

# MILWAUKEE'S GENTLEMEN PALEONTOLOGISTS

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## *Abstract*

During the last half of the nineteenth century several large fossil collections were assembled from Silurian and Devonian rocks quarried in the vicinity of Milwaukee, Wisconsin. Conditions for collecting were favorable at that time because the quarries were small, low volume, hand-operated and more numerous compared to present-day operations. Low paid quarry workers were able to significantly supplement their incomes by selling fossils which insured a continual supply of specimens.

These collections were assembled by a few moderately wealthy, self-educated naturalists, who had the time, money and interest to secure large numbers of specimens. The most prominent of these gentlemen paleontologists were Increase A. Lapham (collection destroyed by fire in 1884), Fisk Holbrook Day (collection now at Harvard's Museum of Comparative Zoology), Thomas A. Greene (collection at The University of Wisconsin-Milwaukee), and Edgar E. Teller (collection at the National Museum of Natural History).

By assembling collections and publishing a few papers, these individuals stimulated paleontologic and stratigraphic research in the area by such notable geologists as James Hall, Robert Whitfield, Stuart Weller, and many others. Since most quarries in the area are abandoned, and because of the mechanized nature of large-scale quarrying at those remaining, it is impossible to assemble comparable collections of new material. These old collections, therefore, are of critical importance to future geologic work in the area, particularly in the fields of taxonomy, biogeography, biostratigraphy, taphonomy, paleoecology, and stratigraphy.

## INTRODUCTION

During the last half of the nineteenth century, several important collections of Silurian and Devonian fossils were made in the vicinity of Milwaukee, Wisconsin by local naturalists, including I. A. Lapham, F. H. Day, T. A. Greene, E. E. Teller, and C. E. Monroe. These collections, which represented a great expenditure of time and money, stimulated the interest of many prominent scientists in the geology and paleontology of southeastern Wisconsin. The most important result of the subsequent research was the discovery and correct interpretation of Silurian reefs in the area—the first Paleozoic reefs to be identified in North America (Fig. 1).

Two primary factors influenced the assembly of these collections. Most important was the availability of fossil specimens, due to the methods and intensity of quarrying for lime and building stone. Also important, however, was the role of the naturalist in nineteenth century science and his motivation for an interest in natural history. Both of these factors have changed greatly, and the decline of the local stone industry has made it impossible to assemble comparable material. Because the older collections are irreplaceable, they remain a key element in geological research of the Milwaukee area and in Silurian and Devonian paleontology in general.

This paper discusses the conditions under

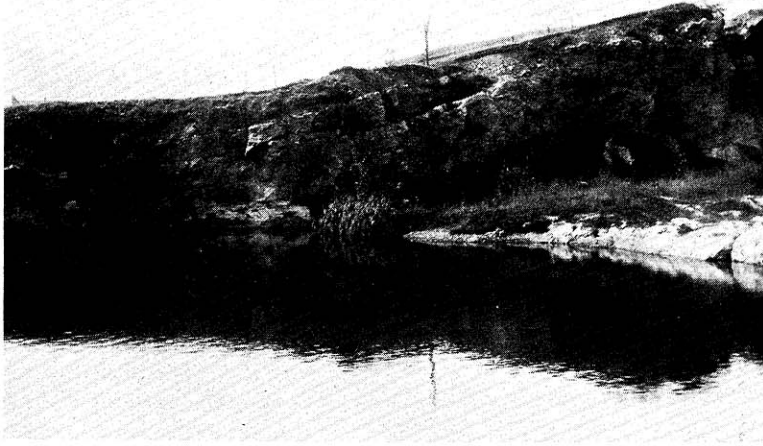


Fig. 1. Reef structure in the west wall of the Schoonmaker quarry, Wauwatosa, Wisconsin, 1899. This Silurian reef was the first Paleozoic reef described in North America (Hall, 1862). This quarry was also the locality from which Day, Greene, and Teller, as well as others, made extensive fossil collections. The area illustrated is near the present intersection of 68th and State Streets in Wauwatosa. Photo by W. C. Alden, Photo No. 115, U.S. Geological Survey Photo Library, Denver.

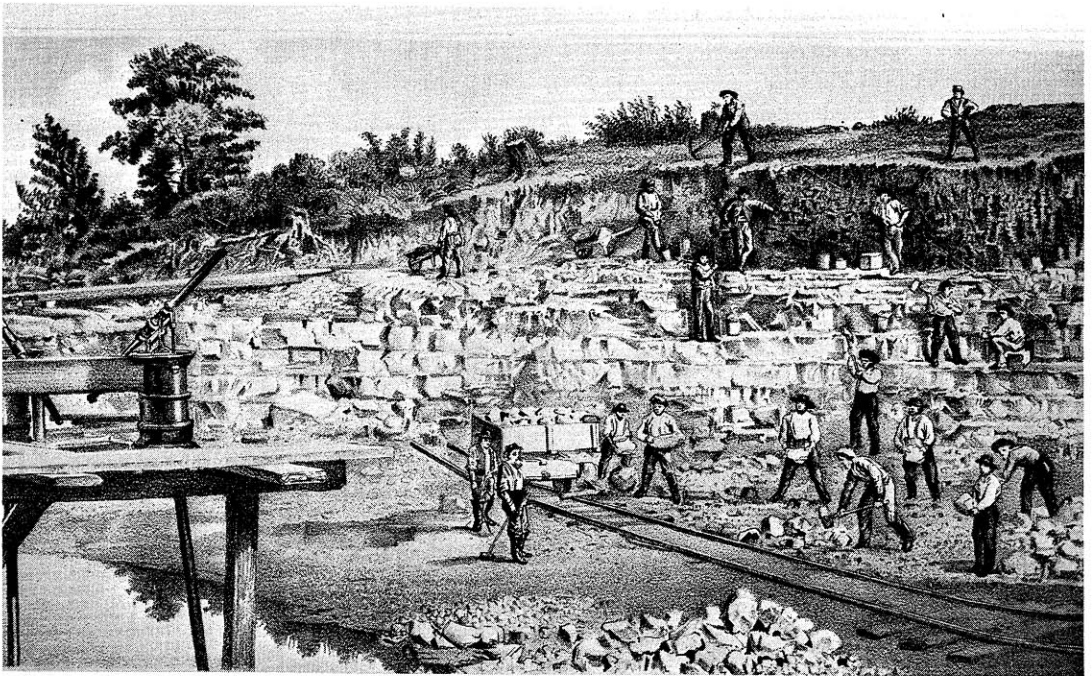


Fig. 2. Lithograph demonstrating typical nineteenth century quarrying methods. Quarry depicted was in Devonian rocks at Mill No. 1 of the Milwaukee Cement Company shortly after the company began operations, ca. 1876. The area shown in the lithograph is on the east bank of the Milwaukee River, near the old swimming beach in Estabrook Park, Milwaukee. From Chamberlin (1877); drawn from a photo taken by J. C. Miller.

which the collections were made, the prominent individuals who assembled them, and the way in which this collecting activity has contributed to geological research of southeastern Wisconsin.

#### MILWAUKEE'S STONE INDUSTRY

Silurian and Devonian dolomite underlies much of southeastern Wisconsin and was an important source of building materials throughout the 1800s. The development of the local stone industry and the methods of operation were important factors in the formation of the nineteenth century Milwaukee area fossil collections. Because a fairly thick cover of Pleistocene and Recent sediments limits natural bedrock exposures in southeastern Wisconsin, quarries were critical to extensive collecting and the rate of fossil discoveries was closely related to the growth of the stone industry. Local quarrying reached its peak in the late 1800s with the development of the natural cement industry, which utilized Devonian rock (Fig. 2).

Nineteenth century quarries were quite different from the large mechanized operations of today. Most were small, shallow, and the rate of rock extraction was slow. Due to the lack of mechanization, large numbers of low-paid laborers were employed. After blasting, blocks too big to be handled were broken with sledge hammers. All rock was picked up by hand and placed in carts or wagons, and building stone was trimmed with hammer and chisel (Fig. 2).

Probably most quarry workers had little desire to start personal fossil collections during their ten hour workdays. However, the opportunity to supplement their incomes was a compelling reason to develop an interest in paleontology. Milwaukee's gentlemen paleontologists supplied the financial incentive by regularly purchasing fossils from the workers. A single good specimen could fetch a dollar or two, a sum which doubled the daily wages of most quarry employees. Thus, the methods of quarrying and the active fossil market insured that few im-

portant fossils would escape the notice of the quarrymen.

Since the later 1800s, the number of quarries in the Milwaukee area has decreased from over thirty sites to only one. Most of the former sites are completely filled and covered, and the active quarries are unfavorable for collecting because of high vertical walls and large-scale operations. Also, quarry workers are no longer a dependable source of specimens since they have little direct contact with the rock and to double their daily wages through fossil purchases would be prohibitive. These changes have all contributed to a significant decrease in the availability of fossils, as well as rock exposures, which severely limits modern geological and paleontological research in southeastern Wisconsin.

#### GENTLEMEN PALEONTOLOGISTS

Fossil collecting was greatly influenced by the presence of several well motivated and competent naturalists who lived in the Milwaukee area during the time that quarrying activities were at their peak. These individuals were typical of the self-educated and self-supported researchers who were responsible for much of the advancement of science throughout the nineteenth century.

In the 1800s, scientific research and education took place sporadically and the quality was irregular. It was difficult to obtain advanced education in new specialized scientific areas such as geology, and it was even more difficult to find employment in these fields. However, these constraints did not prevent an increase in the popularity of all aspects of natural history throughout the nineteenth century.

Studying and collecting natural history specimens for one's "cabinet" became a socially acceptable and popular pastime. The quality of naturalist activities ranged from mindless collecting of everything and anything to some of the best research of the time. Milwaukee's gentlemen paleontologists fit into the middle of this range. While

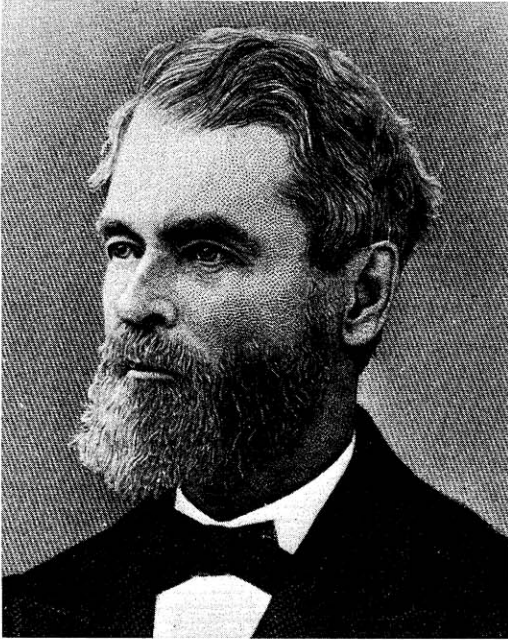


Fig. 3. Portrait of Increase A. Lapham (from Sherman, 1876).

men like I. A. Lapham did make substantial contributions to many fields of natural history, others were not as diversified in their interests nor did they publish as many scholarly papers. All were interested in several different branches of natural history, and these lifelong interests developed early. None of these individuals had advanced training in geology or other science, and were generally self-taught. They all enjoyed fairly high social standing and were successful enough in their chosen careers to have the time and money to devote to paleontological pursuits. The major contributions of these naturalists were the professional interest they stimulated in others and the comprehensive collections they diligently assembled. The following biographical sketches describe Milwaukee's best known gentlemen paleontologists and their activities.

#### *Increase Allen Lapham*

Increase Allen Lapham is well known as Wisconsin's first scientist and one of the

state's most distinguished early citizens (Fig. 3). His numerous accomplishments in other fields of natural history may overshadow his paleontological contributions. However, he was the first to collect fossils in the Milwaukee area, and undoubtedly influenced the activities of his contemporaries.

Lapham was born at Palmyra, New York, on March 7, 1811. As a youth he worked as a stone cutter during construction of the Erie Canal at Lockport, New York (Sherman, 1876), and this work with fossiliferous Silurian rocks stimulated a lifelong interest in geology. He wrote his first scientific article at the age of 17, a short paper published in the *American Journal of Science* dealing with the geology around Louisville, Kentucky (Lapham, 1828). After spending several years as an engineer in Ohio, he moved to Milwaukee in 1836 at the request of Byron Kilbourn, and became chief engineer and secretary of the Milwaukee and Rock River Canal Company (Sherman, 1876). Soon after his arrival, he and Kilbourn began to search the area for economically important rock and mineral deposits. Lapham also began to make observations on a variety of natural history subjects, which he continued to do throughout his life.

In 1846 Lapham sent a collection of Milwaukee area fossils to James Hall for identification. With the help of Hall's fossil identifications, Lapham determined the correct stratigraphic succession of rock units in Milwaukee. By the time his 1851 paper was published, he had defined the general Paleozoic stratigraphic section for eastern Wisconsin, established correlation with the New York section, and recognized the eastward dip of the rocks into the Michigan Basin.

In 1853 Lapham sent a manuscript entitled "American Paleontology" containing over 2000 fossil descriptions to Hall for completion and co-authorship (Winchell, 1894). Collaboration with Hall would have greatly elevated Lapham's stature as a geologist and paleontologist. Although Hall agreed to complete the project, he apparently did

nothing with it and it was returned in 1860 at Lapham's request (Bean, 1936).

In 1873 Lapham was appointed head of the new state geological survey, and in this capacity he assembled a noteworthy group of young geological assistants, including T. C. Chamberlin (Beloit College) and Roland Irving (The University of Wisconsin). In 1875 he was replaced by a political crony of the new governor, but his early planning was in no small way responsible for the later success of the survey. He died on September 14, 1875, a few months after his removal from office.

Lapham's natural history collection, which included "10,000 fossils, minerals, shells, meteorites, and Indian relics" (*State Journal*, Dec. 16, 1884) was purchased by the state for The University of Wisconsin. Unfortunately, his entire collection was destroyed in the Science Hall fire of December 1, 1884 (*Milwaukee Sentinel*, Dec. 2, 1884). Only a partial list of Lapham's material exists in the published catalogue of the Wisconsin state mineral exhibit from the Centennial Exposition at Philadelphia in 1876, which consisted predominantly of specimens from his collection (Sweet, 1876). Lapham was generous with his specimens and many were given to, or exchanged with, other scientists. Some of James Hall's type specimens from Wisconsin, now in the American Museum of Natural History, are probably Lapham's specimens, although they are not so labelled. The Worthen Collection at the Illinois State Geological Survey contains at least one Lapham specimen and others are reported to be located at the Milwaukee Public Museum (Teller, 1912) and in the Greene Museum at The University of Wisconsin-Milwaukee.

#### *Fisk Holbrook Day*

Fisk Holbrook Day, the son of Reverend Warren Day and Lydia Holbrook Day, was born at Richmond, New York, on March 11, 1826 (Fig. 4). He attended Jefferson Medical College in Philadelphia, graduating in 1849

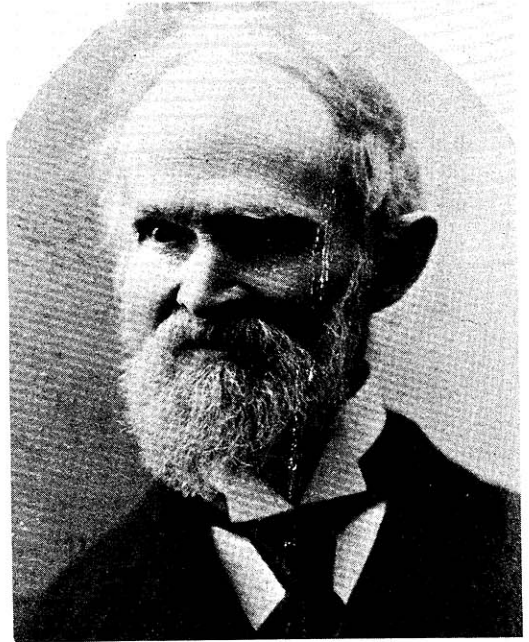


Fig. 4. Portrait of Fisk Holbrook Day (from Zimmermann, 1979).

(*Lansing Journal*, 1903). Day moved to Wauwatosa, Wisconsin, in 1854, and was a prominent physician in Milwaukee County for almost 40 years. Besides having a private practice, Day was a physician for Milwaukee County hospital and poor farm for many years (Zimmermann, 1979).

Day was a naturalist with a wide variety of interests, including geology, botany, and archeology (Fig. 5). His paleontologic interests probably stemmed from his father's acquaintance with James Hall while in New York. Reverend Day had collected fossils and occasionally corresponded with Hall during the 1840s, and Hall visited the Day household to examine his collections. Hall later made several visits to Wauwatosa to study the fossils in F. H. Day's cabinet, and a few specimens figured by Hall in 1867 and 1870 were from the Day collection.

Day published one paper on Milwaukee area geology in 1877. This paper demonstrates that Day was very observant and an original thinker, confident enough in his

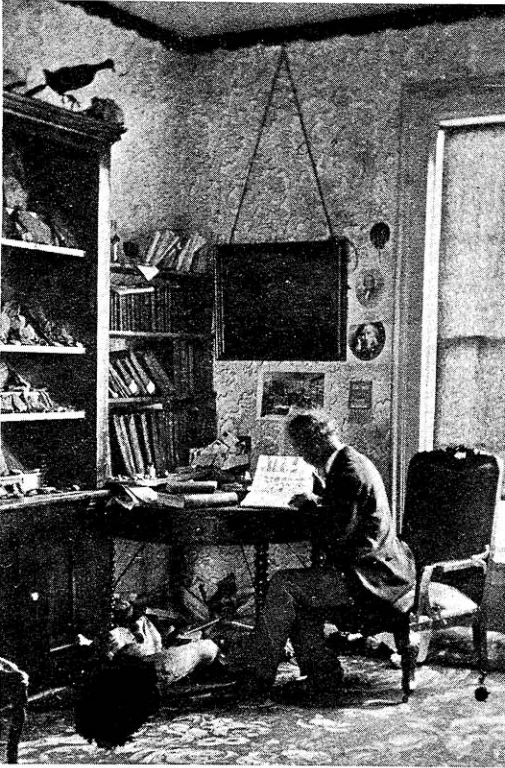


Fig. 5. F. H. Day in his study, ca. 1870s. Photo courtesy of Mary Dawson.

observations to dispute established geological authorities such as James Hall and Charles Doolittle Walcott. Day (1877) mentioned working on another paper about the general characteristics of trilobites that apparently was never published. However, he did supply a detailed faunal list from local quarries to T. C. Chamberlin, which was published in Volume 2 of *The Geology of Wisconsin*.

Day specialized in collecting local Silurian fossils, and by 1880 he had assembled a collection of the best quality ever made in southeastern Wisconsin. His cabinet contained many spectacular specimens, primarily from the Schoonmaker quarry. These included an orthoconic cephalopod over seven feet long, and a spectacular specimen of the trilobite *Bumastus dayi* (named in his honor) (Fig. 6).

In 1880 Day decided to sell his collection, and offered it to The University of Wisconsin (through T. C. Chamberlin) and to Harvard University. Most of the collection, including the best specimens, was purchased by Alexander Agassiz and donated to the Museum of Comparative Zoology at Harvard in 1881 (Raymond, 1916). While it may seem unfortunate that Day's collection was

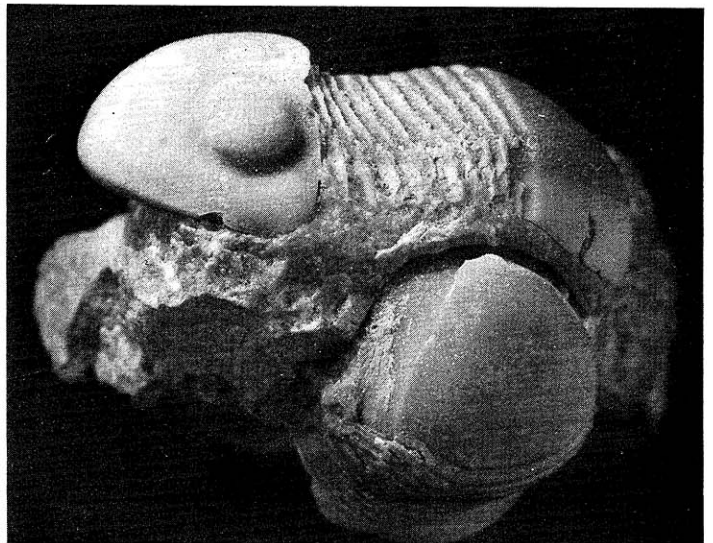


Fig. 6. Two specimens of the trilobite *Bumastus dayi* collected from the Silurian reef at the Schoonmaker quarry by Day, named in his honor by Raymond (1916). This was Day's most valued specimen, for which he was offered \$100. This specimen is now No. 647 in the Museum of Comparative Zoology at Harvard.

sent out of the state, had it been sold to The University of Wisconsin probably it too would have been destroyed in the 1884 Science Hall fire. Even after Day shipped 8265 pounds of material to Harvard (*Milwaukee Sentinel*, Jan. 9, 1881), he still retained over 5000 fossils. In 1884 he sold a large number of the remaining specimens to Thomas Greene and much of his library to Edgar Teller. Day retired in 1893 and moved to Lansing, Michigan, where he died on May 31, 1904. At the time of his death he had several thousand specimens in his possession, which were later sold to The University of Michigan.

Day's material at Harvard was placed in the general collections and cannot be studied as a comprehensive unit. Much of it has not been catalogued, but it is in reasonably good shape. Besides containing most of Day's best specimens, the Harvard collection has material from Milwaukee area localities that is not represented elsewhere. Day's material in the Greene collection cannot be identified, but, based on the purchase price, it probably represents a large part of Greene's Wauwatosa material. The labels for many of Day's specimens at The University of Michigan have been lost, and little of his collection has been unpacked.

#### *Thomas Arnold Greene*

Thanks to the foresight of his family, T. A. Greene's correspondence, library, and, more importantly, his collections have been preserved in Milwaukee. This material, including several biographical studies (Buck, 1884; Conrad, 1895; Nehrling, 1895; Greacen and Ball, 1946a, b; Thomas, 1928) provides the most detailed information available for any of Milwaukee's gentlemen paleontologists.

Greene was born on November 2, 1827 in Providence, Rhode Island (Conrad, 1895) (Fig. 7). At the age of 16 he began training in a drug store, and five years later he moved to Milwaukee. Greene purchased a retail drug store, and shortly afterward went into

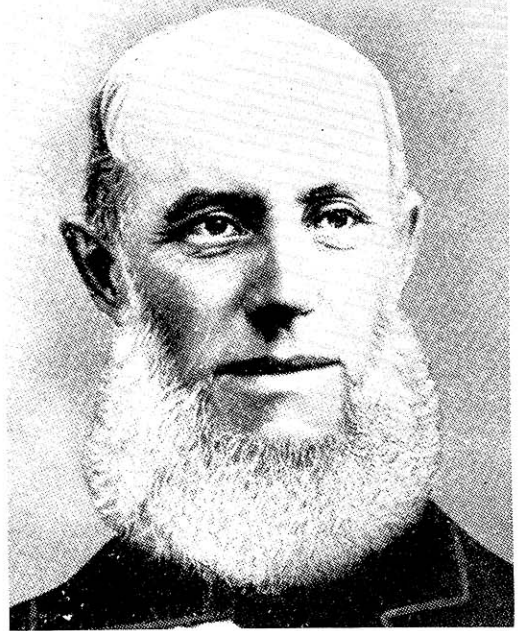


Fig. 7. Portrait of Thomas A. Greene (from Thomas, 1928).

partnership with Henry H. Button. Their firm became one of the largest wholesale drug businesses in the city, making Greene a wealthy man (Greacen and Ball, 1946a).

Greene was very interested in botany and geology in his youth, and brought a collection of Rhode Island minerals with him to Milwaukee (Nehrling, 1895). During his first thirty years in Milwaukee, Greene devoted a little time to collecting and purchasing minerals, but there was no apparent interest in fossils. While he sustained an interest in botany and mineralogy, in subsequent years paleontology became his major concern. Because of poor health in 1878, he was advised by his physician to seek relief from the pressures of business. As a means of relaxing he began to collect and purchase fossils, and continued to do so until his death in the fall of 1893. Greene collected primarily at the cement quarries, the 26th Street quarry, and quarries at Racine and Wauwatosa. He corresponded with fossil collectors around the country to arrange

exchanges or purchases. He also corresponded with many scientists and loaned specimens to them. James Hall, C. Wachsmuth, and J. Newberry all illustrated a number of Greene's specimens.

Although Greene acquired a thorough knowledge of Silurian and Devonian fossil identification, he apparently had no interest in writing scientific papers. His correspondence does reveal some geological data, and it also contains information on how he assembled his collection and gives insight into his personality.

Greene was quite serious and methodical in his efforts (Buck, 1884), and his goal was to obtain a comprehensive collection of both minerals and Silurian and Devonian fossils. Although he wanted the best possible specimens for his collection, he also purchased as many common specimens as possible. He was aggressive in his quest for specimens, and collecting soon became an obsession—certainly not the type of relaxation his doctor had prescribed. Greene's persistence in trying to convince other collectors to trade or sell specimens to him often resulted in their complete disinterest in further dealings with him. Greene seldom revealed informa-

tion on the availability of fossils to other collectors, and in most letters he states that collecting had been better a few years before at all of his localities.

In addition to the large number of fossils purchased from quarry workers in Wisconsin, Greene also dealt with collectors and quarrymen in the Chicago area, and obtained Waldron (Indiana) fossils from J. Doty. His main supplier of Chicago area fossils from 1884 to 1893 was A. G. Warner. Warner appears to have earned a fair income by selling fossils to a small group of wealthy collectors, including Dr. J. Kennicott and W. Van Horne of Chicago. When Greene purchased Kennicott's collection in 1885 he also became Warner's main, and possibly only, customer. For the remainder of his life Greene purchased specimens from Warner on a regular basis, often receiving several boxes of fossils a month during the summer. It is interesting to note that Greene invariably paid Warner less than his asking price for the fossils. There was seldom any bargaining over the price, and it is difficult to determine whether Greene was always underpaying or Warner was always overcharging. As a result of these transactions

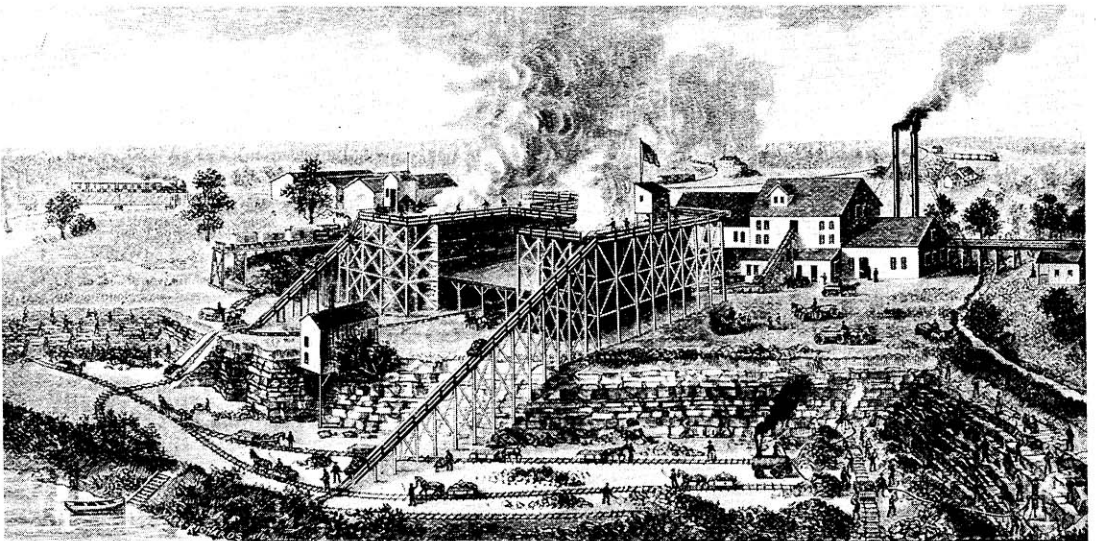


Fig. 8. Mill No. 1 of the Milwaukee Cement Company, ca. 1885 (from Barton, 1886).





Fig. 9. Thomas Greene's collection at his home, probably taken after his death in 1894 and before the dedication of the Greene Museum in 1913. Photos courtesy of the late Katherine G. Nelson.



Fig. 10. Another view of Thomas Greene's collection at his home. Photo courtesy of the late Katherine G. Nelson.

with Warner, Greene acquired the best collection of Chicago area Silurian reef fossils.

Greene's interest in Devonian fossils led him to purchase stock in the Milwaukee Cement Company (Fig. 8). Greene possibly made this investment more to insure a constant supply of fossils than to realize financial gains, but he later became a member of the board of directors and vice president of the company (Greene and Berthelet, 1949).

He also had interesting and unusual dealings with the Horlick Lime and Stone Company in Racine. At most quarries he arranged to have workers and owners save fossils for him to purchase, but at this quarry he also paid to have workers break rocks for him while he was on the premises. He eventually arranged to have charges set in specific parts of the quarry ready to go off when he arrived. Anyone who has collected fossils in recent years knows this type of cooperation is unheard of in modern quarries, even if one could afford it.

Greene was a member of the Board of Trustees of the Milwaukee Public Museum from 1883 until his death in 1894. He arranged fossil purchases for the museum while on the board, but he also outbid the museum for specimens he wanted in his own collection (Greacen and Ball, 1946a).

Greene spent over \$16,000 on his entire collection, including many of the wooden cases in which it is still housed. Of that amount, over \$5000 was spent on fossils between 1878 and 1893. Greene's collection (Figs. 9 and 10) was kept by his family until 1911 when it was donated to Milwaukee-Downer College (Greacen and Ball, 1946a). The family also provided a fireproof building for the collection. In 1964 the collection was sold to The University of Wisconsin-Milwaukee for the bargain price of \$20,000, and is now worth more than ten times that amount.

The Greene collection is the sole major nineteenth century Milwaukee area fossil collection to remain intact and in the area.

Not only is it the largest collection of local Silurian and Devonian fossils, but it is also the largest single collection of Silurian reef fossils from the Chicago area. Although the Greene collection is undoubtedly the most important paleontologic research collection in the state, it has been only partially examined by specialists. However, it will remain a key element in any future geologic research in the area.

#### *Edgar Eugene Teller*

Edgar E. Teller was born on August 3, 1845 in Buffalo, New York (Fig. 11). In 1875 he moved to Milwaukee where he worked as a buyer for Plankinton and Armour (and its successor firms) until his retirement (Teller, 1924). He became interested in paleontology by stopping in at the Moody quarry (26th Street quarry) on his way to and from work in the early 1880s. Teller devoted most of his time to collecting Devonian fossils from the Milwaukee Cement Company quarries, but he also collected a large amount of Silurian

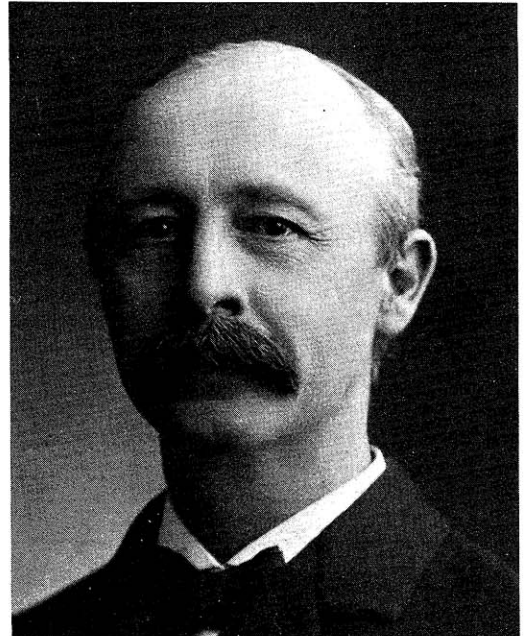


Fig. 11. Portrait of Edgar E. Teller, ca. 1895. Photo courtesy of Kathryn Teller.

material from the Moody quarry and lesser amounts from the Schoonmaker quarry and the Horlick quarry in Racine (Fig. 12), as well as some of the few complete trilobites known from the Cambrian Lodi Shale of Wisconsin.

Teller corresponded with, and loaned specimens to, a number of professional paleontologists, including James Hall, Robert Whitfield, Stuart Weller, Charles Eastman, Charles Walcott, and H. F. Cleland. Because of these associations, his collection contained, or supplied, more figured specimens than any other local naturalist's. He also wrote more scientific papers than other local collectors (Teller, 1900; 1906; 1910; 1912; Monroe and Teller, 1899), providing some of the most detailed descriptions of Wisconsin Devonian geology ever published (also see discussion about Monroe).

Teller was a major participant in the

Wisconsin Natural History Society. He joined the society in 1885, serving as its president on several occasions, and as an editor and director until he returned to Buffalo in 1915. The demise of the society at this time was probably due in part to his departure. Teller was also interested in archaeology, and helped to establish the Wisconsin Archaeological Society as a separate organization from the Wisconsin Natural History Society in 1901 (Teller, 1924).

In 1908 Teller gave a large part of his collection to the Walker Museum at The University of Chicago (now part of the present-day Field Museum). Few of these specimens can now be identified as collected by Teller, but many of the Wisconsin Silurian and Devonian fossils in this collection undoubtedly were his.

Teller died in Buffalo on July 19, 1923. Both the National Museum of Natural History and Yale University were interested



Fig. 12. Main quarry of the Horlick Lime and Stone Company located along the Root River near Racine, Wisconsin, ca. 1888. The Silurian reef rock at this quarry supplied most of the fossils collected in the Racine area (from Art Publishing Co., 1888).

in his collection, and on April 3, 1924 his wife, Marie, gave the entire collection of 100,000 specimens and a library of several thousand volumes to the National Museum. This donation included nearly all of the type specimens described from his collection. Teller's material was assimilated into the National Museum's general collections and can no longer be examined intact. Several drawers of his Silurian specimens remain unsorted and uncatalogued. His books were incorporated into the museum library.

### *Charles Edwin Monroe*

Charles Monroe was born in 1857, and later graduated from Oberlin College and The University of Michigan Law School (*Milwaukee Journal*, May 13, 1931) (Fig. 13). He moved to Milwaukee in 1884, and began a long career as a prominent attorney. He was apparently interested in several fields of natural history, of which botany was foremost.



Fig. 13. Portrait of Charles E. Monroe, ca. 1920s. Photo courtesy of the Milwaukee Public Museum, Neg. No. 417133.

In the 1890s and early 1900s, Monroe spent a considerable amount of time collecting and studying the Devonian fossils of Wisconsin. He was a close friend of Edgar Teller, and the two of them share credit for stimulating research on the Devonian rocks of the area. Together they made comprehensive collections of all the localities and stratigraphic units of the Wisconsin Devonian. They were the first to publish detailed descriptions of the stratigraphic occurrence of Devonian fossils and to subdivide Devonian strata. They published an important report on Devonian rocks and fossils encountered during excavation for water intake tunnels at North Point in Milwaukee. They also discovered the phyllocarid bed in the Silurian Waubakee Dolomite and supplied the phyllocarid specimens described by Whitfield (1896). In 1900 Monroe published a description of the Devonian rocks, which he discovered, at what is now Harrington Beach State Park near Lake Church, Ozaukee County, Wisconsin. He contacted several individuals, including Charles Schuchert and Stuart Weller, in an attempt to have this new fauna described, and it was probably a result of his efforts that one of Schuchert's students, H. F. Cleland, began his work on the Wisconsin Devonian.

Monroe was associated with the Milwaukee Public Museum for many years. He held the position of honorary curator of paleontology from 1897 until at least 1922, and was the only person to work on the museum's fossil collections until Ira Edwards was hired in 1916. A generous donor to the museum, he gave nearly all of his Wisconsin Devonian fossil collection to the museum between 1898 and 1900, including the spectacular jaw of *Eastmanosteus* figured by Eastman (1900) and Cleland (1911) (Fig. 14). Other fossils he collected became type and figured specimens in papers by Cleland, Pohl, Penhallow, and others.

After 1905 Monroe devoted almost all of his spare time to botany, and he made

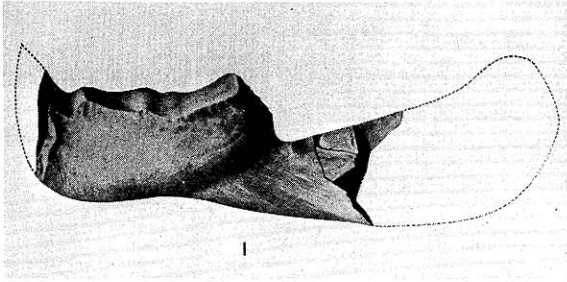


Fig. 14. Jaw of the Devonian fish *Eastmanosteus pustulosus* collected in 1899 by C. E. Monroe in the Milwaukee Cement Company quarries. The specimen is approximately 10 inches long and is now in the collection of the Milwaukee Public Museum (from Cleland, 1911).

several donations of botanical material to the Milwaukee Public Museum, including a collection of over 15,000 specimens in 1924. He moved to Oberlin, Ohio, in 1929, where he died in May, 1931, at the age of 74.

#### *Other Local Collectors*

Several other individuals are known to have made fossil collections in southeastern Wisconsin during the nineteenth century, but little specific information is known about their activities. For the most part, these collections have disappeared.

Professor Samuel S. Sherman, who taught at Milwaukee Female College in the 1860s and 1870s, collected and purchased fossils from quarrymen in the 1860s. Sherman moved to Chicago in 1879 where he worked for Sherman Brothers, a family business.

Walter Rankin of Carroll College collected fossils in the Waukesha area and some of his specimens are thought to be in the Day and Greene collections.

Philo Romaine Hoy was a general naturalist like Lapham, who confined his studies to the Racine area. Hoy was born in Mansfield, Ohio, in 1816, and was trained as a medical doctor. In 1846 Hoy moved to Racine (McMynn, 1893) and later that same year he and Lapham collected fossils together in the quarries north of Racine. Hoy also knew Day and Greene and accompanied

them to Racine area quarries on many occasions. James Hall also received specimens from Hoy. Hoy's collection was divided between Day and the now defunct Racine College (Teller, 1912). Ornithology and botany are the fields of natural history for which Hoy is most often remembered.

F. L. Horneffer collected fossils from the cement quarries and the 26th Street quarry in Milwaukee during the 1890s (Teller, 1912). His fossils became part of Teller's collection, and included some of the type material in that collection. Horneffer continued collecting into the early 1900s, and accompanied Gilbert Raasch into the field on occasion (G. Raasch, 1973, pers. comm.).

After the turn of the century, quarrying activity in the area declined, and methods of operation changed. Social values, education, and employment opportunities also changed, and the gentlemen paleontologists faded from the scene. The only important local collections made since that time were assembled by Gilbert Raasch and Joseph Emielity. Both these men are Milwaukee natives who started collecting fossils as children, and went on to become professional geologists. Nearly all of their collections are now located in the Milwaukee Public Museum.

#### THE COLLECTIONS

##### *Research Value*

The four major surviving collections are of primary importance to paleontological research on the Paleozoic geology of southeastern Wisconsin. The Day, Greene, Teller, and Monroe collections are a source of unique and unstudied fossils and contain many type specimens. They cannot be duplicated in quantity, quality, or comprehensiveness, because most of the bedrock outcrops and quarries have disappeared and quarrying methods have changed. In addition, they are the only source of fossils and rock samples for many of the vanished localities. The later collections made by Raasch and Emielity supplement the older collections by

covering more recent exposures, but do not replace them.

Although many of the fossils were collected more than one hundred years ago, they have not lost their usefulness for paleontologic research. Locality information accompanies most specimens, and by studying old geologic reports and the lithology of the specimens, it is possible to determine the exact geographic location and stratigraphic horizon in which the fossils were collected. It is also possible to determine reef or interreef origins for most of the Silurian material.

These collections are invaluable for taxonomic studies because they include many type specimens and numerous individuals of single taxa which are necessary for population studies. While the Day, Teller, and Monroe collections are no longer readily available for comprehensive faunal studies of specific localities, the Greene collection is ideal. It contains the most complete collection of North American Silurian reef fossils found in any museum. These historic collections are also important for research in biogeography, paleoecology, biostratigraphy, taphonomy, rates of evolution, and for general and local stratigraphic studies.

#### *Preservation of the Collections*

Many other nineteenth century fossil collections in the state, and throughout the country, have virtually disappeared through accident or neglect. Over 20,000 fossils were collected by the Wisconsin Geological Survey during the 1870s, and were equally divided among twelve different educational institutions in the state (Chamberlin, 1880). Approximately 1200 specimens were destroyed along with Lapham's collection in the Science Hall fire in 1884, but the fate of most of the others has not yet been determined. Only a few hundred of these specimens are known to exist.

Even in recent years, important collections have been seriously damaged by neglect. The W. C. Egan collection of Chicago area fossils in the Chicago Academy of Science is a

good example. This collection was well organized as late as 1946 (Ball and Greacen, 1946), but by 1967 it was in disarray and many specimens, including types, cannot be located. The University of Wisconsin-Madison Geology Museum has also suffered long periods of neglect during which fossils disappeared and uncatalogued material was rendered useless because of missing locality information.

The Greene, Day, and Teller collections are all vulnerable in varying degrees to the same problems. Above all, a collection must be completely catalogued to prevent the loss of locality data. Once this is accomplished, the Day and Teller collections will be in little danger (although the Museum of Comparative Zoology is not exactly fireproof). Greene's collection is, and probably always will be, vulnerable to the type of neglect that small university collections often face. As long as a dedicated individual, like the late Dr. Katherine G. Nelson, took care of the collection there was a little danger of this happening. However, with her passing, the awareness of the importance of the Greene collection may fade. The University of Wisconsin-Milwaukee faces an important obligation in preserving the Greene collection and insuring its usefulness in the future.

#### SUMMARY

The collecting activity of Milwaukee's gentlemen paleontologists continues to be a major factor in geological research in the Milwaukee area. They made important observations, published papers, distributed specimens, and assembled comprehensive collections, all of which stimulated interest in the geology and paleontology of the area. They spent more time and money assembling their collections than would have been possible for any professional geologists of that time. Their fossils were studied by some of the most prominent paleontologists of the nineteenth century, including James Hall, F. B. Meek, J. S. Newberry, C. D. Walcott, C. Wachsmuth, R. P. Whitfield, P. E. Ray-

mond, H. F. Cleland, C. R. Eastman, J. M. Clarke, Stuart Weller, A. F. Foerste, E. O. Ulrich, C. E. Resser, E. R. Pohl, and Frank Springer. Most of these collections focused attention on classic Silurian reefs in the area with their abundant and diverse faunas. On a local level, these collectors promoted and actively participated in natural history societies and museums.

It is no longer possible to assemble comparable collections on the Milwaukee area because of the change in quarrying methods, the general decline of that industry, and the lack of people willing to devote large amounts of both time and money to this pursuit. For these reasons the Day, Greene, Teller, and Monroe collections are more important than ever before.

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