and memorials to Wisconsin Congressman Halbert E. Paine, urging the establishment of a government weather service, an effort described by Miller (1931a), Weightman (1952), Truman Abbe (1955), Whitnah (1961), Fleming (1990), Bergland and Hayes (2014), and Potter (2020).

Congressman Paine, once a student of Loomis, quickly recognized the need for the weather service being promoted by Lapham but insisted that such a service should be national in scope, going beyond previous regional and state efforts that failed due to the lack of funding and the ability to attract trained observers (Whitnah 1961). Paine also recognized that this initial service would require a disciplined approach to taking observations at the same time every day, and for the observations to be reliably transmitted through the developing telegraph network connecting all the military installations. For these reasons, Paine chose the U.S. Army Signal Service as the first home of weather service (Miller 1931a, Hughes 1970).

Abbe expressed concerns about the ability of the military to make observations adequately and reliably, even as Paine urged the need for military discipline to make this effort succeed where others had failed (Whitnah 1961, Fleming 1990, Potter 2020). Chief Signal Officer General Albert J. Myer assured Congressman Paine that the U.S. Army Signal Service was up to the task, and Paine was apparently swayed by his enthusiasm (Fleming 1990, Fleming 2000).

Paine’s bill was passed as a joint Congressional resolution, which was quickly signed into law by President Ulysses S. Grant, thus establishing the first nationwide weather service on Feb. 9, 1870. Gen. Myer was assigned to oversee the new federal weather organization, becoming the first director of what was officially known as the Division of Telegrams and Reports for the Benefit of Commerce (Fleming 1990, Fleming 2000, Potter 2020). Economist Erik Craft noted the timing of the bill was fortuitous for the establishment of a government-
run organization. He wrote: “The creation of a federal weather organization in 1870 provided
greater net social benefits than any alternative at that time. Weather information services in
the latter half of the nineteenth century possessed enough public-good characteristics to
imply the efficiency of public provision” (Craft 1999).

When the U.S. Army Signal Service was given the responsibility for the nation’s first
weather service on February 9, 1870, it had two important tools at its disposal – access to
Seeking the mechanisms needed to observe and forecast the weather on a national basis, Gen.
Myer reached widely for input, data, forms, and other ideas to help establish the fledgling
service. Henry, Lapham, and Abbe were just a few who offered their strongest support
(Fleming 1990, Potter 2020). Gen. Myer quickly established the infrastructure required and
assembled the military troops to observe, transmit, and analyze the observational data in real
time (Whitnah 1961).

On November 8, 1870, Gen. Myer hired Lapham as the first civilian employee of the
Signal Service with the title “Assistant to the Chief Signal Officer,” assigning him warning
responsibility for the Great Lakes region. On the same day, Lapham issued the first official
forecast from the Signal Service as a warning (See Figure 5):

"High wind all day yesterday at Cheyenne and Omaha; a very high
wind this morning at Omaha; barometer falling with high winds at
Chicago and Milwaukee today; barometer falling and thermometer rising
at Chicago, Detroit, Toledo, Cleveland, Buffalo and Rochester; high winds
probable along the Lakes" (Lapham 1870b).
4. Headwinds: Growing Pains Lead to the Initial Formation of the Abbe Legend as the Weather Bureau is Established in 1891

With the successful start of the Signal Service’s effort in the provision of weather services, according to some sources, Lapham was offered, but declined, the opportunity to come to Washington to sustain his official position. Not wanting to leave his family and home near Milwaukee, Wisconsin, he instead served in Chicago until 1872.¹ Gen. Myer then hired Cleveland Abbe as the second civilian of the Signal Service on January 3, 1871, also appointing him as “Assistant to the Chief Signal Officer” in Washington, D.C. (Potter 2020).

The fledgling weather service quickly built its operation, gaining responsibility for the entire country (not just the Great Lakes and Atlantic Coast) in 1872 and winning popular praise in the media (Whitnah 1961). Its success was relatively short-lived, however. The

¹ A handwritten copy of a Milwaukee Sentinel article dated Nov. 16, 1870, alludes to Lapham’s inability to take the job in Washington due to “inadequacy of the pay offered” and added, “It would seem to be exceedingly appropriate that the place in question should be filled by Mr. Lapham as he is the originator of the system.” (Lapham 1870a).

Humphreys (1919) states, “private considerations, however, kept [Lapham] from coming to Washington, but he did consent to act for a time in this capacity at Chicago.”
tranquil calm of the new organization under Gen. Myer’s leadership was met with serious headwinds upon his death in 1880, when General William Babcock Hazen took over as Chief Signal Officer (Whitnah 1961, Fleming 2000). While Gen. Hazen hired more civilians than allowed by Gen. Myer and took several steps to strengthen the division’s scientific underpinnings, he also inherited a high-profile financial scandal and further reductions in funding. Secretary of War Robert Todd Lincoln was especially concerned the weather service had “No natural connection whatsoever with the military service” (Fleming 2000, Pietruska 2011). An investigation by the Allison Commission into Signal Service management and operations further threatened its existence. Abbe’s responsibilities had grown during this time, but his pay and responsibilities were questioned. Called before the commission, Abbe proved himself an able company man, testifying to the value of military discipline despite his pre-1870 insistence that any national weather service should be structured as a civilian agency under the aegis of scientists (Allison Commission 1886).

When Gen. Hazen died in 1887, Major General Adolphus Greely was named his successor that same year. Gen. Greely fought hard for the service at first and expanded its work (Fleming 2000). However, the failure of the service to predict two intense major blizzards in 1888, the so-called “Children’s Blizzard” that occurred over the north-central U.S. in January 1888 (Laskin 2004) and the better known “Blizzard of ’88” that crippled the northeast U.S. and killed hundreds of people in New York City alone, renewed the criticism of the Signal Service, with calls again increasing to transfer the weather service into a civilian department (Whitnah 1961).

When Jeremiah Rusk, the first Secretary of Agriculture, suggested the Department of Agriculture take over the meteorological responsibility, Gen. Greely offered little resistance (Whitnah 1961). The bill establishing the civilian Weather Bureau was signed into law by President Benjamin Harrison on Oct. 1, 1890; the effective date of the transfer was set at July
1, 1891, to allow the department to obtain separate and necessary appropriations for the new agency (Whitnah 1961).

Even as the new Weather Bureau became part of the Department of Agriculture, new issues arose. There was bureaucratic discord created when Agriculture Secretary J. Sterling Morton took over in 1893, including a two-year feud with the Weather Bureau’s first civilian chief, Mark Harrington. Furthermore, while the naming of Willis Moore as Weather Bureau chief in 1895 should have brought calm (he came from the agency’s own ranks), Moore, too, was soon a lightning rod for controversy (Whitnah 1961, Pietruska 2011, Potter 2020).

It was around this time and within the organizational turmoil that Abbe seemed to embrace a role as propagandist for the Weather Bureau, promoting his own role in expanding the capabilities of the Bureau, and beginning to insert himself into the history of its creation within the Army Signal Service. His friend and colleague W. J. Humphreys noted in his memorial after Abbe’s death, “Of the many useful roles Professor Abbe played in the drama of his day perhaps on the whole the most serviceable were those of mentor and propagandist” (Humphreys 1919).

Aware of the value of publicity (Abbe, T. 1955, Potter 2020), Abbe set about to establish a new tone for his legacy. In a speech he gave in 1890 to the South African Philosophical Society, later published in the Transactions of the South African Philosophical Society in 1892, Abbe pointed repeatedly to the bureau’s accomplishments for which he alone was responsible. He even claimed responsibility for starting the Monthly Weather Review: “In 1874 the scope of the Signal Service organization was greatly enlarged by the addition of the observers who had hitherto reported to the Smithsonian; these are known as the voluntary observers. By means of all this new data the monthly weather review, that I had started for Gen. Myer in January 1873, and that had hitherto dealt principally with the phenomena of storms, was enlarged so as to cover the general climatology of the States” (Abbe 1892). This
claim ignores others in the Signal Service including Thompson B. Maury and Observer-Sergeant Henry Calver, who were collectively responsible for the first issues of the Monthly Weather Review (Schultz and Potter In Press), as well as other efforts to establish regular compendiums of weather and climatological data that started three decades prior (Whitnah 1961, Fleming 1990, Laskin 1996, Holthaus 2021). Among the most successful was Henry’s Smithsonian Meteorological Project, which laid the foundations for today’s Cooperative Observer network and was perhaps one of the nation’s earliest “crowdsourcing” efforts (Holthaus 2021). The Smithsonian captured detailed information in monthly reports and, beginning in 1852, tabulated data from records starting in 1849 (Whitnah 1961). Indeed, Lapham’s maps were built using Smithsonian data (Fleming 1990) and newspapers joined the fray when the Washington Evening Star used Smithsonian data to issue a weather “forecast” in May 1857 (Laskin 1996). As this monthly summary information became more widely available via print media, farmers and other citizens were able to use this data to their advantage, further driving the need for this type of publication as Gen. Myer spun up the Signal Service’s efforts.

In the same speech, Abbe downplayed the roles of others, especially Lapham, in America’s initial meteorological efforts, promoting an expanded view of his own contributions to forecasting and the congressional action that created the weather service. Abbe continued his correspondence with Lapham into the 1870s seeking clarification of how Lapham convinced Congressman Paine to support the establishment of the weather service. In preparing an article in 1871 for the American Journal of Science, Abbe wrote to Lapham asking for a sketch “of how you were led to propose through the Hon. H. E. Paine that the government should take up this work” (Abbe 1871). Lapham’s response is shown in Figure 6. However, in his South African speech (excerpted in Figure 7), Abbe largely relays these
insights gained from this exchange of letters with Lapham as his own efforts and downplays Lapham’s role.

It was also at this time Abbe’s reputation had grown to the point where he was asked by the editor of the *Encyclopaedia Britannica* to write its meteorology article for the 11th edition (Anderson 2005). Abbe became meteorological science editor of the *Encyclopedia Britannica* starting in 19042 (Humphreys 1919).

After Abbe’s appointment as the meteorological science editor, Lapham’s role in the creation of the weather service was essentially erased as Abbe’s purported role as the creator, the chief scientist, and the first forecaster was created. As a baseline for how Lapham was viewed prior to Abbe assuming the role as an *Encyclopedia Britannica* editor, the New American Supplement of the latest edition of the Encyclopedia Britannica, published in 1890, contained an extensive entry about Lapham’s roles in the demonstration of a weather forecast into the early 1860s and in the creation of the weather service within the Army Signal Service. Subsequent volumes after Abbe’s appointment, including the New Werner Edition (30 volumes; 24 volumes of the original *Britannica* and the five *American Supplement* volumes) published in 1907 (when Abbe was well established as a *Britannica* editor) removed all references to Lapham’s role in establishing the basis for developing a forecast.

2 Robert DeCourcy Ward, who would become the first AMS President, also became the Climatological Editor of the *Encyclopedia Britannica* 11th Edition (Brooks 1932)
capability and his important contribution to the creation of the Signal Service’s Division of Telegrams and Reports for the Benefit of Commerce (Figure 8). A subsequent supplement to the 11th edition published in 1922 went even further (Figure 9), stating that Abbe was the “Father of the Weather Bureau” and that Abbe “remained its head until his death Oct. 28 1916” (Chisholm 1922). And today? The online version of the Encyclopaedia Britannica calls Abbe the Weather Bureau’s “Chief Meteorologist” (Encyclopaedia Britannica 2020) and contains no references to Lapham (See Figure 9).

5. The Abbe Legacy Grows in the 20th Century and Beyond

As was the case throughout the 19th century, meteorology as a science – and the Weather Bureau as a science-based service agency – was under attack at the beginning of the 20th century. Shortly after Willis Moore became Weather Bureau Chief in 1895, he initiated a vigorous public relations campaign against long-range forecasts that historian Jamie Pietruska described as, “distancing forecasting from prophecy, science from superstition and quackery, professional meteorological expertise from lived experience and observation and, ultimately, ideals for modern scientific progress from what he deemed ignorant reliance on weather folklore or false forecasts” (Pietruska 2011).

Pietruska notes that in response to public criticism, the Bureau “cultivated a culture of certainty” for its forecasters, and carefully monitored its public image. It was into this environment that Moore, a former journalist himself, entered, vigorously attacking “weather prophecy” through his public relations efforts. Yet just a few short years later in 1906, Moore boldly announced the Bureau’s new ability to forecast the weather one month in advance was based on science, a claim that drew considerable scorn (Pietruska 2011).
Moore continued to draw criticism throughout his tenure as Weather Bureau Chief. Congressional investigations into Moore’s management of the bureau and the way he used appropriated funds for pet projects (such as the establishment and expansion of the Mt. Weather research facility in Virginia) kept a target on Moore’s back (Whitnah 1961, Potter 2020). Moore’s ultimate downfall occurred in 1913 when vying to become President Wilson’s new Secretary of Agriculture, he was instead removed from office (Whitnah 1961).

It was within this turmoil that Abbe’s long career with the service was coming to an end. Nearing his 45th year with the Weather Bureau and now in his 70s, he was the “sole survivor” among the original cast of 19th-century notables. Willis’s replacement, Charles Marvin, sought to reestablish calm and order within the troubled agency (Whitnah 1961). Abbe and Marvin were good friends³, so casting Abbe as “the first” – the scion of an agency and profession that was just beginning to make major scientific headway – helped burnish an image of a government agency tarnished repeatedly in its short history.

³ Abbe had several professional setbacks under Moore that resulted in losses in both professional position and salary. Noteworthy is that Abbe’s troubles “disappeared” when Marvin was appointed, as Truman Abbe noted: “Father's good friend Charles F. Marvin became Chief of the Weather Bureau, and practically all Father's office troubles vanished. Professor Marvin had long been one of Father's best friends” (Abbe, T. 1955).
The accolades heaped on Abbe during the Hartley Medal ceremony in 1916 proved to be the beginning of a public campaign to celebrate his life and his accomplishments at the expense of others, especially Increase Lapham. Abbe’s Hartley Medal acceptance letter was printed in *Scientific American* magazine two months later (Abbe 1916a). Upon his death in October 1916, newspapers from Washington, D.C. to Los Angeles headlined that the “Father of the Weather Bureau” had passed away (Washington Post 1916, Los Angeles Times 1916).

Additional praise followed through a memoir written by friend and Weather Bureau colleague A.J. Henry published in the *Annals of the Association of American Geographers* in 1917 (Henry 1917); and by W.J. Humphreys (presented to the National Academy of Sciences Annual Meeting in 1918) (Humphreys 1919). Along with Abbe’s letter read at the Hartley Medal presentation, these became the backbone of the Abbe legend that was picked up and actively and repeatedly promoted by the Weather Bureau and American Meteorological Society over the next 100 years.

Many of Abbe’s friends and acquaintances would be prominent figures in the founding of the American Meteorological Society in 1919, just a few short years after his death. Potter states the AMS was borne from a vision Abbe described in an 1898 *Monthly Weather Review* note (Potter 2020); Charles F. Brooks, the Society’s first secretary, described the founding of the organization in more detail in a 1930 article in the *Bulletin of the American Meteorological Society* (Brooks 1930). Since then, the AMS and the Weather Bureau have played central roles in maintaining the Abbe legacy, celebrating his positions and accomplishments replayed through a sequence of articles in the *Bulletin of the American Meteorological Society* and the *Monthly Weather Review* especially at important anniversaries of the Society (e.g., Hunter 1923, Brooks 1945, Reichelderfer 1970, White 1970). Furthermore, the AMS created the Cleveland Abbe Award for Distinguished Service to Atmospheric Sciences by an Individual (later changed to the Cleveland Abbe Award for
Distinguished Service to the Atmospheric and Related Sciences) in 1963 (Potter 2020). As late as 2017, the AMS web page about the award stated Abbe was “the first head” of the Weather Bureau (See Figure 10). The AMS was informed of this error in that year, and now no longer includes Abbe’s biography on its web page describing the award (See Figure 11).

As noted previously, Cleveland Abbe was not the first Director, Chief nor “head” of what is now the National Weather Service. Indeed, he never attained these positions or titles.

6. The Abbe Legend Endures

The fundamental question: Why did Abbe’s legacy take precedence over the contributions of Lapham, Gen. Myer, Henry, and the many others who preceded him before he entered the field after the Civil War? And who REALLY gets the credit for establishing the first functional national weather service in the United States?

While several people were to claim credit for bringing this historic effort over the finish line in 1870, including Abbe starting in 1890, it was Cleveland Abbe himself who wrote a note to Lapham in January 1870 as Paine’s bill was winding its way through Congress, “I must write to express the pleasure experienced in noticing the energy with which you are pushing the matter of a telegraphic meteorological system of storm warnings” (Abbe 1870).

Several years later, when Maury was being given credit in some French journals for the creation of the Signal Service’s storm warning service, the Annual Record of Science and Industry (of which Abbe was meteorological editor), stated, “To Professor Lapham must the credit be given of having brought to a most successful conclusion this long line of efforts.” (Baird 1874).
Abbe certainly had significant organizational and operational responsibility for expanding the new service during its formative years (Willis and Hooke 2006, Potter 2020). Yet the confusion surrounding the Weather Bureau’s paternity persisted for years, despite the attempts by Eric R. Miller, Official-in-Charge of the Weather Bureau station in Madison, Wisconsin, who wrote three *Monthly Weather Review* articles, one published in 1930 and two in 1931, challenging the popularized versions of the founding of the Weather Bureau (Miller 1930, Miller 1931, Miller 1931a).

Furthermore, in 1952, Weather Bureau Station Facilities and Meteorological Operations Division Chief Richard H. Weightman wrote a paper to clear the air on this historiography in which he mostly credited Congressman Paine for the administrative effort to get a bill signed into law, while also acknowledging the important contributions of Lapham in the creation of the Signal Service’s weather service and Abbe in its subsequent development. “That both Lapham and Abbe had important roles in the creation and development of a national weather service is obvious,” Weightman wrote. “Lapham had a more important part in its creation whereas Abbe had a far longer and more important role in its development” (Weightman 1952). A later Weather Bureau history compiled in 1970 states, “The man who started the immediate chain of events leading to [the service’s] creation was Professor Increase A. Lapham of Milwaukee, a student of meteorology and a weather observer for both Henry and Abbe” (Hughes 1970).

Nevertheless, the Abbe legend endures, based on the long-standing firsts attributed to him by himself, his colleagues, and supporters, essentially establishing Abbe as the “Abner
Doubleday” of the weather service’s creation. Indeed, at a time when meteorology needed a hero – what public relations pioneer Edward Bernays called a godhead symbol (Moyers 1983) – Cleveland Abbe “checked all the boxes.” Abbe had what many considered “proper” scientific credentials, especially in comparison to Lapham’s, which, while extensive, were self-taught. Abbe’s education at the Free Academy of New York, Harvard, and Johns Hopkins; study in Russia; oratory and writing skills; and social and professional connections with Washington’s scientific elite placed him in an ideal position to serve as meteorology’s standard-bearer.

7. Summary and Conclusions

The timeline surrounding the players and actions of those involved in the creation, development and growth of the federal bureau that would become the National Weather

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4 The myth that Abner Doubleday invented the game of baseball is an enduring one. Book reviewer Bruce Weber writes of John Thorn’s book (Thorn 2011) about the birth of baseball, “[Baseball in the Garden of Eden’s] premise is that when it comes to baseball, what is generally thought to be history is myth, and the two most prominent myths – the one that Abner Doubleday invented the game in Cooperstown, N.Y., in 1839, and the other that the responsible party was a New Yorker, Alexander Cartwright, who formalized the game’s rules in 1845 – were promulgated by men with ulterior motives” (Weber 2011).
Service is critical to place the roles of Abbe and others in context of the complicated history of the expansion of the interest of meteorology in the United States as a science that would come to include the controversial notion of predicting the future. We have demonstrated it was not Abbe, but Increase Lapham, Halbert Paine, and Gen. Albert J. Myer – building on the work of others who came before (See Figure 12) – who were largely responsible for the creation of the Division of Telegrams and Reports for the Benefit of Commerce in the U.S. Army Signal Service.

1) Lapham’s efforts over a decade before and then after the Civil War demonstrated how a forecast could be made out to 24 hours with surface data collected at the same time from day-to-day to track the west-to-east movement of weather systems.

2) Lapham’s success in demonstrating how a forecast could be made and would have saved lives along the coasts of the Great Lakes convinced Congressman Paine, who then wrote the law that established the first national weather service within the U.S. Army Signal Service assigned as the federal agency to organize the first weather service within the U.S.

3) Gen. Myer got the new service up and running in less than a year, hiring Lapham as the service’s first civilian employee on November 8, 1870, in the position of Assistant to the Chief Signal Officer.

4) And it was Lapham who then issued the first official forecast from the United States Signal Service as a storm warning on November 8, 1870, the day he was hired. (See Figure 13).

Inexplicitly, these documented facts have not stood the test of time. Abbe’s successful rewriting of history starting with his well-documented South African speech, his editorial control of *Encyclopedia Britannica* weather content starting in 1904, and the efforts of others on Abbe’s behalf throughout the 20th century resulted in Lapham’s, Paine’s, and Gen. Myer’s
efforts to establish and then build the nation’s first federal weather service to be largely relegated as afterthoughts. While Lapham was the first civilian hired by the new service and delivered the first official forecast and warning, Abbe is often erroneously given this credit for the first official forecast, even into the end of the 20th century (e.g., Kutzbach 1979, Laskin 1996).

By bringing these issues to light, the authors believe we have “corrected the record” about the beginnings of the National Weather Service more than 150 years ago. Additional research is needed to understand the motivations behind these efforts, including the societal forces prevalent at the time that promoted a solitary individual into this leadership position.

5 One important area for future research is Abbe’s long associations with well-known leaders in the eugenics movement of the late 19th and early 20th centuries, including William Morris Davis and Robert DeCourcy Ward, the latter of whom became AMS’s first president (Ward was a founder of the Immigration Restriction League, an architect of the restrictive immigration laws of the early 1920s and a recognized eugenicist for his work on global race mapping (Okrent 2019, Lavery 2016, Cohen 2016)). This era, marked by the rise of eugenics as a science and its impact on the meteorological community is being more deeply investigated by the authors and others (see, e.g., Lavery 2019) with a sharp focus on Ward (Okrent 2019, Lavery 2016, Cohen 2016). Any current evidence that Abbe was personally and actively engaged in eugenics is largely circumstantial. Potter (2020) addresses this issue (based to some degree on material provided him by the authors when he was researching his book), but the need for more research into this area is important given the social belief among...
We encourage current and future generations to look beyond the hyperbole and self-aggrandizement that marks the Abbe history to understand the many forces and players – going back even as far as colonial times – that came together to 1) create and sustain a government-supported weather service that has now existed for more than 151 years, 2) develop and grow the meteorological research, technology, education and now growing commercial components of the meteorological profession, and 3) establish the foundation for the science-based National Weather Service we know today.

Acknowledgments.

Co-author John Stremikis is responsible for the initial stimulus of this paper. His passion for historical accuracy brought these issues about Cleveland Abbe and others in the meteorological community to light, and his research skills uncovered many of the source documents referenced in this paper. We also recognize the detailed records, letters and other documentation on Increase Lapham that were the basis of the book Studying Wisconsin: The Life of Increase Lapham in 2014 (Bergland and Hayes 2014), a book that further motivated the authors to look deeper into this controversy. The authors also recognize Dr. Harry R. “Bob” Glahn who’s unofficial 100-year history of the National Weather Service (updated in eugenicists that they were endowed with special skills in science and academic leadership through their heredity and should be recognized as such, even as they promoted their superiority over others deemed inferior (King 2019).
2012) also raised these issues about who did what during the creation of the Signal Service and Weather Bureau (Glahn 2012).

Finally, we thank the editor and reviewers of this manuscript whose insightful comments helped strengthen and clarify the salient points presented in this paper.

Data Availability Statement.

The data supporting the findings of this study are available from the corresponding author upon request.
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FIGURES

Figure 1

Annotated Screen Shot of Library of Congress photograph citation noting the incorrect role of Cleveland Abbe (Clinedinst 1912).
Figure 2

Annotated screenshot of corrected photograph title in Library of Congress (Clinedinst 1912a).

“meteorologist and assistant to the Chief Signal Officer”
Lapham’s map shows the origin and progress of the storm of March 14-17, 1859, and how it might have been known on the Great Lakes before it reached them (Lapham 1868).
Figure 4

American Forecasting Pioneers
1820-1870

William Redfield publishes his theories on storm rotation based on observation of New England hurricane devastation a decade earlier.

James Pollard Espy espouses his convective theory of cyclones publishing *The Philosophy of Storms*. A controversy develops between Redfield and Espy’s conflicting theories.

Espy (in conversation with Joseph Henry) begins promoting telegraph use to collect weather observations to study the progression of storms that could form a scientific basis for weather forecasting.

Henry envisions using weather data collected by telegraph for climate studies and forecasting; persuades telegraph companies to transmit local weather data to the Smithsonian.

Increase Lapham, who started making weather observations in 1827, urges establishment of an observatory to collect real-time data and prepare forecasts to help save lives on the Great Lakes.

U.S. Navy Lt. Matthew Fontaine Maury organizes Brussels maritime conference to discuss weather observations for mariners and introduces a format for transmitting observations via the telegraph.

Lapham continues his meteorological work, now with Dr. Asa Horr of Dubuque, IA to prove storms track from west to east and can be forecast for the Great Lakes. His map of a March 1859 system demonstrates how Great Lakes shippers would have known about a storm a day in advance.

The Civil War interrupts American efforts to create a sustainable weather observing and forecasting system.

Cleveland Abbe becomes Cincinnati Observatory director. He proposes a plan to incorporate meteorology into the observatory’s efforts, initially to support astronomy goals. Abbe gains the support of local businessmen.

On Sept. 1, Abbe begins his Cincinnati pilot program to provide forecasts for commercial purposes. Lapham serves as one of Abbe’s observers.


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Increase Lapham’s first official bulletin for the Great Lakes was generated and issued Nov. 8, 1870, the day he was hired by Chief Signal Officer Gen. Albert J. Myer (Lapham 1870).
Figure 6

While my work in Cincinnati was in the first months of its infancy, it was everywhere well spoken of by an appreciative public press as a step in the right direction. My correspondent in Milwaukee, Prof. J.A. Lapham, not content with sending me his daily weather telegram, determined to, if possible, secure predictions for the benefit of the commerce of Lake Michigan. I had myself some months earlier presented the same subject to the Board of Trade in Chicago and also to the daily newspapers in New York, and the better success of Prof. Lapham's efforts was largely due to the counsel of his friend, Gen. H. E. Paine, the member of Congress from Milwaukee, who, as he himself has told me, advised that the memorial prepared by Lapham for use in the West, should instead be addressed directly to Congress; he also suggested that the "National Board of Trade," as representing all the business interests of the country, should be asked to support the project of a National Weather Bureau for the benefit of commerce and agriculture. The next meeting of this Board occurred at Richmond, Virginia, in November 1869, and on that occasion the delegates from Cincinnati united in the support of the resolutions favouring a national system that were introduced by the delegates from Milwaukee. In December, Gen. Paine submitted to our Congress, at Washington, the memorial prepared by Prof. Lapham and a "Bill" that proposed the establishment of a National Weather Service to be conducted by a high scientific authority. Immediately that this step became public, the Secretary of War authorized the Chief Signal Officer of the Army to present his views on the subject of storm and weather signals, the outcome of which was the passage on February 4, 1870, of a "Joint

Excerpt from Abbe's 1889 speech in South Africa (Abbe 1892).
Annotated screenshots of *Encyclopaedia Britannica* volumes showing markedly different entries and removed references to Lapham’s role in meteorology (Left, *New American Supplement to the latest edition of the Encyclopaedia Britannica* (Kellogg 1890), and right, *The New Werner Twentieth Century Edition of the Encyclopaedia Britannica* (New Werner Twentieth Century 1907)).
Figure 9

Annotated screenshots show (Left) the Cleveland Abbe entry in Volume 30 of the *Encyclopaedia Britannica: The New Volumes* (Chisholm 1922) and (Right) a compilation of the current online entry (edited for display purposes and to remove advertisements) (Encyclopaedia Britannica 2020).
Figure 10

Annotated screenshot of AMS Cleveland Abbe Award website as it appeared Apr. 5, 2015 (American Meteorological Society 2015).

“first head of the US Weather Bureau”
Figure 11

Annotated screenshot of AMS Cleveland Abbe Award website as it appeared Feb. 4, 2021 (American Meteorological Society 2021).
Activity Leading to Creation of the First National Weather Service 1869-1870

Dec. 1 - Responding to a bad shipwreck in November, Lapham pleads with Abbe and a friend who serves as representative of the National Board of Trade convention to help establish a system to communicate storm potential to ships on the Great Lakes. Lapham’s friend, Edward Horton, introduces a resolution at the convention to establish a nationwide system of meteorological observations to be communicated by telegraph to prevent the loss of life and property on the oceans and Great Lakes.

Dec. 8 - Lapham writes his congressman, Halbert E. Paine about his concerns. He includes news clippings and a memorial of this own that propose an organization to track the progress of storms approaching the Great Lakes from the west. Paine recognizes the need for a nationwide system to collect weather observations and communicate notice on both the Great Lakes and Atlantic seaboard of approaching storms. He immediately begins drafting legislation for a weather service supported by the federal government.

Dec. 14 - Paine introduces H.R. 579. A revised version - H.R. 602 - is introduced two days later: then referred to the Committee on Commerce. Before Congress adjourns for the Christmas holiday on Dec. 22, Paine sends copies to Elias Loomis and Henry, among others. Concurrently, Gen. Albert J. Myer, Chief Signal Officer, appeals to Paine to place the proposed service under the Signal Service. Paine recognizes military discipline will be essential for ensuring that observations are taken at the same time and place every day for the effort to succeed where others have failed due to lack of sustained support and the discipline needed to take daily observations.

Jan. - Both Loomis and Henry provide letters of support. Abbe writes Lapham a letter on Jan. 7 applauding the latter’s lobbying efforts.

Feb. 2 - Paine reintroduces the legislation as a joint resolution. Despite some initial, limited opposition, it is adopted by unanimous consent. With a week, it is adopted by the Senate, referred to the Committee on Military Affairs where it left without amendment, passed by the Senate, and sent to the White House.

Feb. 9 - President Ulysses S. Grant signs the joint resolution into law.

Sources include Whitnah (1961), Fleming (1990), and Potter (2020).
The New Service’s First Steps
1870-1875

Mar. 15 - Chief Signal Officer Myer is officially charged with responsibility for leading the first government weather service. Myer immediately reaches out to Lapham, Abbe, Henry, and others for information and procedures that can be used to support the new service.

Apr. 20 - Congress passes appropriations bills to support the new weather service.

Aug. - Myer staffs the new “Division of Telegrams and Reports for the Benefit of Commerce” as it is officially called with officers and enlisted personnel and develops the organization’s plans for synchronized observations of pressure, temperature, wind direction and speed, wind pressure, cloud cover, and overall state of the weather to be transmitted and collected for real-time weather.

Nov. 1 - The new division becomes an operational real-time weather service as the first synchronized observations are collected and transmitted three times a day from 25 stations.

Nov. 8 - Myer meets with and hires Lapham as Assistant to the Chief Signal Officer, the first civilian employee of the division, to oversee the service’s weather operations for the Great Lakes. Lapham issues the nation’s first official forecast as a “storm warning” for the Great Lakes region that same day.

Jan. 3 - Having resigned his position at the Cincinnati Observatory, Abbe meets with Myer in Washington, D.C., and is offered a position in the division as Assistant to the Chief Signal Officer in the Washington, D.C. office. He becomes the weather service’s second civilian employee.

May 11 - After serving a turbulent year-and-a-half with the division that included disagreements with Myer and a brief leave of absence to attend to some personal matters, Lapham is discharged from the service. He would die Sept. 15, 1875, at the age of 64. Abbe continues his long career with the service, contributing to the development of the weather services with the Signal Service and through its transfer to the Department of Agriculture in 1891 as the Weather Bureau, under the direction of six different leaders until shortly before his death on Oct. 28, 1916.

Sources include Whitnah (1961), Fleming (1990), and Potter (2020).