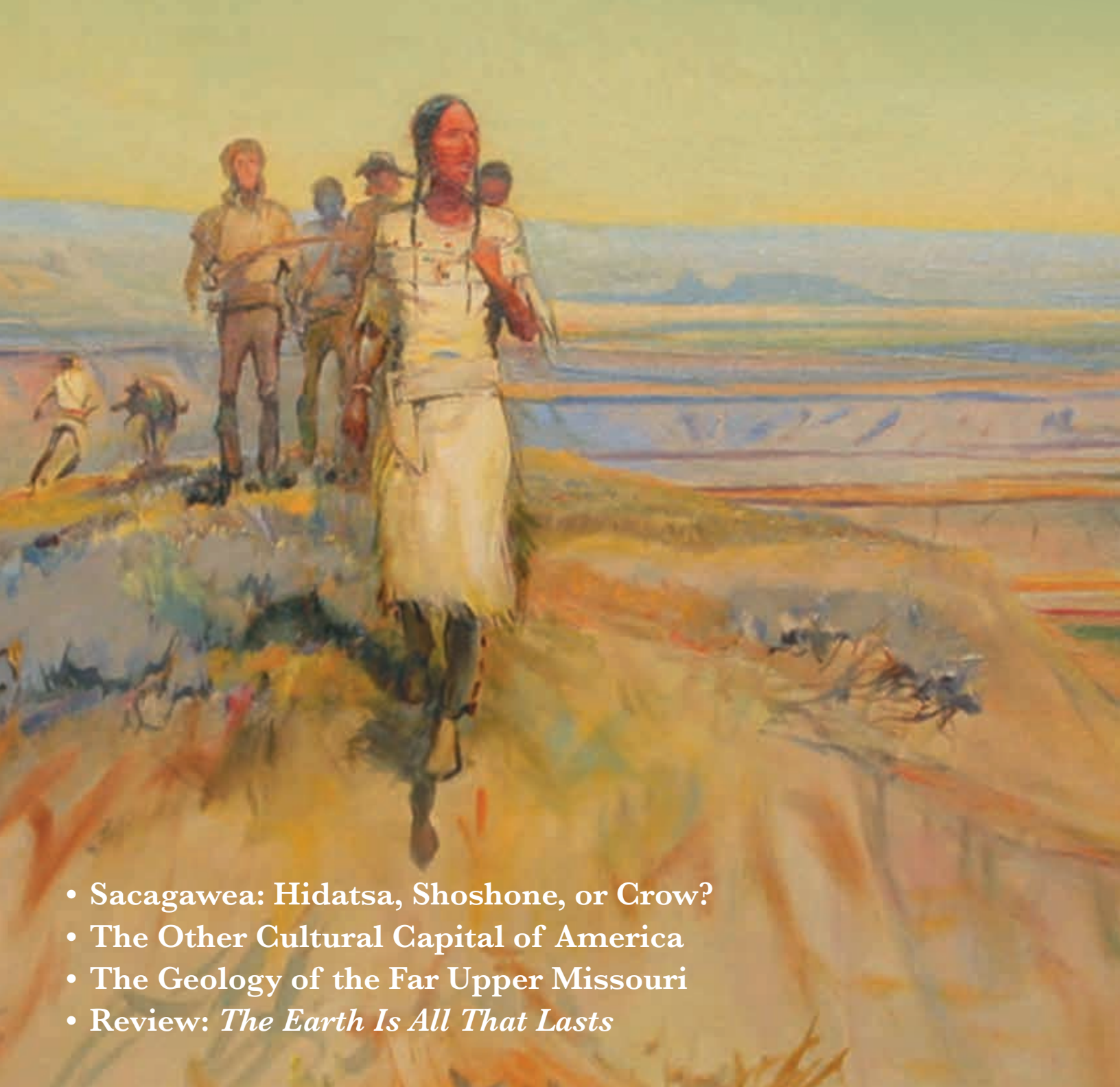


We Proceeded On

NOVEMBER 2022 VOL 48 NO 4

LEWIS AND CLARK TRAIL HERITAGE FOUNDATION



- Sacagawea: Hidatsa, Shoshone, or Crow?
- The Other Cultural Capital of America
- The Geology of the Far Upper Missouri
- Review: *The Earth Is All That Lasts*

HISTORY FROM THE HEART

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“Sacajawea at the Portage.” Painting by J.K. Ralston. Image courtesy of Tim Peterson.

We Proceeded On welcomes submissions of articles, proposals, inquiries, and letters. Writer’s guidelines are available by request and can be found on our website, lewisandclark.org. Submissions should be sent to Clay S. Jenkinson (701-202-6751) at editor@lewisandclark.org.



November 2022 Volume 48, Number 4

We Proceeded On is the official publication of the Lewis and Clark Trail Heritage Foundation, Inc. Its name derives from a phrase that appears repeatedly in the collective journals of the expedition. © 2022

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Founder, *We Proceeded On*
ISSN 02275-6706

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We Proceeded On, the quarterly journal of the Foundation, is mailed to current members who opt to receive it in February, May, August, and November. Articles appearing in this journal are abstracted and indexed in Historical Abstracts and America: History and Life.

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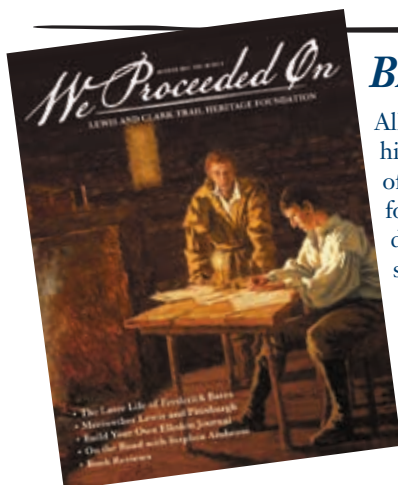
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We Proceeded On is published four times a year in February, May, August, and November for the Lewis and Clark Trail Heritage Foundation, 4201 Giant Springs Road, Great Falls, MT 59405. Current issue: November 2022, Volume 48, No. 4, ISSN 02275-6706.

Postmaster: Send address changes to P.O. Box 3434, Great Falls, MT 59403. Periodical postage paid at Great Falls, MT, and additional offices.

Incorporated in 1969 under Missouri General Not-For-Profit Corporation Act. IRS Exemption Certificate No. 501(c)3, Identification No. 510187715.



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A Message from the President



LCTHF President James R. Sayce

As Lewis and Clark Trail Heritage Foundation Immediate Past President Lou Ritten has done through some challenging times, I hope to serve you well and ably in the coming years as president of our foundation.

I live a nautical mile from where I was born on a narrow strip of land between the North American continent and the Pacific Ocean. I grew up to the deep rumble of the ocean and the foreboding whistling winds in the tall Sitka spruce that signal the approach of immensely powerful cyclonic storms. Away for a decade in study I returned home to farm cranberries and eventually enter public service.

With more natural history in my blood than history I always believed our kin relationship with the environment, the land, the waters to be the root of our existence. It gives us great joy to imagine and “re- create” ourselves on those trips and passages through the immense landscapes of North America.

A simple trail, an overlook, an interpretive park, a headland at the mountain top, or a sea view can all open new windows, enabling us to visit a past reimagined or a future yet to be experienced. My cross-continent bike trip in 1976 with

five college friends compelled me to recognize the vast continental scale known to all peoples who traveled across land and time. And as we learn day by day, our enduring passage though the land is the sum of many small, albeit sometimes difficult, journeys taken together.

It was this that drew me in to the Corps of Volunteers for Northwest Discovery. When David Nicandri, the former director of the Washington State Historical Society, tapped me as his representative on the ground for building Middle Village/Station Camp, it was an epiphany. This was the same place at a little creek along a forgotten wayside park that witnessed the beginning of my journey more than five decades ago to become an Eagle Scout and nurtured my lifelong interest in the land and water boundary.

Little did I know that would include the life lessons I learned through becoming friends with Chinook Indians and their Clatsop brothers and sisters, Chinook Tribal Chair Ray Gardner, and former Chair Gary Johnson and his son Tony. And then Middle Village/Station Camp arose owing to the efforts of Ray, Lewis and Clark National Historical Park Superintendent Dave Szymanski, and property owner representative Bill Garvin. It was not easy for us, but it was worth a decade of time to tell in Ray’s words, “All the stories.” This was brought home to me by former Lewis and Clark National Historic Trail Superintendent Gerard Baker when he called me and asked, “What is this discovery trail?” and I met him at Beard’s Hollow, and we walked through the heavy dark forest to

the brilliant Pacific shore. Barefoot, Gerard waded into the surf to greet the water and the sky. I was forever transfixed by the realization that journeys change us, re-create us. We need to make more of them together.

Could we re-create ourselves in daily journeys? On or parallel to the Lewis and Clark National Historic Trail? Can we adopt modern themes that are ancient (think over-landing) or mobility technology (e-bikes, scooters, mountain bikes, etc.) that gives greater access to a broader cohort of visitors? Of course we can. Or can we re-imagine the trail as six dozen (or more) smaller journeys bracketing the points of historical significance? Yes, we can because arrival to and taking leave of those points are the core of a journey, one of many daily experiences to look forward to for a lifetime. As stewards of the trail, we must feel the compulsion to share our experiences in whichever manner connects us to our many and diverse audiences.

I had never been to the Great Falls before. When Lee Ebling of the Montana Region’s Portage Route Chapter led us there, I too was transfixed by the water and sky, like the falls of Niagara, Palouse, Snoqualmie, the thunderous roars of the present, gravity drawing the roars down, reminding us of the past. Let us take journeys together and, in the process, we will start to re-create ourselves. ■

*James R. Sayce, President
Lewis and Clark Trail Heritage Foundation
Seaview, Washington*



Enlightening Gotham

How New York City Became a Cultural Hub at the Start of the Nineteenth Century

By Lee Alan Dugatkin

Mangin-Goerck 1803 Map of New York City.

Enlightenment: A European intellectual movement of the 17th and 18th centuries in which ideas concerning God, reason, nature, and humanity were synthesized into a worldview that gained wide assent in the West and that instigated revolutionary developments in art, philosophy, and politics. Central to Enlightenment thought were the use and celebration of reason, the power by which humans understand the universe and improve their own condition. The goals of rational humanity were considered to be knowledge, freedom, and happiness.

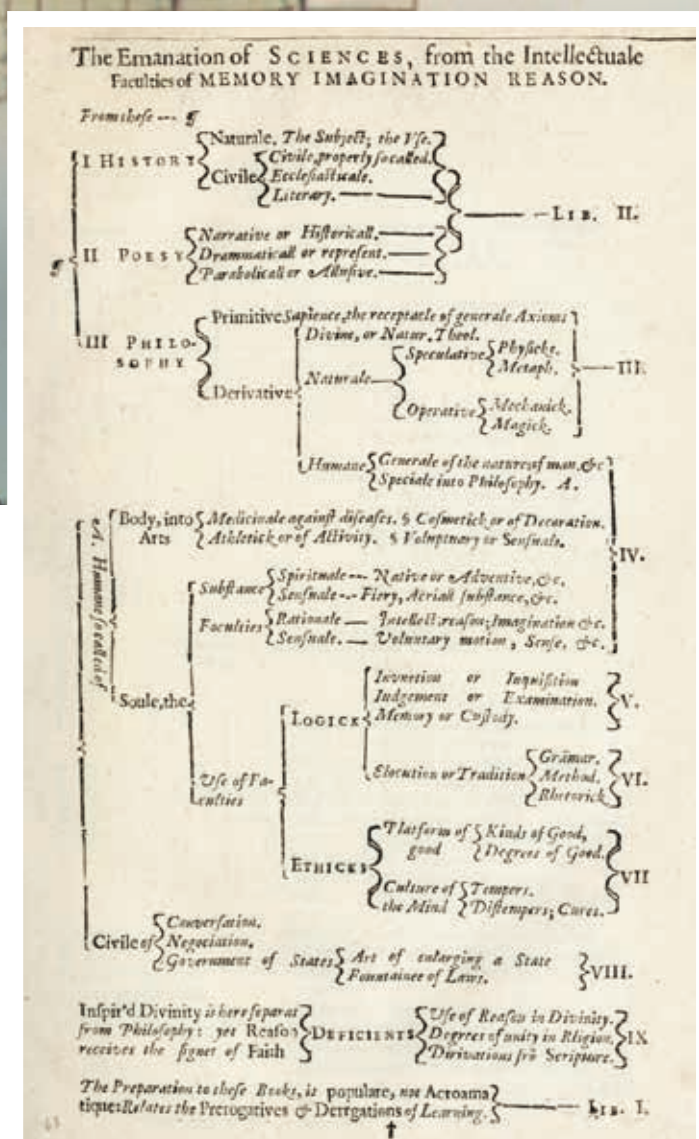
Encyclopedia Britannica

Thomas Jefferson's passion for the ideals of the Enlightenment was born when he was a student at the College of William and Mary in the early 1760s. It was there he met Professor of Natural Philosophy and Mathematics William Small who had emigrated from Scotland. The quintessential Enlightenment thinker, he introduced the Socratic method to replace rote memory and recitation at the college. Small quickly took on the role of teacher, mentor,

friend, and perhaps surrogate father to the young Jefferson.

When Jefferson cared about something – and he cared deeply about every branch of knowledge touched by the Enlightenment, including natural philosophy (what today we call science), art, philosophy, literature, history, and politics – he read about it. Books were Jefferson's primary window on the world, especially in his formative years.

Jefferson's library shelves, organized around a tripartite



Nestled in the shelves housing Jefferson's books on geography was one book, Sir Alexander Mackenzie's *Voyages from Montreal, on the River St. Laurence, Through the Continent of North America, to the Frozen and Pacific Oceans; In the Years 1789 and 1793*, that many historians believe at least served as a partial impetus for the Lewis and Clark Expedition. In 1801, Mackenzie published his travel narrative of two voyages, the first of which took him to the Arctic

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Back of the State House, Philadelphia, Birch's Views of Philadelphia, 1800.

Ocean, and the second of which had Mackenzie crossing the Rocky Mountains to the Pacific coast. Jefferson knew of the publication no later than May 8, 1802, when he wrote John Vaughn of an edition published in Philadelphia by John Morgan. Unhappy with the quality of that edition, on June 17, 1803, Jefferson wrote James Cheetham, "I have understood there is to be had in New York an 8vo. [octavo] edition of Mc.kenzie's travels with the same maps which are in the 4to. [quarto] edition. I will thank you to procure it for me. The American 8vo. edition is defective in its maps, and the English 4to. edition is too large & cumbersome." Four days later, Cheetham sent the 1802 London octavo edition that had been advertised in his *Cheetham's Republican Watch-Tower*

for a price of \$3.50 (about \$85 today).

Jefferson did more than read the books in his library. He corresponded with many of the authors. For example, his library housed thirty-six volumes (in English, French, Italian, Latin, and Greek) categorized as "Botany" and six more that he placed under the rubric "Natural Philosophy," but for all intents and purposes they were about botany as well. Many of these volumes were penned by the leading botanists of his day and earlier, including Benjamin Smith Barton, Charles Darwin's grandfather Erasmus Darwin, Georges Louis Marie Dumont de Courset, Humphrey Marshall, Alexander von Humboldt, Constantine Rafinesque, André Michaux, and his son François André Michaux. Jefferson corresponded

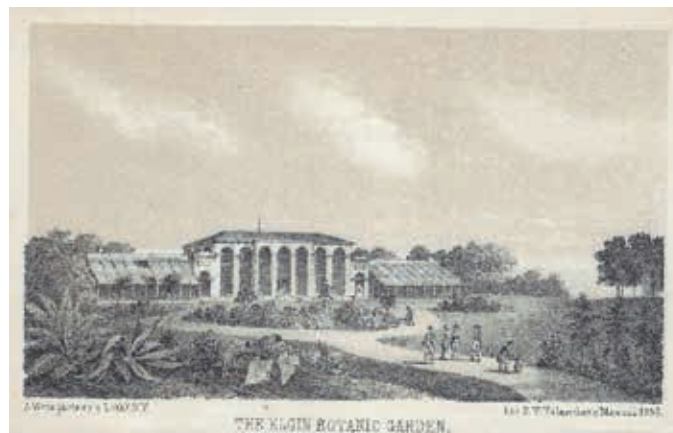
with Barton, von Humboldt, Rafinesque, and both Michaux and his son. In 1792, Jefferson and the American Philosophical Society even sponsored André Michaux to lead an expedition west. That expedition collapsed before Michaux could get underway.

If Jefferson's library captured the Enlightenment in words, in the fledgling years of the United States, Philadelphia was where those words came to life most vividly. Perhaps most famously, Philadelphia was the home of the American Philosophical Society, founded in 1743, the year of Jefferson's birth. After alternating between enthusiasm and less during its early years, by the time Jefferson entered adulthood, the Society had committees that among them covered mathematics, natural philosophy, astronomy, chemistry, anatomy, medicine, architecture, mechanics, and more. Members included Benjamin Franklin (the Society's first president), astronomer David Rittenhouse (the Society's second president), Thomas Jefferson (the Society's third president), physicians Benjamin Rush and Benjamin Morgan, mathematician Robert Patterson, composer, writer, and lawyer Francis Hopkinson, and foreign members including the Marquis de Lafayette, chemist Monsieur Lavoisier of the Academy of Sciences in Paris, historian Guillaume-Thomas Raynal, the Marquis de Barbe-Marbois, the Marquis de Chastellux, and many more.

But there was much more to Philadelphia's claim to being the center of the Enlightenment in the New World. It was home to Franklin's Library Company, the American Academy of Painting, Sculpture, Architecture, and Engraving, a bustling theatre and music culture, and many bookshops, all within a short walk of the State House. There were salons modeled after those of Paris. Some, like the ones hosted by Elizabeth Graeme Fergusson (1737-1801), were true Enlightenment soirees. Fergusson's salons revolved around literature, and among those in attendance were her friends: poet Annis Boudinot Stockton, physician Benjamin Rush, artist Benjamin West, writer and composer Francis Hopkinson, as well as John Dickinson, who had authored *Letters from a Farmer in Pennsylvania* (1768). Rush describes a salon led by Fergusson, "who instructed by the stores of knowledge contained in the historians, philosophers, and poets of ancient and modern nations, which she called forth at her pleasure ... she charmed by a profusion of original ideas, collected by her vivid and widely expanded imagination, and combined with exquisite taste and an endless variety of elegant and delightful forms."¹

Many, if not most, of the country's preeminent scientists including botanist Benjamin Smith Barton called Philadelphia home. In 1803, the very same year that Barton published *Elements of Botany: Or, Outlines of the Natural History Of Vegetables*, the first botany textbook by an American, Jefferson wrote Barton: "What follows in this letter is strictly confidential. You know we have been many years wishing to have the Missouri explored, & whatever river, heading with that, runs into the Western ocean. Congress, in some secret proceedings, have yielded to a proposition I made them for permitting me to have it done." After extolling Captain Lewis' skills as a naturalist, "who possesses a remarkable [sic] store of accurate observation on all the subjects of the three kingdoms," Jefferson told Barton that there was no space for a botanist per se among the expedition crew. That needed to be remedied somehow or another. "I must ask the favor of you to prepare for him a note of those in the lines of botany," Jefferson wrote. "He [Lewis] will be with you in Philadelphia in two or three weeks, & will wait on you ... and any verbal communications which you may be so good as to make to him. I make no apology for this trouble, because I know that the same wish to promote science which has induced me to bring forward this proposition, will induce you to aid in promoting it."² Barton has happy to oblige. He gave Lewis private lessons in his library, allowed Lewis to audit his botany course at the University of Pennsylvania, and for hands-on experience led him on an excursion through the Bartram's Garden, as well as The Woodlands, William Hamilton's gorgeous garden just outside the city.

Philadelphia was also home to Charles Willson Peale's museum. The first true museum in the new republic, it fused natural history, anthropology, and art. It was not without



Elgin Botanical Garden, established in New York City in 1801, the year Jefferson assumed the presidency.

cause that after visiting Peale's museum once, the Comte de Volney proclaimed it, "the temple of God. Nothing but truth and reason." Peale's museum was many things, including the public face of the Lewis and Clark Expedition's artifacts. Most of the specimens came to Peale after the end of the Expedition, but as early as July 1804, Jefferson shared with Peale a copy of diagrams that Lewis and Clark had sent him of a new lizard species, and starting in October 1805, Lewis and Clark began sending (initially to Jefferson) occasional samples like the skeletons of two deer, a big-horned sheep, a badger, a prairie dog, and "(a) burrowing wolf of the prairies," as well as thirteen fox furs, the skins of two antelope, and a live magpie. All that material was carefully examined by the ever-curious Jefferson, who made his selections. "There are some articles," he wrote Peale, "which I shall keep ... at Monticello." Much of the remainder the president sent to Peale, and to a lesser extent, the American Philosophical Society.³

Peale was naturally delighted: "everything that comes from Louisiana [i.e., the West]," he wrote Jefferson, "must be interesting to the public." He also dispensed some detailed advice regarding ethnographic material the president would have likely received from Lewis and Clark: "As you wish to keep some Indian dresses at your Mansion," he wrote his friend, "and parts of them may be liable to the depredations of *Dermests* [leather-eating beetles], the mode of preserving may be applied to the perishable parts as I do with my large animals."⁴

Meriwether Lewis visited Philadelphia upon his return from the Pacific and sat for a portrait that Peale hung in the museum. Peale also created a wax figure of Lewis for the museum, writing Jefferson that he "placed it in the Museum, my object in this work is to give a lesson to the Indians who may visit the Museum, and also to shew my sentiments respecting wars ... I am pleased whenever I can give an object which affords a moral sentiment to the visitors of the museum." It was quite the sight with Lewis clad in Indian dress, a tippet, presented to him by "Comeahwait, Chief of [the] Shoshone Nation." The figure, Peale continues, "has its right hand on its breast and the left holds the Calmut [a calumet pipe] which was given me by Captn. Lewis."⁵

Jefferson was so impressed by his friend Peale's museum that when he was looking for the perfect place to send his fifteen-year-old grandson Thomas Jefferson Randolph for the finest Enlightenment education available, he turned to his friend Peale, asking if the young Randolph could board with him and have his educational curriculum guided by all that



DeWitt Clinton by Wesley Jarvis. Courtesy of the National Portrait Gallery.

Peale and his connections had to offer. What better place to have his grandson, Jefferson thought, than living *in* Peale's Museum, taking it all in, along with everything else Philadelphia had to offer a developing young mind.

A little more than four and a half miles south and west of the State House in Philadelphia sat Bartram's Garden, initially planted by John Bartram who worked later with Franklin to establish the American Philosophical Society. Bartram's Garden was frequented by the curious working men and women of Philadelphia, as well as Washington and Jefferson, the Marquis de Barbe-Marbois, and the Chevalier de La Luzerne. During the Constitutional Convention in the summer of 1787, delegates would often escape the blistering heat of the city and the fiery debates going on behind closed doors at the State House by heading to Bartram's Garden for a few hours.

In the last decades of the eighteenth century and start of the nineteenth century, Philadelphia was clearly the seat of the American Enlightenment. But there were stirrings of a challenge from New York City, soon to be nicknamed Gotham by Washington Irving. In his 1789 book, *American Geography*, Jedediah Morse laid out what needed to be done. A reasonable person, Morse wrote, who wished "to acquaint



David Hosack by Augustus G. Heaton. Courtesy of the Collection of the New-York Historical Society.

himself with the true situation of the people of New York, their manners and government,” and who queried where were the “societies for the encouragement of sciences, arts ... etc.? For their public libraries? For the patrons of literature? [The] well-regulated academies?” would be disappointed at the answers. “Such enquiry might be made with propriety,” Morse noted “but could not, at present, be answered satisfactorily.”

In the last decade of the eighteenth century, new societies, each with its own brand of Enlightenment-inspired ethos, emerged in Gotham. One was the Uranian Society “whose main object [was] the promotion of literature.” There were also New York City’s Calliopean and Philological Societies whose members focused primarily on language and literature. The Philological Society, whose concern was “ascertaining and improving the American Tongue,” was founded by twenty-nine-year-old lexicographer Noah Webster. There was also the Friendly Society which sought “to enlighten our fellow-men & render them more happy.” There was even the Tammany Museum, established “for the sole purpose of collecting and preserving whatever may relate to the history of our country and serve to perpetuate the same.” In time, the Tammany Museum became known

as the Scudder’s American Museum. All of which is to say, at the cusp of the nineteenth century the infrastructure was starting to emerge for a second enlightened city in America.

Starting in 1802, four temples of wisdom and a garden, which among them covered art, literature, science, philosophy, and history, set out to take the next step, and to make New York a “first city” in every sense of the term. Over the next two decades, the New York Academy of Fine Arts, the Elgin Botanical Garden, the New York Historical Society, the Literary and Philosophical Society of New York, the Lyceum of Natural History, and the small but powerful coterie of men who created and championed them, laid the groundwork for a cultured Gotham.

DeWitt Clinton, David Hosack, Samuel Latham Mitchill, and John Pintard, the four men most responsible for these societies and academies, did more than create and nourish them. They, along with a very few others, were *the* cultural face of New York City during the first two decades of the nineteenth century. Between 1802 and 1818, each of these four men not only served as founder, president, vice president, secretary, or fundraiser for each group, but made seminal contributions of their own to science, art, history, and philosophy in the process.

In 1802, David Hosack was a professor of *Materia Medica* and a professor of botany at Columbia College (formerly King’s College, now Columbia University). He had come to think that New York City needed a botanical garden on par with the gardens he had seen when he had studied in Scotland and England, a garden that would do Bartram’s Garden in Philadelphia one better by being both a public garden and a place for botanical research. He turned to Columbia for help, but they declined, as did the New York State Senate. So Hosack decided to do it himself. He purchased twenty acres of land about three and a half miles from City Hall – close enough to the heart of the city for people to visit, but far enough away to give him the space he needed – and built the Elgin Botanic Garden.

Description of Elgin Garden, an 1802 pamphlet, told visitors of oak, elm, sugar maple, ash, chestnut, willow, and poplar trees, along with a living “amphitheater ... of shrubs, natives and foreign ... every step [presents] something new and engaging.” Elgin Garden also had a conservatory and a row of greenhouses that together spanned 180 feet. The greenhouses alone were worth the visit, providing visitors with a visual and olfactory smorgasbord: lemon trees, orange trees, jasmine, cinnamon, roses, hyacinths, azaleas, and more.

The *New-York Evening Post* proudly decreed Elgin Garden the “first attempt of the kind in this country ... every person of taste and science ... [will] feel himself interested in the success of this establishment.” A few years later, Hosack was proud enough of his Elgin Garden to write President Jefferson, “Knowing your attachment to science and the interest you feel on the progress of it in the United States, I take the liberty of enclosing to you a catalogue of plants which I have been enabled to collect as the beginning of a botanic garden.” In reply, Jefferson wrote Hosack that, “should he have it in his power to be useful to his institution at any time he shall embrace the occasion with that pleasure which attends every aid given to the promotion of science.”⁶

The same year that Elgin Garden opened, Robert R. Livingston was residing in Paris as the American ambassador to France. After gazing at some of the finest art in the world during a visit to the Louvre, he decided that New York City needed an academy of fine arts, and wrote his brother Edward, at the time mayor of New York City, to promote such an academy. The Livingstons had the money to visit museums around the world, but they knew that almost no one else in America did, and they aimed “to make a collection, that may be the foundation of a school for the Fine Arts and attract the attention of such of their admirers as have not the means or the leisure to visit the originals.” The plan was for Ambassador Livingston, with the help of Louvre Director Dominique Vivant Baron Denon, to “procure Casts in Plaster of the most beautiful pieces of ancient sculpture, now collected in the National Museum, which would then be sent to New York City to seed the Academy of Fine Arts.”

In December 1802, Mayor Livingston chaired the first meeting of the society that became the New York Academy of the Fine Arts, which shortly thereafter changed its name to the American Academy of Arts. David Hosack, John Pintard, and Samuel Latham Mitchill were among that earliest group of subscribers, pledging support – both financial and more – in the very year it was proposed. Pintard bought space in *The Daily Advertiser* and wrote that “were a society of sufficient spirit ... the beneficial effects would be progressive and infinite.” DeWitt Clinton agreed, so much so that the American Academy of Arts’ bylaws were written in his hand.

In 1803, as his brother the ambassador was negotiating the Louisiana Purchase with the First Consul in Paris, Mayor Livingston used the local newspapers to spread the word about the American Academy of Arts: “The existence of this institution has been already announced to the public, and



John Pintard by Samuel Waldo and William Jewett. Courtesy of the Collection of the New-York Historical Society.

has attracted some attention,” he noted. “It has not, however, been [so] generally appreciated as its importance merits, chiefly because its objects have not been fully detailed.” He provided some of those details, including the Society’s goal to house “1. A complete collection of Casts in Plaster, from every valuable Statue ... now in Paris. 2. Good copies from the best masters in the several Schools of Painting, together with a few originals. 3. A selection of Architectural models, drawings and plans.” Mayor Livingston wanted to demonstrate to the world that America, young though it was, was already a place of culture: “The reputation of our country is closely connected with everything that may introduce within it a gem of those arts so highly cultivated in Europe but not yet planted here,” the mayor told the citizens of New York City. “If properly fostered ... the American Republic, like those of Greece and Rome, will prove another honorable and instructive example of the intimate connection of freedom with the Arts.”⁷

New York City’s Pantheon building was soon housing the American Academy of Arts’ first exhibition with sixteen large statues and busts sent from Paris, including the Apollo Belvedere, Venus of the Capital, the Gladiator of the Borghese Palace, Castor and Pollux, Hermaphrodite, Ceres,



Samuel Latham Mitchill by Ezra Ames. Permission from the Zimmerli Art Museum at Rutgers University.

Grecian Cupid, Homer, Demosthenes, Bacchus, and Romas. The intended audience for the academy's exhibit included both aspiring artists who received "constant admission ... without expense or subscription" and the general public who were welcomed each Saturday by advertisements particularly aimed at "such ladies as may be disposed to view the collection."

Reviews of the first public exhibition were good. New York's *Morning Chronicle* told readers of "a collection of taste and elegance, at once useful and ornamental to the city which has given it birth" while Longworth's *New York Almanack* wrote that the "infant institution has obtained much celebrity and promises to be an ornament of the country." The Academy had made its mark. A few years later, when the Society of Mechanics and the Tradesmen of the City of New York held their annual meeting, in addition to toasting the President of the United States and the City of New York, they raised their cups to "the Academy of the Fine Arts, may it receive the aid it so justly merits, and rival the ancient schools of Greece and Rome."⁸

In addition to art academies, enlightened cities care about history per se. The French Académie des Inscriptions et Belles-Lettres, the Spanish Real Academia de la Historia,

and the Society of Antiquaries of London long predated the American Revolution, but almost three decades after Jefferson's Declaration of Independence was signed, only Massachusetts had a state-chartered historical society. For Pintard and Clinton and Hossack, that simply would not do. Nor would it suffice for Mitchill, who was splitting his time between New York City and Washington, D.C., where he served as a congressman and often dined with President Jefferson. In 1804, together with about a dozen other leading citizens of New York City, Mitchill, Pintard, Clinton, and Hossack established the New York Historical Society.

At the first meeting of the New York Historical Society on November 24, 1804, members laid out their ambitious goal, which was "to collect and preserve whatever may relate to the natural, civil or ecclesiastical History of the United States in general, and of this State in particular." In a long article in *The New York Herald*, they informed the public that:

It is well known that many valuable manuscripts and papers relative to the history of our country remain in the possession of those who, though unwilling to entrust them to a single person, yet would cheerfully confide them to a public institution, in whose custody they would be preserved for the general benefit of society. To rescue from the dust and obscurity of private repositories such important documents, as are liable to be lost or destroyed by the indifference or neglect of those into whose hands they may have fallen, will be a primary object of our attention.

But they would need help to accomplish this. In the same article they appealed for "the aid of the liberal, patriotic and learned to promote the objects of our maturation." This was more than a call to the city's wealthy who might possess "valuable manuscripts and papers." It was a plea for any information that might advance the cause. The next section of *The Herald* article listed twenty-three queries including, "Can you give any information regarding the settlement of your town or district...?", "what proportion of the first settlers of New Netherlands appear to have attached themselves to agriculture and [what] proportion to trade?", "When were schools ... first instituted in your town?", and "When was the first printing press instituted in your town?" The response was so great that a New York Historical Society library was soon needed, not just to house what documents might flow in from the public, but as a home for

books that Society-member dues would enable the official librarian – one of just a handful of official positions delineated in the Society’s original constitution – to acquire.⁹

About a decade after the American Academy of Arts and the New York Historical Society were founded (see sidebar for some activities during this period of 1804 to 1814), a meeting was held in Mayor Clinton’s office on a cold January day. At that meeting, the Literary and Philosophical Society of New York was born. Its mission was no less than to “promote the useful arts, diffuse knowledge, and enlighten the human mind.” A week later, at another meeting held in the mayor’s office, officers of the society were elected. Clinton was chosen president, Hosack one of the vice presidents, Mitchill recording secretary, and Pintard curator of the Society. The Society’s bylaws dictated it would focus on “Belles-lettres, Civil History, Antiquities, Moral and Political Sciences ... Medicine, Chemistry, Natural Philosophy, and Natural History ... Mathematics, Astronomy, Navigation, and Geography ... Husbandry, Manufactures, and the Useful Arts.”

Soon the Literary and Philosophical Society of New York was offering public lectures on almost all of the fields delineated in the bylaws. Printed versions of the lectures, like the one DeWitt Clinton presented on Buffon’s theory of New World degeneracy, were sent to Thomas Jefferson, who replied from Monticello that he was impressed by all the Society was accomplishing: “The field which he has therein spread before the lovers of science offers ample room for their cultivation,” the former president wrote to Clinton. “[I am] happy to observe that New York is so fast advancing to the work. She is certainly much favored by circumstances which lead to eminence in that career.”¹⁰

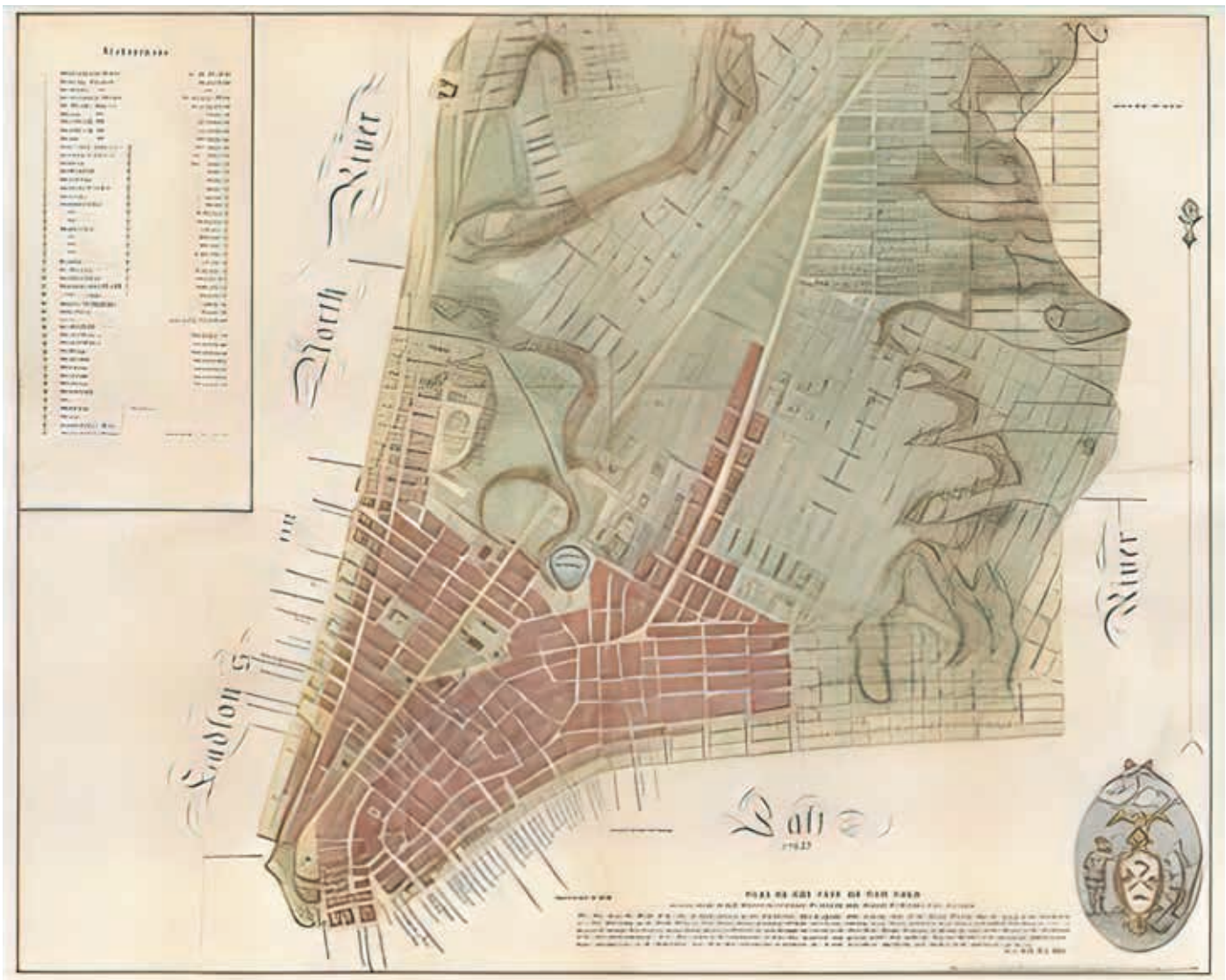
The New York Historical Society, the American Academy of Arts, and the Literary and Philosophical Society were initially housed in separate locales across the city. Then John Pintard had an idea. Why not house them all under one roof at the Old Alms House and create a one-stop culture center to place New York City firmly on the map as an Enlightenment hub? Together with Clinton, Mitchill, and Hosack, Pintard pitched the idea for the New York Institution for the Promotion of Arts and Sciences to New York’s City Council. It took some time to convince them, but they ultimately embraced the idea.

On Tuesday, June 13, 1815, before a crowd of citizens in the public gallery, the City Council opened its report on the New York Institution for the Promotion of Arts and

Sciences by noting the matter at hand was “a subject of immense importance.” Yes, the Council continued, New York City was already recognized as an economic center, but “ought not some attention be now directed to the fine and liberal arts?” Indeed, they argued, it should, for “immense advantages will be derived from extending some patronage to these infant institutions.”¹¹ By a vote of thirteen ayes to four nays, the council approved leasing the Alms House, worth an estimated \$200,000, *rent free*, to create the New York Institution for the Promotion of Arts and Sciences.

The Alms House, three stories tall (plus a basement), sat 260 feet long by forty-four feet wide. On the first floor, the New York Historical Society, including its library, was allotted a forty-eight by twenty-foot room and the Literary and Philosophical Society was given a room of similar dimensions. The first floor also had a forty-by-forty-foot lecture hall. Scudder’s American Museum was given the second floor and the entirety of the third floor was handed to the Academy of the Arts. The basement would be home to John Griscom, a professor at Queens College, for a “chemical laboratory with its furnaces, forges, and other appurtenances and conveniences for instruction in that branch of philosophy.” If all of that were not enough, there was also a plan to one day add an Athenaeum “furnished with newspapers, magazines, journals, reviews, and tracks, from all parts of the world.”¹²

It would take some time to make all this happen, but in the interim, the rest of the country was taking note of the soon-to-be New York Institution for the Promotion of Arts and Sciences. Philadelphia’s magazine *The Port Folio* noted that “for their munificent encouragement of useful and ornamental knowledge of every description the state and city of New York are worthy of admiration and imitation of every state and city in the union ... we hope that her example will not fail to awaken in other sections of our country the spirit equally favorable to literature and science and all the liberal and useful arts.” *The National Advocate*, a Philadelphia newspaper, wrote that there is “nothing which discovers the wisdom, and virtue, and happiness of a nation more than a just liberality and protection of the arts, encouraging genius, and fostering and aiding their progress,” and they wished that New York, along with their own city would “aim at becoming the Athens of America.” They also praised the New York City Council for supporting the establishment of the New York Institution, calling it an act “uniting benevolence with the love of science and utility.”¹³



Mangin-Goerck 1803 Map of New York City.

October 23, 1816, marked the opening day of the New York Institution for the Promotion of Arts and Sciences. It was a grand affair. DeWitt Clinton addressed the citizens of New York, judges of the Supreme Court of the State, politicians and military leaders of all stripes, as well as the members of the New York Historical Society, the American Academy of Arts, and the Literary and Philosophical Society. The lecture hall at the Old Alms House was not large enough to house the crowd, so the event was held in City Hall. When Clinton stood before his audience that day, he was, technically speaking, addressing them in his role as president of the American Academy of Arts and so spoke largely of that department of the new Institution. Clinton sent Jefferson a copy of his speech, which Jefferson read “with pleasure the luminous view you have presented of the value of the fine

arts in human society.” And then, to the delight of Clinton, Jefferson added, “I rejoice to see the spirit of science manifesting itself so strongly in the city of New York. It is worthy the station she holds among us to distinguish among the fruits of commerce and wealth, the luxuries of science as well as of the sensualities.”¹⁴

Two days after Clinton’s lecture at City Hall, the opening-week events for the New York Institution for the Promotion of Arts and Sciences moved to the Institution’s home at the Alms House, where the American Academy of Arts was hosting a grand exhibition. Two hundred and fifty-two paintings lined the walls of the Academy’s rooms at the Institution. Among the paintings seen by the thousands of New Yorkers who came to the exhibit were *Lear* and *Ophelia’s Madness* by Benjamin West,

Portrait of a Lady by Gilbert Stuart, *Lady of the Lake* by John Trumbull, *The Nativity* by Peter Paul Rubens, *Landscape with a Hermit at his Devotions* by Gaspard Poussin, and *Niagara, the Rapids* by Alexander Robertson.

The original plan for the New York Institution for the Promotion of Arts and Sciences had allocated considerable space to the New York Society Library. But there was a problem. For a variety of reasons the Library decided not to move in. Fortunately, the perfect replacement was available. Using Philadelphia's Academy of Natural Sciences as a model, Samuel Latham Mitchill and his colleagues at the College of Physicians and Surgeons and elsewhere had created the Lyceum of Natural History in New York not long before the space at the Institution suddenly became vacant. It happily moved into the newly available space at the Alms House.

The Lyceum had many missions, primary among them establishing a cabinet of natural history. To create that natural history cabinet, the Lyceum largely relied on contributed materials. Solicitations for such contributions, as well as updated lists of what had been received, were published often in New York City newspapers, informing the citizens of the city of a variety of new fossils ranging from mammals to pipe worms that had been recently donated to the Lyceum and were on display "for the curious" of mind. The curious of mind could also come to the Lyceum to hear what the experts had to say about natural history. A committee on lectures was created. Knowing the tendency for members to be rather longwinded, they deemed that "the lecturer shall in no case occupy the attention of the Society more than one hour at a time." Ten lecturers were selected, including Mitchill who would speak about fish, reptiles, and mollusks and Constantine Rafinesque who would lecture on worms, polyps, and taxonomy (classification).

With the Lyceum operating in full force, the New York Institution for the Promotion of Arts and Sciences now housed science, art, history, and philosophy in an array of different forms, all under one roof. It stood as a one-stop Enlightenment market of sorts, and for the next sixteen years, no other city in the country had anything remotely comparable.

As New York City grew, so too did the local government. The city needed space to house new agencies and government offices, and the Alms House had that space. By 1833, the pressure for government office space was just too great, and all members of the New York Institution for the Promotion of Arts and Sciences were forced out, closing a unique



Portrait of a Lady by Gilbert Stuart, c. 1800, oil on canvas. Courtesy of Brigham Young University Museum of Art.

New York City Enlightenment experiment.

Of the organizations that made up the New York Institution for the Promotion of Arts and Sciences, one is gone. The last meeting of the Literary and Philosophical Society was held on November 28, 1834. The New York Historical Society has fared much better. Having celebrated its 218th birthday recently, it remains one of the leading historical societies in the United States. Its home today is in a gorgeous four-story building located at 170 Central Park West at West 77th Street across from Central Park.

Descendants of the New York Lyceum of Natural History and the American Academy of Fine Arts are still with us, as well. In 1876, the Lyceum became the New York Academy of Sciences whose headquarters today are a five-minute walk from City Hall in lower Manhattan. The American Academy of the Arts lives on largely through the National Academy of Design which resides at 15 Gramercy Park South, a thirty-minute subway ride (on the L and C train) from the New-York Historical Society, a twenty-minute subway ride (on the number 4 and 5 lines) from the New York Academy of Sciences, and a twenty-minute subway ride (on the number 6 line) from a plaque at Rockefeller Center – the land once home to the Elgin Garden – that reads

“In memory of David Hosack, 1769 to 1835, botanist, physician, man of science, and citizen of the world. On this site he developed the famous Elgin Botanic Gardens.” ■

Lee Alan Dugatkin is an evolutionary biologist and a historian of science at the University of Louisville. He is the author of more than one hundred and seventy-five papers and has written twelve books, including How to Tame a Fox and Build a Dog (co-authored with Lyudmila Trut, University of Chicago Press, 2017), which The New York Times Book Review called “Sparkling ... A story that is part science, part Russian fairy tale, and part spy thriller.” His latest book is The Enlightenment of Gotham: How Four Men Transformed New York City at the Start of the 19th Century (Butler Books, 2021) from which this article is adapted.

Notes

1. Benjamin Rush, “An Account of the Life and Character of Mrs. Elizabeth Ferguson,” *Portfolio* I (1809), 523. See also Anne Ousterhout, *The Most*

Learned in Woman America: A Life of Elizabeth Graeme Fergusson (Philadelphia: Pennsylvania State University Press, 2004).

2. Thomas Jefferson to Benjamin Smith Barton, February 27, 1803. This and all letters cited can be accessed using the search function at <https://founders.archives.gov>.

3. Jefferson to Charles Willson Peale, October 6, 1805.

4. Peale to Jefferson, October 22, 1805; Peale to Jefferson, January 30, 1806.

5. Peale to Jefferson, January 29, 1808.

6. *New-York Evening Post*, June 29, 1803; David Hosack to Jefferson, September 10, 1806; Jefferson to Hosack, September 18, 1806.

7. *Morning Chronicle*, January 22, 1803.

8. *Morning Chronicle*, December 20, 1803; David Longworth, *New York Almanack* (New York: David Longworth, 1805).

9. *The New York Herald*, February 13, 1805.

10. Jefferson to DeWitt Clinton, March 15, 1815.

11. *Minutes of the Common Council of the City of New York*, vol. 8: July 6, 1814-January 27, 1817 (New York: The City of New York, 1917).

12. *New-York Evening Post*, July 3, 1815.

13. *The Port Folio* VII (August 1815); *National Advocate*, August 9, 1816.

14. Jefferson to Clinton, November 24, 1816.

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“the most remarkable cliffs
that we have yet seen”

The
Great Falls
to
Three Forks:

Montana Geology of Lewis and Clark

By John W. Jengo, PG



After the laborious portage around the cataracts of Great Falls, Montana, the spirits of the Corps of Northwestern Discovery were undoubtedly lifted on July 15, 1805, when, as Meriwether Lewis wrote, “we once more saw ourselves fairly under way much to my joy and I believe that of every individual who compose the party.”¹

Lewis had been scrupulous in documenting geological features during the long interval of scouting, then executing the month-long portage, having made meticulous observations of the Great Falls and four other cascades, the sulfur spring across from Portage Creek (now Belt Creek) that helped revive Sacagawea, and the prodigious freshwater fountain of present-day Giant Springs. Yet, several times he expressed a growing anxiety about losing valuable time. On June 30, 1805, he wrote, “I begin to be extremely impatient to be off as the season is now waisting a pace,” and when the troubles with assembling the iron boat began to mount, he stated, “the men all seem anxious to be moving upward as well as ourselves.”² Finally free of the disconcerting delays that affected their readiness to launch their reconstituted fleet of boats,³ and putting the failure of the iron boat behind him, Lewis was certainly ready to make up for lost time and resume his naturalist duties, as evidenced by his diligent geological observations between the Great Falls and the Three Forks of the Missouri.

“Fort Mountain” - Square Butte Laccolith

On July 15, 1805, Meriwether Lewis composed the first written description of present-day Square Butte, a prominent geographic landmark:

we have now passed Fort Mountain on our right it appears to be about ten miles distant. this mountain has a singular appearance it is situated in a level plain, it's sides stand nearly at right angles with

each other and are each about a mile in extent. these are formed of a yellow clay only without the mixture of rock or stone of any size and rise perpendicularly to the hight of 300 feet. the top appears to be a level plain...the surface appears also to possess a tolerable fertile mole [mold] of 2 feet thick. and is to all appearance inaccessible. from it's figure we gave it the name of fort mountain.⁴

The closest approach of the meandering Missouri River to Square Butte is eight miles at the mouth of Little Muddy Creek, but on the approach to this confluence, the Expedition was farther away, so it is feasible Lewis was roughly ten miles away (or more) when he made his estimation. Lewis took no note of the larger Shaw Butte located three miles west-northwest or Crown Butte, a smaller feature 7.6 miles directly west of Square Butte. The detail in Lewis' description of the topsoil (“mold”) atop Square Butte strongly suggests he used his telescope. The “yellow clay” may be a reference to the yellowish-gray (along with light gray, pale olive, and light olive gray) upper Cretaceous-age Virgelle Formation and Telegraph Creek Formation sandstones (the latter interbedded with yellowish-gray weathered silty mudstone and light to dark gray weathered fissile shale) that underlie an erosion-resistant igneous caprock.⁵ The caprock of Square Butte is composed of dark gray, dark grayish-red, brownish-gray, and dark grayish-green shonkonite.⁶ This is the same unique rock mineral assemblage that forms the ranges of walls at the White Cliffs of the Missouri so

Example of strongly deformed rock strata present along the Lewis and Clark Expedition's route from the Adel Mountains to the Three Forks of the Missouri. All photos by John W. Jengo, PG.



On July 15, 1805, the day the Lewis and Clark Expedition departed Great Falls after their month-long portage, Meriwether Lewis composed the first written description of present-day Square Butte: “we have now passed Fort Mountain on our right it appears to be about ten miles distant. this mountain has a singular appearance it is situated in a level plain, it’s sides stand nearly at right angles with each other.” The igneous shonkonite laccolith capping Square Butte originated from the Adel Mountains volcanic field over twenty miles to the south.

elegantly described by Meriwether Lewis on May 31, 1805.

The shonkonite layers capping Square Butte are considered to be a laccolith,⁷ a mounded sheet-like intrusive rock where molten fluids (in this case, from the Adel Mountains volcanic field to the south) were essentially injected horizontally between existing subsurface stratigraphic layers from feeder fractures (dikes) connected with a magma source. Eventually, the rock layers above and surrounding the laccolith eroded away, leaving an isolated, roughly circular landform. On a geologic map, Square Butte, Shaw Butte, and Crown Butte appear like magmatic balloons tethered ever so tenuously to the Adel Mountains by their exceptionally narrow feeder dikes. These laccoliths are coincident with the Great Falls tectonic zone, a band of northeast-trending high-angle faults and shear zones believed to have facilitated and controlled the spread and orientation of Late Cretaceous- to early Cenozoic-age igneous intrusions.⁸ It has been proposed by geologists that the Great Falls tectonic zone represents either a reactivated intracontinental shear zone or a suture between a microcontinent (the Wyoming province/craton) and a crustal fragment (the Medicine Hat Block) which were welded together in deep geological time (more than 1.86 to 1.77 billion years ago) to form part of the basement core of the ancient North American continent of Laurentia.⁹

“hard black grannite” - Adel Mountain Volcanics

On the morning of July 16, 1805, and undoubtedly intent on making forward progress, Lewis was “determined to leave Capt. C. and party, and go on to the point where the river enters the Rocky Mountains and make the necessary observations against their arrival.”¹⁰ Along with John Potts, Jean Baptiste Lepage, and George Drouillard, Lewis hiked overland, but struck the river “at the foot of the mountain where the Missouri first enters them,”¹¹ near present-day Tower Rock State Park. Lewis noted:

these mountains appear to be only about 800 feet above the river and are formed almost entirely of a hard black grannite.¹²

It should be stated neither captain had formal training in recognizing igneous rocks. For example, they would traverse the entire Columbia Plateau in western Idaho, Washington, and Oregon and not once refer to those rocks as basalt. However, the mineralogical expertise needed to accurately describe the Adel Mountain volcanics¹³ that compose Tower Rock and the surrounding volcanic field would have been beyond anyone’s grasp in 1805. Particularly at a distance, the rocks appear uniformly dark gray to light gray (shadings of black)



View to the south from Tower Rock, climbed and named by Meriwether Lewis on July 16, 1805, of the Missouri River as it flows through the volcanic rocks of the Adel Mountains. Lewis observed "both banks of the river are formed for a short distance of nearly perpendicular rocks of a dark black grannite of great high; the river has the appearance of having cut it's passage in the course of time through this solid rock." Although not technically granite, some rocks within the Adel Mountains volcanic field are mineralogically very similar.

and seemingly unrelated to the more familiar pinkish-colored granite; yet upon closer examination, the rocks can be grayish orange-pink, red, pale red, purplish-red, purplish-gray, and dark grayish-red in color. On closer inspection, the rocks are porphyritic containing very evident phenocrysts,¹⁴ meaning they possess crystals visible to the naked eye set in a finer-grained groundmass. This familiar granitic-like texture is probably what Lewis used as his basis for classifying the rock as granite. Although technically not a granite, Lewis was nearly correct in his interpretation, more so than he has been given credit for. With just a small increase in quartz content, the syenite-type Adel Mountains volcanic rocks would officially be classified as granite.¹⁵

We know where Lewis was in the Adel Mountains when making his observations because of his unmistakable description of what is now Tower Rock:

at this place there is a large rock of 400 feet high wich stands immediately in the gap which the missouri makes on it's passage from the mountains; it is insulated from the neighbouring mountains by a handsome little plain which surrounds it base on 3 sides and the

Missouri washes it's base on the other, leaving it on the Lard. as it decends. this rock I called the tower.¹⁶

Despite the presence of Interstate 15 to the east, old U.S. Route 91 to the west, and other modern intrusions, the view from Tower Rock still affords "a most pleasing view of the country."¹⁷ All three enlisted men, including Sergeant John Ordway, noted the Expedition was now at the "entrence of the Rocky Mountain, which appear verry high & rocky."¹⁸ Little did the captains or the Expedition members know more "entrances" awaited them upriver, given that the Missouri River had cut through several other high, rocky mountainous barriers to find an exit to the Great Plains.

William Clark and the canoes caught up to Lewis' small party around 8 a.m. the next morning (July 17, 1805), and the Expedition proceeded on together. It was an arduous route, as Lewis noted:

the river clifts were so steep and frequently projecting into the river with their perpendicular points in such manner that we could not pass them by land, we wer therefore compelled to pass and repass the river very

frequently in the course of the evening...in some places both banks of the river are formed for a short distance of nearly perpendicular rocks of a dark black grannite of great height; the river has the appearance of having cut its passage in the course of time through this solid rock.¹⁹

Expressions such as “in the course of time,” when Lewis tacitly acknowledged great chronological periods were necessary to actuate geologic change, offer a fascinating glimpse into his intellect. In this era, the enormity of geological time was only being discretely recognized by a select few because it was in direct conflict with the Mosaic chronology of the Bible,²⁰ yet Lewis’ scientific training and Enlightenment sensibilities in his journalizing shine through. In this regard, Lewis was in agreement with his great mentor Thomas Jefferson, who understood that the Biblical chronologies could not any longer be understood literally. In Montana alone, Lewis would use this “course of time” phrase to describe the erosional process that formed the White Cliffs (May 31, 1805), the Great Falls (June 13, 1805), and large sand dunes that had accumulated on the plains (July 15, 1805). The latter observation, recorded on July 17, 1805, was made on July 15, the day they had departed Great Falls.

Only the three enlisted men recorded the estimated height (700 feet) of the ridge peaks, with Private Joseph Whitehouse noting, “these rocky Mountains are broken & verry uneven & appear to be nearly a Solid rock.... Some of these knobs we allow to be 700 feet high and a Solid rock.”²¹ These are fair estimates overall, although some peaks along the Expedition route are over 1,000 feet higher than the elevation of the Missouri River.

The slow ascent of the river and the “fear our fireing Should allarm the Indians and cause them to leave the river”²² was the impetus for Clark to set out the following morning (July 18, 1805) with York, Joseph Field, and John Potts after the Expedition had encountered the Dearborn River, just upstream of present-day Mid Canon. Lewis would remain with the canoes on July 18 and move into somewhat gentler terrain and encamp above present-day Holter Dam. The following day, he would come upon one of the great landmarks of the Expedition route.

“the most remarkable cliffs” - The Gates of the Mountains

One of the most notable points of Missouri River geography east of the Continental Divide met Lewis’ pen in the

late afternoon of July 19, 1805:

this evening we entered much the most remarkable cliffs that we have yet seen. these cliffs rise from the waters edge on either side perpendicularly to the height of [NB: *about*] 1200 feet. every object here wears a dark and gloomy aspect ... from the singular appearance of this place I called it the *gates of the rocky mountains*.²³

The Gates of the Mountains were formed of much older and different (i.e., sedimentary) rocks than the Adel Mountains volcanics. It was here that Lewis made one of the most perplexing of his geological observations:

this rock is a black grannite below and appears to be of a much lighter colour above and from the fragments I take it to be flint of a yelloish brown and light creemcolourd yellow.²⁴

At face value, it appears Lewis simply erred here, given that these rocks are composed primarily of the light gray to white Mission Canyon Limestone and, in the area of Coulter Canyon and Sacajawea Mountain on the east side of the river south of Mann Gulch, the light gray to white Lodgepole Limestone.²⁵ Moreover, other journal keepers such as Patrick Gass noted that the cliffs were composed “mostly of solid rock of a light colour” as did Joseph Whitehouse.²⁶ It has been supposed by various Expedition scholars that Lewis may have been fooled by the deep shadows on the lower cliffs, perhaps combined with the limestone’s natural light gray weathering, to mis-identify these rocks, especially when contrasted with brighter overlying rocks apparently illuminated by sunlight.²⁷ However, according the Weather Diary for July 1805, there was a “Thunder Storm ½ after 3 P.M.” and the weather thereafter was “c a h & r,” meaning cloudy after hail and rain.²⁸ Under such overcast conditions, there should have been no such differential color or light contrast on the cliff faces. The author proposes instead that Lewis’ reference to black granite below was intended to mean *downstream* in the Adel Mountains, and *not* the lower stratigraphic horizons of the limestone cliffs at the Gates. As evident in his earlier journal entries, Lewis often attempted to place the geologic features he was observing in a more regional context,²⁹ and the author believes he was drawing a comparison to the “black grannite” of the Adel Mountains he observed three days earlier.



Encountering one of most notable points of Missouri River geography east of the Continental Divide, Meriwether Lewis declared: "this evening we entered much the most remarkable cliffs that we have yet seen. these cliffs rise from the waters edge on either side perpendicularly...from the singular appearance of this place I called it the gates of the rocky mountains." The cliffs are primarily composed of the Mission Canyon Limestone and Lodgepole Limestone.

Lewis also observed:

the tow[er]ing and projecting rocks in many places seem ready to tumble on us. the river appears to have forced it's way through this immense body of solid rock for the distance of $5\frac{3}{4}$ miles and where it makes it's exit below has thown on either side vast collumns of rocks mountains high.³⁰

When the Expedition proceeded upriver and out of the Gates to their evening encampment, they crossed over the Eldorado thrust fault, which they would do several more times the next day. It was the Eldorado thrust fault, coupled with the Lombard thrust fault Lewis was to encounter on July 25, and other consequential thrust and extensional faults, and not the Missouri River, that were the prime mechanisms of mountain building and the cause of the shattering "Convulsion" noted by William Clark west of the river on July 19, 1805:

all the rocks of every description is in Small pices appears to have been broken by Some Convulsion.³¹

This area in west-central Montana is composed of perhaps the most complex geology of the entire Lewis and Clark Expedition route. The Gates of the Mountains lie within the fold and thrust belt of northwestern Montana, a zone of strongly deformed rock strata caused by multiple pulses of rock-shattering movements that occurred during the Laramide orogeny.³² During the millions of years of orogeny compression, great sheets of rock of various ages (primarily packages of Mesoproterozoic- and Paleozoic-era rocks)³³ detached from their original location (in some cases from tens of miles away) and were *thrust* eastward over contorted equivalent- and younger-age rocks.³⁴ The thrust faulting that occurred along the Expedition route included the Eldorado-Lombard overthrusts, which pushed sequences of older Mesoproterozoic-age rocks eastward over younger Paleozoic- and Mesozoic-age strata,³⁵ thus reversing the normal sequence of rock superposition where each layer of rock is always younger than the layer beneath it. These great thrust sheets broke apart when compressed to end up like overlapping shingles on a roof, creating repeated stacked

The Birth of Geology in the Age of Jefferson

The modern science of geology arguably began with the publication of Scottish geologist and naturalist James Hutton's *Theory of the Earth* in the *Transactions of the Royal Society of Edinburgh* in 1788 (later expanded and published in book form in 1795). Hutton formulated paradigm-shattering geological theories, including that substantively long periods of time were needed for rock formation, that erosion of the land surface produced sediments that were carried to the ocean to form sedimentary rocks, that the internal heat of the earth converted these sediments into lithified rocks, that rocks such as granite were formed by igneous processes, and that it was conceivable that geological forces could uplift rocks from the bottom of the ocean to form mountains. Despite this momentous breakthrough in geological thinking, which would ultimately overthrow the erroneous theory that nearly all rocks had been formed as a result of aqueous crystallization precipitation from waters of an all-encompassing ocean, it would be decades after the Lewis and Clark Expedition returned home before geology would materialize in America as a distinguishable science, set apart from the realm of mineralogy, chemistry, and geography. It is, therefore, absolutely necessary to view the occasionally inexact geological observations of Lewis and Clark through the prism of this nascent science as it existed in 1803, particularly the exceptional difficulty in correctly determining the chemical composition of rocks and minerals, unawareness of the existence of deep geological time, and the absence of a unifying theory to explain the vast array of extraordinary phenomena from angular unconformities to volcanoes. Even Thomas Jefferson was largely unaware of the emerging science of geology. His instructions to Captain Lewis mostly concerned themselves with possible mineral deposits in the West (metals, limestone, pit coal, etc.) and a vague reference to volcanic phenomena. ■

sequences of similar rock assemblages the way automobiles of the same make and model would come to rest and lean upon each other after a multi-car pileup on a freeway. These tremendous forces also warped and folded the rocks into series of tight folds, some of which were then *refolded* under smaller-scale thrust faults and persistent compressional forces.³⁶ In the Gates of the Mountains, some conspicuous folds of the Mission Canyon Limestone, where formerly horizontal beds are now near vertical, can be seen between Welds Gulch (about halfway through the Gates from Mann Gulch heading upstream) and Upper Holter Lake.

“fragments of broken rocks” - Thrust Faults and the Lewis and Clark Tectonic Zone

On July 20 and through mid-day on July 21, 1805, the Expedition skirted the southwestern margin of the Big Belt Mountains, passing through sections of open country and spurs of ranges, where Lewis noted:

Cliffs high and covered with fragments of broken rocks.³⁷

This brief notation is the only description Lewis made after crossing the Eldorado thrust fault three times over a course of only five river miles between Prickly Pear Creek and Trout Creek. The author postulates Lewis was observing steep peaks of Mesoproterozoic-age Spokane Formation siltite and argillite,³⁸ which form a narrow defile cut by the Missouri River, observable from present-day York Road where it crosses Hauser Lake. The Spokane Formation, and the Greyson Formation the Expedition would encounter on July 25, are part of the Belt Supergroup (named for the Big Belt Mountains in west-central Montana), an extraordinary thick (upwards of nine to twelve miles) package of primarily Mesoproterozoic-age sediments that were deposited 1.47 to 1.40 billion years ago.³⁹ The section of “broken rock” observed by Lewis is representative of the older Mesoproterozoic-age rocks that were thrust over younger rocks along the Eldorado-Lombard thrust faults along the Expedition route between the Adel Mountains and the Three Forks.

Late on July 21, Lewis succinctly captured the transition out of the mountains as the Expedition proceeded upriver into present-day Townsend Valley:

the country was rough mountainous & much as that of yesterday untill towards evening when the river entered a beautifull and extensive plain country of about



William Clark's observation that "all the rocks of every description is in Small pices appears to have been broken by Some Convulsion" is an accurate description of strongly deformed rock strata along the expedition route from the Adel Mountains to the Three Forks of the Missouri. In the Gates of the Mountains, some conspicuous folds of the Mission Canyon Limestone, where formerly horizontal beds are now near vertical, can be seen between Welds Gulch and Upper Holter Lake.

10 or 12 miles wide which extended upwards further that the eye could reach this valley is bounded by two nearly parallel ranges of high mountains which have their summits partially covered with snow.⁴⁰

Those two ranges were the Big Belt Mountains to the east and the Elkhorn Mountains to the west, although the low lying Spokane Hills lie more immediately to the west of the river. About halfway down present-day Hauser Lake near the village of Lakeside, the captains would unknowingly cross over the Helena Valley Fault Zone, the eastern extension of a major structural boundary in the earth's crust named after the captains: the Lewis and Clark Tectonic Zone.⁴¹ This zone is an enormous feature, roughly 250 miles long (from near Wallace, Idaho, to southeast of

Helena, Montana) and as much as fifty miles wide.⁴² Many of the principal faults in the zone have been intermittently active from the Mesoproterozoic era until the present day and have horizontal displacements of between seven to seventeen miles which primarily occurred during Late Cretaceous time.⁴³ The origin of this zone remains controversial amongst geologists, but the magnitude of the off-sets and its long history of recurrent movement suggest it is a major intraplate transform fault,⁴⁴ meaning a boundary between two tectonic plates of the Earth's crust. The Lewis and Clark Tectonic Zone encompasses a long linear band of confused rock displacements caused by the periodic reactivation⁴⁵ of ancient and elementary deep subterranean structures.⁴⁶ It is apropos that such a prominent structural feature was named for the captains because they were the



The Crimson Bluffs southwest of Townsend, Montana, were described by Meriwether Lewis as “a remarkable bluff of a crimson coloured earth on Stard. intermixed with Stratas of black and brick red slate.” The reddish-orange and reddish-brown colors are a result of enriched accretions of prominently reddish-colored aluminum oxides and iron oxides that have conspicuously stained these deposits of gravel, sand, and subangular/ angular blocky rock fragments.

first to note the confused geometry of the rock strata. This feature remains an object of intensive study, particularly its role in forming the geomorphology of present-day mountains and valleys in Montana, including those traversed by Lewis and Clark.⁴⁷

“a different aspect and character” - The Townsend Valley

Over the next several days, the Missouri River was reminiscent of its character in the Great Plains, as Lewis noted on July 21, 1805:

the river immediately on entering this valley assumes a different aspect and character, it spreads to a mile and upwards in width crouded with Islands, some of them large, is shallow enough for the use of the seting pole in almost every part.⁴⁸

And on July 22, 1805, Lewis observed:

The river being divided into such a number of channels by both large and small Island that I found it

impossible to lay it down correctly following one channel only in a canoe and therefore walked on shore took the general courses of the river and from the rising grounds took a view of the Islands and it's different channels which I laid do[w]n in conformity thereto on my chart. there being but little timber to obstruct my view I could see it's various meanders very satisfactorily.⁴⁹

All these islands and river meanders are now drowned under Canyon Ferry Lake. The Expedition reunited with Clark at his encampment at day's end on July 22, but Clark set out again on foot the next morning. Lewis and the main party continued upriver on July 23, 1805, noting “the river is still divided by a great number of islands ... the bed gravel and smooth stones” with the stones being “so smooth that the points of their [the men's setting] poles slipped in such manner that it increased the labour of navigating the canoes very considerably.”⁵⁰ Ever resourceful, Lewis “recollected a parsel of giggs which I had brought on, and made the men



The thrust faulting that occurred along the Expedition route between Great Falls and the Three Forks included the Eldorado thrust fault and the Lombard thrust fault (pictured here just upstream of Toston Dam), which pushed sequences of older Mesoproterozoic-age rocks eastward, upward, and outward over younger Paleozoic- and Mesozoic-age strata and resulted in near-vertical upturning of various rock layers.

each atatch one of these to the lower ends of their poles with strong wire, which answered the desired purpose.”⁵¹ Lewis’ group encamped near the south end of present-day Canyon Ferry Lake, north of Townsend, Montana.

“remarkable bluff of a crimson coloured earth” - The Crimson Bluffs

Upon departing their camp at sunrise on the morning of July 24, 1805, Lewis and the Expedition happened upon a curious sight along the river’s western edge:

passed a remarkable bluff of a crimson coloured earth on Stard. intermixed with Stratas of black and brick red slate.⁵²

Oftentimes, Lewis and Clark would call out rock outcrops as a bluff or cliff; in fact, Sergeant John Ordway referred to this same exposure as a “redish clift of rocks.”⁵³ But in this case, Lewis also stated it was an “earth,” a word he typically used for surficial soils, and as confirmed by Patrick Gass, it was “a bank of very red earth, which our squaw told

us the natives use for paint”⁵⁴ along the west side of the river. Clarification is needed here because the rock outcrops in the lofty Limestone Hills that dominate the western horizon include siltite and argillite of the Greyson Formation, which can weather to a pale yellowish-brown (among other colors), and the overlying Spokane Formation, which weathers to a moderate reddish-brown, grayish-red, and dusky red.⁵⁵ The Expedition journal keepers undoubtedly viewed these prominent mountain slope exposures, but it is evident their journal entries were referring to riverside embankment exposures Lewis could get close enough to examine.

Outcrops of these “crimson coloured” bluffs are still present along the western bank of the Missouri River southwest of Townsend, although access to them can be difficult. The author closely examined a roughly 250-foot long by fifteen-foot high cut bank along a side channel of the river, and found the lower ten feet to be composed of unconsolidated to weakly consolidated gravel and sand with a dense concentration of mostly subangular/angular blocky clasts (rock fragments) encased in a moderate reddish-orange colored silty matrix.⁵⁶

But the blocky rock clasts are not red slate as Lewis supposed, because upon breaking them open, the author noted the surficial moderate reddish-orange and moderate reddish-brown color is only a stained veneer on an otherwise dusky yellow to pale yellowish-orange rock that lacked the partings and the degree of metamorphism of slate.⁵⁷ This crimson bluff exposure could confidently be termed a laterite, a rock product that develops from prolonged weathering (i.e., thousands of years) of an iron-containing parent rock under strongly oxidizing conditions. Fluctuations of the water table in these deposits in an apparent well-drained terrain facilitated the depletion of leachable ions such as calcium, ultimately leaving enriched accretions of prominently reddish-colored aluminum oxides and iron oxides, the distinguishing characteristic of laterites (which can also be blackish-brown, brownish, and yellowish in color).

Lewis' party proceeded on and camped about seven miles north of present-day Toston, whereas Clark's small party was encamped just north of the Three Forks of the Missouri.

“Some rough rocky hills” - Little Gate of the Mountain

Late in the day on July 25, 1805, Lewis noted: the valley appeared to terminate and the river was again hemmed in on both sides with high caiggy and rocky cliffs...the cliffs are formed of a lighter coloured stone than those below.⁵⁸

The Expedition had crossed over the Toston Fault, a normal fault active for the last 500,000 years that has dropped the valley to the west and formed the highlands at the mouth of the “Little Gate”⁵⁹ canyon, which are composed primarily of the Greyson Formation, a greenish-gray, dark gray, and yellowish-brown siltite and fine-grained brownish-gray or light gray quartzite.⁶⁰ As Joseph Whitehouse noted: “in the afternoon we entered in to Some rough rocky hills which we expect from the Indian account is the commencement of the Second chain of the rocky mountains, but they do not appear So high as the first nor So Solid a rock.”⁶¹ Whitehouse was correct that the siltite was not as “Solid” as the more resistant Mission Canyon and Lodgepole limestones that compose the “first” chain of mountains at the Gates of the Mountains. The Toston fault parallels the Lombard thrust fault, which Lewis appears to have noticed near that evening's encampment just above the present-day Toston Dam.

I observed that the rocks which form the cliffs on this part of the river appear as if they had been undermined by the river and by their weight had separated

from the parent hill and tumbled on their sides, the stratas of rock of which they are composed lying with their edges up; others not separated seem obliquely depressed on the side next the river as if they had sunk down to fill the cavity which had been formed by the washing and wearing of the river.⁶²

William Clark had also noted the day before (July 24, 1805) while passing through this area that “the mountains on either Side appear like the hills had fallen half down & turned Side up-wards.”⁶³

Both captains should be given credit here for noting the near-vertical upturning of various rock layers (dipping as much as eighty degrees from horizontal along with beds overturned at steep angles). This was not caused by the “washing and wearing” erosive action of the Missouri River, but by the Lombard thrust fault, which slices across two tight meander bends of the Missouri River immediately upriver and downriver of the Toston Dam in just over 2.3 linear miles. As was the case with the Eldorado thrust fault the Expedition crossed over several times above present-day Hauser Lake, the Lombard thrust fault juxtaposed ancient Mesoproterozoic-age rocks (in this case, the Greyson and Spokane Formations) with rocks as young as Cretaceous age (Kootenai Formation).⁶⁴ With their observations here at the “Little Gate” and notes about a major “convulsion” at the Gates of the Mountains, the captains astutely perceived the major stratigraphic disruptions caused by the Eldorado-Lombard thrust faults that largely shaped the disordered mountainous terrain of this region.

“the valley again widens” - The Clarkston Valley

With William Clark having already arrived at the Three Forks the previous day, and then pushing forward to reconnoiter the Jefferson River, Lewis and the Expedition continued moving up the Missouri River on July 26, 1805. Lewis noted:

here the hills or reather mountains again recede from the river and the valley again widens to the extent of several miles with wide and fertile bottom lands.⁶⁵

Lewis makes no comment on what his thoughts may have been upon sighting the “snowclad tops of distant mountains before us.”⁶⁶ Private Joseph Whitehouse may have captured the disappointment of the party when, upon entering the valley where “hills make off lower than they did Yesterday,”



The geology of the highlands at the confluence of the Three Forks is primarily composed of the same prevalent limestone formations as those at the Gates of the Mountains, the Mission Canyon Limestone and the Lodgepole Limestone, with both formations composing Fort Rock (foreground) along the west bank of the Gallatin River (right). Meriwether Lewis ascended Lewis' Rock (the tilted Lodgepole Limestone in the far upper left) where he "commanded a most perfect view of the neighbouring country," which he deemed "an essential point in the geography of this western part of the Continent."

he noted that:

We now find that we were mistaken, and that we have not as yet, entered into the Second Chain of Mountains, and we discovered very high white topped Mountains, lying some distance up the Mesouri.⁶⁷

There would be more mountains to overcome, but Lewis' group was encamped only few miles downriver of a major Expedition objective, what Lewis would confidently declare as "an essential point in the geography of this western part of the Continent."⁶⁸

"the limestone appears to be of an excellent quality" - The Three Forks of the Missouri

As was the case for the mountainous regions the Expedition encountered since the Adel Mountains, a series of thrust faults and uplifts were responsible for the geologic terrain described by Lewis in the early morning hours of July 27, 1805:

the river was again closely hemmed in by high Cliffs of a solid limestone rock which appear to have

tumbled or sunk in the same manner of those described yesterday.⁶⁹

Although Lewis may not have realized it, the most prevalent limestone formations he observed on his approach to the Three Forks were the same as those at the Gates of the Mountains, the Mission Canyon Limestone and the Lodgepole Limestone. His description of the limestone indicated he made a close inspection:

the limestone appears to be of an excellent quality of deep blue colour when fractured and of a light led colour where exposed to the weather. it appears to be of a very fine gr[a]in the fracture like that of marble.⁷⁰

Medium gray to dark medium gray fresh exposures of these limestones can appear to some observers as deep blue in color. Of interest also is Lewis' observation of the very fine-grained texture of these limestones, which would be similar to marble given marble forms from the metamorphism of sedimentary carbonate rocks such as limestone.

At 9 a.m., Lewis and his party arrived at the Three Forks

and shortly thereafter, Lewis “ascended the point of a high limestone clift from whence I commanded a most perfect view of the neighbouring country,”⁷¹ now known as Lewis’ Rock. From this vantage point, in addition to making detailed observations and a map of the connections and meanders of the Gallatin, Madison, and Jefferson rivers, Lewis noted:

between the middle [Madison River] and S. E. [Gallatin River] forks near their junctions with the S. W. fork [Jefferson River] there is a handsom site for a fortification it consists of a limestone rock of an oblong form; it’s sides perpendicular and about 25 ft high except at the extremity towards the middle fork where it ascends gradually and like the top is covered with a fine terf of greensward. the top is level and contains about 2 Acres. the rock [r]ises from the level plain as if it had been designed for some such purpose.⁷²

This is Fort Rock, composed primarily of the Mission Canyon Limestone, although the northern tip of this isolated outcropping is a narrow band of Lodgepole Limestone.⁷³ It sits astride the southwest-northeast trending Trident thrust fault, the last in the series of thrust faults that the Expedition would traverse on their approach to the Three Forks and representative of the great compressional forces that uplifted the “tow[er]ing and projecting rocks” of this geologically complex region.

Epilogue

What lay beyond the Three Forks for the Lewis and Clark Expedition in the months of August through September 1805 was an ever more ardent and arduous mission to cross the Rocky Mountains and reach the watershed of the Columbia River. The attentions of the captains and enlisted men were directed to more pressing concerns: nutrition, hypothermia, survival. As such, geological notations diminish in frequency and detail, particularly after August 26, 1805, when Lewis’ daily journal keeping essentially ceases for the remainder of the year. For instance, although both Lewis and Clark duly noted the physiography of Beaverhead Rock on August 8 and August 10 respectively, neither captain remarked that the “remarkable Clift”⁷⁴ was composed of limestone, the very same formation (Mission Canyon Limestone) dominating the canyon of the Gates of the Mountains and the terrain of the Three Forks. Yet, the lack of detailed observations does not indicate a lack of intention to fulfill President Thomas Jefferson’s pre-expeditionary instructions

to Lewis,⁷⁵ but rather reflects a pragmatic balance of prioritizing observations to the most consequential natural history features when circumstances permitted. With that perspective, we can be grateful for the written accounts of the captains and the enlisted men between the Great Falls and the Three Forks, which are among the most perceptive geologic observations made on the Lewis and Clark Expedition. ■

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Notes

1. Gary E. Moulton, ed., *The Journals of the Lewis & Clark Expedition*, 13 vols. (Lincoln, Nebraska: University of Nebraska Press, 1983–2001), 4:382. Lewis or Clark journal quotations for June 1804 are from volume 4, by date. All *Atlas* citations in the ensuing text are from volume 1, by map number.

2. Moulton, ed., *Journals*, 4:344 and 4:356.

3. Lewis was undoubtedly aware the Expedition departure was delayed for at least twelve days because of the continued assembly of the iron boat. The Expedition could have conceivably embarked upriver on July 3, 1805, instead of July 15, after having completed the portage in the afternoon of July 2, if they had focused on the building of two dugout canoes in the last week of June when it became evident tallow and pounded charcoal were not an adequate substitute for pitch to seal the seams of the iron boat.

4. Moulton, ed., *Journals*, 4:383. As noted in Moulton 4:386, N 3, Fort Mountain is clearly depicted in the upper left of Moulton, *Atlas*, map 54, and is now Square Butte.

5. Lithologic descriptions from Susan M. Vuke, *Geologic Map of the Great Falls South 30' x 60' Quadrangle, Central Montana*, Montana Bureau of Mines and Geology, Open File Report MBMG 407, 2000, 18, Plate 1, scale 1:100,000. In other locales, the Virgelle Formation is a member of the Eagle Sandstone. Square Butte is surrounded by an apron of dark gray shale that also contains thin beds of yellowish-gray weathered, very fine-grained sandstone and siltstone that compose the Kevin Member of the Marias River Shale, but given Lewis’ vantage point, he likely did not observe these deposits.

6. Shonkinite is a rare, dark-colored syenite intrusive igneous rock composed primarily of augite and a mixture of potassium feldspar [KAlSi₃O₈] and sodium feldspar [NaAlSi₃O₈], along with olivine, biotite, and nepheline.

7. The Square Butte laccolith was shown to be connected to the Adel Mountains volcanic field (discussed later in this article) whose approximate center is located twenty-two miles to the south, as depicted in Donald W. Hyndman and David Alt, “Radial Dikes, Laccoliths, and Gelatin Models,” *The Journal of Geology* 95:6 (November 1987): 763–74.

8. The Great Falls tectonic zone extends from Idaho through basement rocks of west-central and southwestern Montana and into southwestern Saskatchewan, Canada; see J. Michael O’Neill and David A. Lopez, “Character and Regional Significance of Great Falls Tectonic Zone, East-Central Idaho and

Glossary

Carbonate rocks: sedimentary rocks composed primarily of minerals containing the carbonate ion $[\text{CO}_3^{2-}]$; the two major types of carbonate rocks are limestone and dolomite.

Cretaceous: A period of Earth's geological history that began approximately 145 million years ago and ended approximately 66 million years ago.

Laramide orogeny: a series of mountain-building events caused by the movement of tectonic plates that affected much of western North America in Late Cretaceous and Paleogene time.

Laurentia: The craton (a large stable block of the earth's crust that forms the core of a continent) that was once an independent supercontinent primarily composed of present-day North America and Greenland.

Limestone: rock composed of calcium carbonate $[\text{CaCO}_3]$.

Lithologic: the general physical characteristic of a rock in a particular area.

Mesoproterozoic: An era of Earth's geological history that began approximately 1,600 million years ago and ended approximately 1,000 million years ago.

Mesozoic: An era of Earth's geological history that began approximately 251.9 million years ago and ended approximately 66 million years ago.

Paleocene: An epoch of Earth's geological history that began approximately 66 million years ago and ended approximately 56 million years ago.

Paleogene: A period of Earth's geological history that began approximately 66 million years ago and ended approximately 23 million years ago.

Paleoproterozoic: An era of Earth's geological history that began approximately 2,500 million years ago and ended approximately 1,600 million years ago.

Paleozoic: An era of Earth's geological history that began approximately 538.8 million years ago and ended approximately 251.9 million years ago.

Sedimentary rocks: Rocks that formed through the solidification of sediment that was transported and deposited by water (rivers, lakes, and oceans), ice, or wind.

Syenite: A coarse-grained intrusive igneous rock with a general compositional similarity to granite, but deficient in quartz.

Thrust fault: A fault across which older rocks are pushed above and on top of younger rocks.

Volcanics or volcanic rocks: Rocks formed by erupted magma that cooled and solidified on or near the Earth's surface.

West-Central Montana," *The American Association of Petroleum Geologists Bulletin* 69:3 (March 1985): 437-47. The Late Cretaceous [100.5-66 Ma] is the younger of two epochs of the Cretaceous period; Ma is a "million years," as abbreviated from the Latin *mega-annum*. The Cenozoic era began 66 Ma and extends to the present day.

9. David E. Boemer, James A. Craven, Ron D. Kurtz, G.M. Ross, and F.W. Jones, "The Great Falls Tectonic Zone: Suture or Intracontinental Shear Zone?" *Canadian Journal of Earth Sciences* 35:2 (1998), 175-83; Paul A. Mueller, H. Robert Burger, Joseph L. Wooden, John B. Brady, John T. Cheney, Tekla A. Harms, Ann L. Heatherington, and David W. Mogk, "Paleoproterozoic Metamorphism in the Northern Wyoming Province: Implications for the Assembly of Laurentia," *The Journal of Geology* 113:2 (March 2005): 169-79 and Jennifer N. Gifford, Paul A. Mueller, David A. Foster, and David W. Mogk, "Extending the Realm of Archean Crust in the Great Falls Tectonic Zone: Evidence from the Little Rocky Mountains, Montana," *Precambrian Research* 315 (September 2018), 264-81. Most geologists believe failed rifts in continental tectonic plates and former microcontinent suture/shear zones are zones of weakness that preferentially focused subsequent deformations and magmatic activity.

10. Moulton, ed., *Journals*, 4:386.

11. Moulton, ed., *Journals*, 4:387. Lewis and Clark's name for the rapid at this location (Pine Island Rapids) was officially restored in 2004 from the disparaging "Halfbreed Rapids," a change supported by the Montana Lewis and Clark Bicentennial Commission.

12. Moulton, ed., *Journals*, 4:387. Now mapped as the "Adel Mountain volcanics," the rocks are primarily composed of shonkinite, latite, monzonite, volcanic conglomerate, and volcanic breccia, per Vuke, *Geologic Map of the Great Falls South*. Shonkonite was described in a previous footnote. Latite is a porphyritic extrusive rock having phenocrysts of sodium feldspar $[\text{NaAl-Si}_3\text{O}_8]$ /calcium feldspar $[\text{CaAl}_2\text{Si}_2\text{O}_8]$ and potassium feldspar $[\text{KAlSi}_3\text{O}_8]$ in nearly equal amounts with little to no quartz. Monzonite is the intrusive equivalent (sharing the same chemistry) of latite. The volcanic conglomerate is composed of rounded and subrounded clasts of trachybasalt, trachyandesite, latite, and quartz latite ranging from pebble sized up to two feet in diameter. The volcanic breccia (a rock formed predominantly of angular fragments) is composed of blocks and ejected small rocks of trachybasalt, trachyandesite, and latite embedded in a fine-grained to microcrystalline tuff matrix.

13. These volcanics cover an area of 347.5 mi^2 (900 km^2) and consist of both extrusive rocks (lava flows, breccias, and volcanoclastic sediments) and intrusive rocks (numerous plugs and sills and thousands of dikes, including the feeder dikes to Square Butte, Shaw Butte, and Crown Butte). See Stephen S. Harlan, Lawrence W. Snee, Mitchell W. Reynolds, Harald H. Mehnert, R.G. Schmidt, Steve D. Sheriff, and Anthony J. Irving, " $^{40}\text{Ar}/^{39}\text{Ar}$ and K-Ar Geochronology and Tectonic Significance of the Upper Cretaceous Adel Mountain Volcanics and Spatially Associated Tertiary Igneous Rocks, Northwestern Montana," *United States Geological Survey Professional Paper* 1696, 2005, 19.

14. The distinct phenocrysts are augite, a dark glossy pyroxene $[(\text{Ca},\text{Na})(\text{Mg},\text{Fe},\text{Al},\text{Ti})(\text{Si},\text{Al})_2\text{O}_6]$ mineral that crystallized early at high temperatures during the cooling of magma deep within the earth, allowing the crystals to grow much larger than late-cooling, low-temperature minerals such as quartz.

15. These Adel Mountain volcanics are now considered Upper Cretaceous in age, not Paleocene as cited in Moulton, ed., *Journals*, 4:391, N 4. The age dating performed and summarized in Harlan, " $^{40}\text{Ar}/^{39}\text{Ar}$ and K-Ar Geochronology," 17, suggest the rocks were probably emplaced during a two to three million-year interval between 76-73 Ma.

16. Moulton, ed., *Journals*, 4:387. Lewis' "tower" does not appear on Moulton, *Atlas*, map 62, perhaps because Clark passed through this location quickly and is not known to have climbed the pinnacle. Lewis' estimate of 400 feet was remarkably close, per the interpretive sign at Tower Rock State Park that has the height of Tower Rock as 424 feet.

17. Moulton, ed., *Journals*, 4:387.

18. Moulton, ed., *Journals*, 9:185. Sergeant John Ordway journal quotations are from volume 9, by date.

19. Moulton, ed., *Journals*, 4:394.

20. Mosaic geology is a "type of geology which seeks to reconcile observations of the earth's crust with the account of earth's origin and early history as described in the Old Testament, and supposedly by Moses," per David Oldroyd, *Thinking About the Earth: A History of Ideas in Geology* (Cambridge: Harvard University Press, 1996), xxi.

21. Moulton, ed., *Journals*, 11:229. Private Joseph Whitehouse journal quotations are from volume 11, by date.

22. Moulton, ed., *Journals*, 4:401.

23. Moulton, ed., *Journals*, 4:402-3. Labeled “the Gates of the Rocky Mountains” on *Atlas map 62*, Clark referred to it as the “Great gate of the rock Mounts.” in his list of estimated distances from Fort Mandan to the Pacific Coast (part of Codex I) composed at Fort Clatsop, Moulton, ed., *Journals*, 6:450.
24. Moulton, ed., *Journals*, 4:403.
25. The Mission Canyon Limestone weathers light gray, very light gray, and white and has scattered nodular beds and isolated nodules of brownish-gray chert and forms cliffs or rugged slopes. The underlying Lodgepole Limestone is composed of limestone, interbedded silty limestone, and highly calcareous siltstone and weathers light gray, very light gray, and white and moderate orange pink to pale yellowish-orange in silty intervals. See Mitchell W. Reynolds and Theodore R. Brandt, *Geologic Map of the Canyon Ferry Dam 30' x 60' Quadrangle, West-Central Montana*, United States Geological Survey, Scientific Investigations Map 2860, 2005, 32, Plates 1-3, scale 1:100,000. These two carbonate formations, often mapped together as the Madison Group, were deposited in a shallow marine shelf setting offshore of an ancient continental land mass during early to middle Mississippian time (Tournaisian to Visean stages about 359 to 331 Ma) within the Carboniferous Period, and in the same general time frame as the Burlington-Keokuk Limestone encountered by the Expedition near present-day Rocheport, Missouri.
26. Moulton, ed., *Journals*, 10:114. Sergeant Patrick Gass journal quotations are from volume 10, by date. Whitehouse remarked the rocks were “of a lightish colour,” Moulton, ed., *Journals*, 11:233.
27. As stated in Moulton, ed., *Journals*, 4:405, N 3.
28. Moulton, ed., *Journals*, 5:22-3.
29. For example, during the passage through the North Dakota lignite country, Lewis often referred back to his previous mineral and rock observations with such comments as “continues as yesterday” [April 10, 1805], “mineral appearances still continue” [April 14, 1805], “mineral appearances still continue” [April 22, 1805], “hills and bluffs exhibit their usual mineral appearances” [April 28, 1805], and ultimately when the outcrops of these lignite and clinker exposures were no longer evident “stratas...have in a great measure ceased” [May 3, 1805]. Moulton, ed., *Journals*, 4:19, 36, 60, 81, and 103.
30. Moulton, ed., *Journals*, 4:402-3.
31. Moulton, ed., *Journals*, 4:405.
32. It is widely held that the primary tectonic action that formed the Rocky Mountains in Montana, termed the Laramide orogeny, occurred primarily from the Late Cretaceous epoch (roughly ~70-80 Ma) into the Paleocene epoch [early Cenozoic era] (~55 Ma), although some workers believe the event continued into the Oligocene epoch (34-23 Ma). This orogeny was caused by the eastward subduction of Pacific Ocean dense oceanic plates (called the Farallon and Kula plates, now fully consumed) under the westward-moving, more buoyant North American continental tectonic plate in response to the rifting and opening of the North Atlantic Ocean on the other side of the continent. The earth is not expanding so crust added at a spreading center must be balanced by crustal material’s being consumed, melted, and recycled elsewhere. The tremendous compressional forces of this slow-motion crustal convergence uplifted, folded, and thrust faulted rocks upward and outward over the margin of other formations in episodic fashion punctuated by periods of quiescence. Geologists continue to debate exactly which rock packages were thrust during the Laramide orogeny versus those uplifted during the Sevier orogeny, a somewhat contemporaneous mountain-building event in western North America that partially overlapped the Laramide orogeny in time and location. The author has chosen to stay with the traditional Laramide orogeny interpretation because of the deep-seated or “thick-skinned” nature of the thrust faults the Expedition encountered; however, there may be displaced strata present along the Expedition route associated with “thin-skinned” Sevier orogeny.
33. Rocks assigned to the Mesoproterozoic-era range in age from 1,600-1,000 Ma, a more specific subdivision of the Precambrian, which encompasses any strata older than 539 Ma. Kim M. Cohen, Stan C. Finney, Philip L. Gibbard, and Junxuan Fan, *The International Commission on Stratigraphy (ICS) International Chronostratigraphic Chart v2022/10* (2013; updated October 2022), Episodes 36: 199-204. Paleozoic-age [539-251.9 Ma] and Mesozoic-age [251.9-66 Ma] rocks are considerably younger.
34. Melville R. Mudge, “Origin of the Disturbed Belt in Northwestern Montana,” *Geological Society of America Bulletin* 81:2 (February 1970): 377-92. In reference to the frontal fold and thrust belt that lie east of the Expedition route, Mudge theorized great slabs of rocks moved eastward by gravity, sliding along a décollement (a gliding plane) off a vertical uplift located to the west.
35. For example, along the Eldorado thrust fault in the Canyon Ferry Dam quadrangle, Mesoproterozoic-age rocks (the Spokane and Greyson Formations) were transported east and northeast over folded and thrust-stacked rocks ranging in age from the Mesoproterozoic era through the much younger Late Cretaceous epoch. Reynolds and Brandt, *Geologic Map of the Canyon Ferry Dam*, 11.
36. Geologists continue to work at the specific timing and ages of individual thrust sheets, an exceptionally complex task given that thrust faults cut through rocks of different ages along the fault trace; multiple thrust faults in any one area and along hundreds of miles of the fold and thrust belt may have been active at different times; and deformation of previous thrust sheets often occurred prior to emplacement of subsequent thrust sheets, a geological process termed “overprinting” when folds and other structures get reoriented during later tectonic events.
37. Moulton, ed., *Journals*, 4:411.
38. Siltite is a compact, weakly metamorphosed rock formed by alteration of siltstone, mudstone, or silty shale. Argillite is a compact rock derived from mudstone (claystone or siltstone) or shale that has been hardened (indurated) by baking or cementation/compaction. Robert L. Bates and Julia A. Jackson, eds., *Glossary of Geology*, 2nd ed. (Falls Church, VA: American Geological Institute, 1980), 34.
39. The Belt Supergroup assemblage of mostly mudstones, siltstones, fine-grained sandstones, and carbonate sediments covers an area of some 200,000 km² (77,220 mi²) of Washington, Idaho, Montana, British Columbia, and western Alberta. See John S. MacLean and James W. Sears, eds., *Belt Basin: Window to Mesoproterozoic Earth* (Boulder, CO: The Geological Society of America Special Paper 522, 2016), 384. A continental rift had opened up an epicratonic reentrant, meaning a semi-circular embayment open to the adjacent ocean basin, which allowed tens of thousands of feet of Mesoproterozoic-age sediments to be deposited in a unique paleogeographic setting somewhat analogous to the Mississippi Gulf Coast. See Jack E. Harrison, Allan B. Griggs, and John D. Wells, “Tectonic Features of the Precambrian Belt Basin and their Influence on Post-Belt Structures,” *United States Geological Survey Professional Paper 866*, 1974, 15. The author opted to use the age dates and thickness estimates from Karl V. Evans, John N. Aleinikoff, John D. Obradovich, and Christopher M. Fanning, “SHRIMP U-Pb Geochronology of Volcanic Rocks, Belt Supergroup, Western Montana: Evidence for Rapid Deposition of Sedimentary Strata,” *Canadian Journal of Earth Sciences* 37:9 (September 2000): 1287-300.
40. Moulton, ed., *Journals*, 4:411.
41. Reynolds and Brandt, *Geologic Map of the Canyon Ferry Dam*, 11, Plate 1, and Figure 2.
42. Formerly referred to as the “Lewis and Clark line” in much of the historical geological literature, this feature has been described as a “west- and northwest-trending zone of steep, strike-slip, dip-slip, and oblique-slip faults that transverses northern Idaho and west-central Montana.” See C.A. Wallace, David J. Lidke, and Robert G. Schmidt, “Faults of the Central Part of the Lewis and Clark Line and Fragmentation of the Late Cretaceous Foreland Basin in West-Central Montana,” *Geological Society of America Bulletin* 102:8 (August 1990): 1021. The most distinguishing feature of the Zone in this region is the multiple array of strike-slip faults where two blocks of rock have moved past each other horizontally.
43. Wallace, “Faults of the Central Part of the Lewis and Clark Line,” 1022 and 1036. More specifically, the block on the south side of the “right-slip” St. Mary’s-Helena Valley fault (the Helena Valley fault is the eastern extension of the St. Mary’s fault) crossed by the Expedition was measured in the vicinity of Ravalli, Montana, to have traveled some eight miles from the east (meaning it moved from left to right from a south-facing observer’s view) per Wallace, 1027. The cessation of movement along a fault can be roughly determined when rocks of a known age that were deposited across the fault are not off-set, indicating the fault had stopped being active by that time.
44. Reynolds and Brandt, *Geologic Map of the Canyon Ferry Dam*, 12. The most famous continental transform fault in the United States is the San Andreas fault in California that forms the tectonic boundary between the North American and Pacific plates. The reason why the Lewis and Clark tectonic zone has been indisputably recognized by geologists is because it “separates crustal blocks of profoundly contrasting structural style and gross lithology that have been juxtaposed by a combination of large-scale horizontal and vertical fault movements.” Geological Survey Research 1978, *United States Geological Survey Professional Paper 1100*, 1978, 68.
45. One of best maxims in geology is “major faults do not die; they will move again in whatever direction is necessary to accommodate the new stresses that are being imposed,” per William R. Muehlberger, “Different Slip Senses of Major Faults during Different Orogenies – The Rule?” in M.J. Aldrich, Jr., and A.W. Laughlin, eds., *Proceedings of the Sixth International Conference on Basement Tectonics* (Santa Fe, New Mexico, September 16-20, 1985), International Basement Tectonics Association, Inc., 1986, 76-81.

46. Brian G. White, "Unkinking the Lewis and Clark Tectonic Zone, Belt Basin, Idaho and Montana," in MacLean and Sears, eds., *Belt Basin*, 341-63.
47. Generally, following the millions of years of thrust faulting (compression of the crust) in the late Mesozoic and early Cenozoic eras, this area of Montana has undergone extensional faulting (stretching of the crust) which has down-dropped blocks of strata and uplifted others into their present-day configuration.
48. Moulton, ed., *Journals*, 4:412.
49. Moulton, ed., *Journals*, 4:415-16.
50. Moulton, ed., *Journals*, 4:419-20.
51. Moulton, ed., *Journals*, 4:420. The gigs were probably multi-pronged metal spikes somewhat like a small trident.
52. Moulton, ed., *Journals*, 4:422.
53. Moulton, ed., *Journals*, 9:189.
54. Moulton, ed., *Journals*, 10:117.
55. Identified as Pre-Cambrian in age in Moulton, ed., *Journals*, 4:425, N 1, the age of these formations has been more specifically assigned to the Mesoproterozoic era [1,600-1,000 Ma] per Mitchell W. Reynolds and Theodore R. Brandt, *Preliminary Geologic Map of the Townsend 30' x 60' Quadrangle, Montana*, Open-File Report 2006-1138, Version 1.0, United States Geological Survey, 2006, Scale 1:100,000. The author cited the range of weathered colors listed in Reynolds and Brandt, *Geologic Map of the Canyon Ferry Dam*, 28-29.
56. Although cited in Moulton, ed., *Journals*, 4:425, N 1 as an exposure of the "upper part of the Pre-Cambrian Greyson Shale near its contact with the Spokane Shale," the embankments on the western side of the river are actually mapped as "Older gravel" on the Reynolds and Brandt, *Preliminary Geologic Map of the Townsend 30' x 60' Quadrangle*. This "Older gravel" deposit of a somewhat indeterminate age (Pliocene [5.3-2.58 Ma] or Pleistocene [2.58 Ma to 11,700 years ago]) is composed of both stream deposits and colluvial deposits that washed or otherwise slowly slid downhill from nearby bedrock sources. The author noted textural, shape, and color similarities between siltite beds in Greyson Formation outcrops upslope and the blocky clasts entrained in the Crimson Bluffs.
57. It is possible Lewis observed the fine, even, parallel laminae of the siltite blocks and mistook those for typical slate partings.
58. Moulton, ed., *Journals*, 4:426.
59. Clark labeled this range of hills as the "Little Gate" on *Atlas map 64*, but referred to it more fully as "Little Gate of the Mountain" in his list of estimated distances from Fort Mandan to the Pacific Coast (part of Codex I) per Moulton, ed., *Journals*, 6:450.
60. Susan M. Vuke, *Geologic Map of the Southern Townsend Basin, Broadwater and Gallatin Counties, Montana*, Montana Bureau of Mines and Geology Open

File Report 586, 2009, 21, Plate 1, scale 1:24,000.

61. Moulton, ed., *Journals*, 11:240.
62. Moulton, ed., *Journals*, 4:427.
63. Moulton, ed., *Journals*, 4:425.
64. The geology depicted on Vuke, *Geologic Map of the Southern Townsend Basin* was interpreted by the author in combination with the stratigraphy depicted on Susan M. Vuke, *Geologic Map of the Clarkston Valley, Broadwater and Gallatin Counties, West-Central Montana*, Montana Bureau of Mines and Geology Open-File Report 642, 2013, 14, Plate 1, scale 1:24,000.
65. Moulton, ed., *Journals*, 4:430. Lewis noted "the river in the valley is from 2[00] to 250 yds. wide and crowded with Islands, in some places it is $\frac{3}{4}$ of a mile wide including islands. W[h]ere it passed the hills it was from 150 to 200 yds."
66. Moulton, ed., *Journals*, 4:430.
67. Moulton, ed., *Journals*, 11:241-42.
68. Moulton, ed., *Journals*, 4:435.
69. Moulton, ed., *Journals*, 4:433. There are other formations along this reach of "closely hemmed in" cliffs that have limestone units such as the Jurassic-age Morrison Formation and Ellis Group, the Permian-age Phosphoria Formation, the Pennsylvanian-age Quadrant Formation, and the Pennsylvanian- and Mississippian-age Snowcrest Range Group (all exposed west of the Missouri River), and the Mississippian- and Devonian-age Three Forks Formation and Devonian-age Jefferson Formation (exposed east of the Missouri River). However, the Mission Canyon Limestone, along with the Lodgepole Limestone, are the most prevalent limestone formations along the river margin and so these were likely the "tumbled" rocks (meaning they are tilted 40-47° to the west) Lewis observed closely.
70. Moulton, ed., *Journals*, 4:433.
71. Moulton, ed., *Journals*, 4:434.
72. Moulton, ed., *Journals*, 4:434.
73. Susan M. Vuke, Jeffrey D. Lonn, Richard B. Berg, and Christopher J. Schmidt, *Geologic Map of the Bozeman 30' x 60' Quadrangle, Southwestern Montana*, Montana Bureau of Mines and Geology, Open-File Report 648, 2014, 42, Plate 1, scale 1:100,000.
74. Moulton, ed., *Journals*, 5:66.
75. Donald Jackson, ed., *Letters of the Lewis and Clark Expedition with Related Documents, 1783-1854*, 2nd ed., 2 vols. (Urbana: University of Illinois Press, 1978), 1:63. Jefferson included very specific mineralogical objectives in the list of objects he considered worthy of note, including "the mineral productions of every kind; but more particularly metals, limestone, pit coal, & saltpetre; salines & mineral waters, noting the temperature of the last, & such circumstances as may indicate their character; volcanic appearances."

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Photograph of Trapper Peak, Bitterroot Mountains, Montana, courtesy of Steve Lee.



Is it Possible to Know Sacagawea?

Sacagawea in the Bitterroots. Painting by Charles Fritz. Courtesy of Charles Fritz and Tim Peterson.

Our Story of Eagle Woman, Sacagawea: They Got It Wrong

By Gerard Baker, Calvin Grinnell, Bernard Fox, Carol Fredericks Newman, and Wanda Fox Sheppard

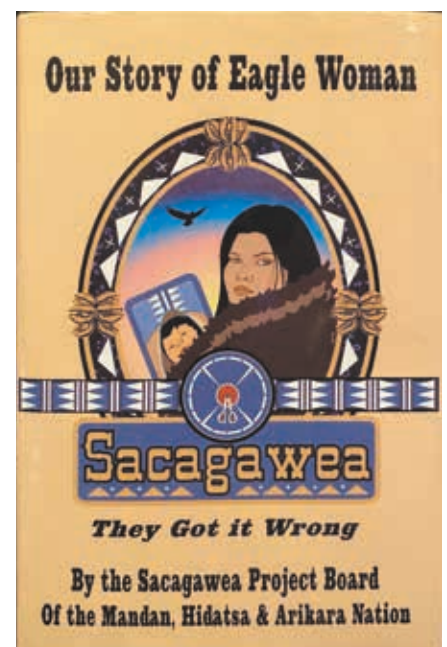
The Paragon Agency, 2021, 342 pages, \$50.00

Reviewed by Clay S. Jenkinson

Over several decades, when I have encountered my friend Gerard Baker of the Mandan-Hidatsa, he has invariably said, “You know Sacagawea was Hidatsa.” The Hidatsa (Lewis and Clark’s Minnetarees) believe that Sacagawea

was always Hidatsa, that she had an important relationship with the Shoshone, but that she was not genetically Shoshone. The Hidatsa believe that Lewis and Clark “got it wrong.” Now they have published a book to make their case, *Our Story of Eagle Woman: Sacagawea: They Got It Wrong*.

This is a very difficult book to review for several reasons. First, its argument, its insistence, contradicts everything we thought we knew about Sacagawea. We thought Sacagawea was born Shoshone, captured by the Hidatsa, acculturated into the Hidatsa world, given a Hidatsa name (Bird Woman), and that Lewis and Clark took her with them in April 1805



to help secure horses from her natal people, the Shoshone. According to Gerard Baker, the Sacagawea Project Board of the Mandan, Hidatsa & Arikara Nation, Calvin Grinnell, Bernard Fox, Carol Fredericks Newman, and Wanda Fox Sheppard, solid Hidatsa oral tradition confirms that she was Hidatsa all along, and the Lewis and Clark world needs to accept the truth and correct the record.

Second, Gerard Baker, Calvin Grinnell, and the others involved in this project are formidable people who have earned the right to be taken very seriously. Grinnell is a distinguished Mandan-Hidatsa elder and historian who has worked extensively with the State Historical Society of North Dakota for many years. Baker is a distinguished, even celebrated, Mandan-Hidatsa elder who had a remarkable career in the National Park Service. He served as Superintendent of Mount Rushmore National Memorial, Superintendent of the Little Bighorn Battlefield National Monument, and, during the Bicentennial of the Lewis and Clark Expedition, as Superintendent of the Lewis and Clark National Historic Trail. They do not enter this debate lightly.

Third, the authors of this book are Hidatsa. It is *their* tradition. Lewis and Clark were Anglo-outsiders who passed through the world of the Upper Missouri carrying a great deal of Eurocentric cultural baggage, who might have misunderstood the basic facts of Sacagawea's biography. Half a century ago, it was routine in White historical circles to dismiss oral tradition as unworthy of scholarly respect. For example, the testimony of one of Sally Hemings sons, Madison Hemings, as told to an Ohio newspaperman in 1873, that Thomas Jefferson was his father and the father of several of his siblings, was summarily dismissed by Jefferson historians, including the great Dumas Malone, until around 1980, *even though it was the recorded testimony of the son of Sally Hemings*. All that has changed. We have learned to take oral tradition much more seriously than we used to. It is not that oral traditions are invariably 100% accurate, but neither are more traditional document-based histories. And even when oral traditions don't hold up in all of their details, they usually reveal some important truth about the people telling the stories that must be respectfully factored into our analysis of historical events.

The Hidatsa Account

Here, as carefully as I can piece it together, is the Hidatsa story. The woman we call Sacagawea would more accurately be known as Eagle Woman. She was born on Night Walker Butte, near the confluence of the Little Missouri and

Missouri rivers (the confluence now drowned by Lake Sakakawea). The men of the Awatixa Hidatsa village were out hunting when a raiding party of the Shoshone attacked the village. Eagle Woman was taken back to the Shoshone world as a captive, along with a number of other Hidatsa children. She refused to forget her Hidatsa life and often looked longingly towards the east. An old Shoshone woman noticed her intense homesickness and offered to help her escape. The old woman escorted her some ways east of the Shoshone village and gave her essential advice. Eagle Woman was to let herself be led home by wolves that would appear to her each night and lead her toward the Hidatsa. At first light the wolf would disappear and Eagle Woman must hide through the day. The journey was an immense undertaking. Altogether four wolves would be needed to get her home. The Hidatsa acknowledge that "four" is a symbolic number (like the creation over six days in the book of Genesis) and that it might have taken much longer than four days for Eagle Woman to cross Montana and get home.

This is known as the Strong Jaw Story, first written down by the White historian and ethnologist Alfred Bowers in the 1930s. There are several other variations of the story. There is, for example, the Bull's Eye version, in which Bird Woman was taken by her father on a visit to the Shoshone, during which she established relationships with several individuals, whom thereafter she called "brother" or "sister," in the wider kinship definitions of the Hidatsa and other Native American tribes. In another version she may have been more Crow-Hidatsa than Hidatsa, which would make the distances less gigantic. The Hidatsa and Crow were linguistic and cultural cousins. They had once all lived on the Missouri River in North Dakota, but after a dispute, part of the Hidatsa relocated along the Yellowstone River in Montana.

Most Hidatsa accounts have Eagle Woman (Sacagawea) dying on Sand Creek near Wolf Point, Montana, at the age of approximately 86. That tradition rejects both the December 1812 death story (at Fort Manuel on the North Dakota-South Dakota border) and the Wind River Indian Reservation April 9, 1884, death story, as indicated by a grave marker at Fort Washakie, Wyoming.

What Degree of Skepticism is Proper?

I confess that I am skeptical of the full Hidatsa claim.

It needs to be acknowledged, however, that the Hidatsa have already been remarkably successful in claiming

Sacagawea. The really old view that she was a Shoshone girl named Sacajawea who was captured by the Hidatsa, but who returned to her people in company with the Lewis and Clark Expedition, has mostly been retired, except in parts of the Shoshone world. Led by the Hidatsa, and particularly Gerard Baker, by the time the Bicentennial was underway, the new view was that while she may have been born Shoshone and may even have been called Sacajawea in her childhood, her Lewis and Clark name was unmistakably Hidatsa, and she had been largely culturally absorbed by the Hidatsa by the time the Corps of Discovery arrived at the mouth of the Knife River in October 1804. The giant reservoir behind Garrison Dam in North Dakota is named Lake Sakakawea (as if to emphasize the point as powerfully as possible!). The Knife River Indian Villages National Historic Site calls one of the earth-lodge villages Awatixa, the Sakakawea village.

In other words, what the Hidatsa have already accomplished represents a serious revision (almost a revolution) in our thinking about Sacagawea. Their more extreme claim that she was Hidatsa all along has to overcome some formidable evidence in the journals of the Lewis and Clark Expedition.

Let me explain.

How Lewis and Clark Saw It

Before May 20, 1805, the woman in question was invariably called the “interpreter’s wife,” the “interpreter,” the “interpretness,” the “squar,” or Charbonneau’s “woman.”

For example, on the day she gave birth to her first child, February 11, 1805, Captain Lewis wrote a 200-word account of the day, almost all of which was devoted to her prolonged and difficult labor, which may or may not have been relieved by a rattlesnake rattle concoction suggested by the French Mandan interpreter Rene Jusseume. In the course of this entry, Lewis refers to the woman in question as “one of the wives of Charbono,” as “this woman,” “the woman,” and “she” (twice), but never by name. I think it is quite possible, even likely, that Lewis did not know her name in February 1805. She was just the “wife” of Toussaint Charbonneau, à la *façon du pays* (in the accepted coupling manner of the outback).

On the day of the spring mustering, departure day, April 7, 1805, Lewis lists all of the members of the 1805 exploration party, including, in his subordinate list, “an Indian Woman wife to Charbono with a young child.” William Clark makes a similar list in his journal entry for the day, including “Shabonah and his *Indian Squar* to act as an Interpreter &

interpretness for the snake Indians—one Mandan & Shabonahs infant. *Sab-kab-gar we â*.” Editor Gary Moulton, who studied the original journals painstakingly, provides a footnote suggesting that *Sab-kab-gar we â* was carroted in at some later point. “Sacagawea’s name may have been added as an afterthought, or perhaps later, after Clark came to know her better.” Precisely: when he “came to know her better.”

So, whatever Lewis and Clark called the woman in question during the winter and spring of 1805, they seem not to have known her name – or perhaps were unable to pronounce or write her name, which, if you have ever heard the Hidatsa pronounce it, is difficult and guttural. She was the wife of Charbonneau. Their view of her was pragmatic and instrumental, “interpretness for the snake Indians.” At this early point in their relationship with her, they seem to have regarded her as something more than a camp follower but less than a full member of the Corps of Discovery.

Then Something Happened

On May 14, 1805, in eastern Montana, near today’s Snow Creek Bay now inundated by the Fort Peck Reservoir, the White Pirogue nearly sank during a sudden squall on the Missouri River. Charbonneau, who was at the rudder, panicked when the wind nearly overturned the pirogue, threw up his hands in prayer, and only got control of the boat when Pierre Cruzatte threatened to shoot him.

The two captains were both on shore far across the river at the time of the incident. They watched in helpless anguish. If the White Pirogue had gone down, the Expedition would have been severely compromised, and might have collapsed altogether. As Lewis wrote, we “were too far distant to be heard or to do more than remain spectators of her fate; in this perogue were embarked, our papers, Instruments, books medicine, a great part of our merchandize and in short almost every article indispensibly necessary to further the views, or insure the success of the enterprize in which we are now launched to the distance of 2200 miles.”

In this dramatic account of the accident, Lewis makes no mention of Sacagawea. In his entry for the same day, Clark does mention her, but only in the usual manner. Matter of factly, Clark writes, “the articles which floated out was nearly all caught by the Squar who was in the rear.” The Squar. Two days later, however, viewing the incident in retrospect, Lewis added “the Indian woman” to the story. “[T]he loss we sustained was not so great as we had at first apprehended; our medicine sustained the greatest injury,



Sacagawea points the way! Painting by Edgar Paxson. Courtesy of Tim Peterson.

several articles of which were intirely spoiled, and many others considerably injured; the ballance of our losses consisted of some gardin seeds, a small quantity of gunpowder, and a few culinary articles which fell overboard and sunk, the Indian woman to whom I ascribe equal fortitude and resolution, with any person onboard at the time of the accedent, caught and preserved most of the light articles which were washed overboard.”

“Fortitude and resolution” is high praise, but even so, “the Indian woman” is not accorded a name.

That moment came just four days later. On May 20, 1805, Lewis writes, “about five miles abe the mouth of shell river a handsome river of about fifty yards in width discharged itself into the shell river on the Stard. or upper side; this stream we called Sâh-câ-gar me-âh [NB: *Sah ca gab we a*] or bird woman’s River, after our interpreter the Snake wom-an.” The bracketed [NB...] is Nicholas Biddle’s attempt to get even closer to the true pronunciation of her name.

Now, more than five months after they first met her at the

Fort Mandan building site, Sacagawea finally has a name, and the beginnings of an origin story. The care with which Lewis tries to spell her name phonetically is unmistakable. You can almost hear someone, perhaps Charbonneau, repeating her name again – and again – while Lewis tries to render it in the roman alphabet. Sâh câ gar me âh. Note: it is possible that Lewis wrote a w rather than an m in the journal, and that Biddle later got the right pronunciation from Clark or George Shannon. Lewis also learned the translation of her name on May 20: Bird Woman. Not Boat Launcher or She Who Carries Burdens, but Bird Woman, which establishes beyond debate that what he was given on that day in Montana was Sacagawea’s Hidatsa name. Just how Biddle brought the variant Sacajawea into the world of the 1814 edition of Lewis and Clark’s journals is still a mystery, one that we would give a great deal to sort out. And Lewis clearly identifies her here as a Snake or Shoshone woman (by birth).

This much seems clear. First, Sacagawea first got named in the journals almost immediately after her resolute and heroic behavior in the potentially disastrous White Pirogue incident. Second, Lewis had to make enquiries before he put ink to paper. Third, he worked hard to get the facts right. There is nothing haphazard or informal about this journal entry. Fourth, Sacagawea got a river named for her precisely because she had performed an important service for the Corps of Discovery, the more impressive because she could not have known at the time how essential those papers, instruments, books, and medicine she plucked out of the river were to the success of the voyage.

Today’s Hidatsa are certainly not going to dispute the name Sah ca gar we a or the translation Bird Woman on May 20, 1805. They surely believe that she deserved to have a river named for her, more than a slackwater reservoir in North Dakota that nearly destroyed the lifeway of the Mandan, Hidatsa, and Arikara in the 1950s. (Today the tributary in Montana is usually known as Crooked Creek, though attempts have been made to restore the name Sacagawea River.) It’s Lewis’ phrase “Snake woman” the Hidatsa dispute.

Later in the summer of 1805, Lewis provided more information about Sacagawea’s back story. On July 28, 1805, not far southwest of the Three Forks of the Missouri, Lewis wrote: “Our present camp is precisely on the spot that the Snake Indians were encamped at the time the Minnetares of the Knife R. first came in sight of them five years since. from hence they retreated about three miles up Jeffersons river and concealed themselves in the woods, the

Minnetares pursued, attacked them, killed 4 men 4 women a number of boys, and mad prisoners of all the females and four boys, Sah-cah-gar-we-ah or Indian woman was one of the female prisoners taken at that time.”

Again, this seems authoritative. Lewis had no reason to distort whatever was told to him by Charbonneau or Sacagawea through Charbonneau. On a number of occasions in *Our Story of Eagle Woman*, *Sacagawea*, the authors suggest that Charbonneau may have made up the Shoshone origin story in order to secure the contract of accompanying Lewis and Clark with one or both of his “Shoshone” wives. According to this far-fetched account, Charbonneau was worried that if he correctly identified Sacagawea as Hidatsa or Hidatsa-Crow, the captains of the Expedition might not have been persuaded that they needed Sacagawea to secure Shoshone horses. Because Charbonneau was a very resourceful opportunist (I agree heartily with this view) and because he was not particularly wedded to the truth, he fabricated the Hidatsa capture story to get the contract and assumed that he would be able to finesse things somehow once the Expedition arrived at the Shoshone camps. Too late to turn back now! When Charbonneau struck his wife on the evening of August 14, 1805, the authors offer this explanation: “Sacagawea was most likely under constant threat of being struck if she didn’t do as Charbonneau said. He may have seen her as not following his cover story that she was Shoshone.” This is so speculative as to be meaningless. Isn’t it more likely, by far, that Charbonneau was sometimes just a brute?

The authors of the book attempt to weaken the Shoshone origin story by arguing that Sacagawea did not really know the Shoshone language. Because Lewis used the problematic word *tab-ba-bone* (meaning stranger or possibly enemy) when he came within earshot of the Shoshone, the authors conclude that Sacagawea gave Lewis an imprecise word because her “Shoshone language ability was questionable.” This seems like a stretch. Lewis must have asked her what a good word for White man would be, and she gave him the nearest equivalent in Shoshone, stranger, which indeed he was. He should have asked for the Shoshone word for friend.

When, on August 17, 1805, Lewis writes, “acordingly about 4 P. M. we called them together and through the medium of Labuish, Charbono and Sah-cah-gar-weah, we communicated to them fully the objects which had brought us into this distant part of the country, in which we took care to make them a conspicuous object of our own good wishes and the care of our government,” the authors of *Our Story*

of *Eagle Woman* write, “Note that it took several to interpret between the party and the Shoshones, not just Sacagawea who was to be the interpreter. She was not fluent in Shoshone.” Thus, in a couple of pages she has gone from having “questionable” Shoshone language skills to the more severe liability of being “not fluent” in the language.

But this is to miss the point entirely. If Lewis wanted to explain to Cameahwait the Expedition’s needs and purposes, he would have to speak in his only language, English. Then Francois Labiche would translate from English to French, and Charbonneau, who was apparently weak in both English and Hidatsa, would translate into the language he shared with his wife Sacagawea, Hidatsa. She then (and only then) could communicate the words of Lewis to her relatives. There was no way to make this chain of interpretation any easier. Sacagawea could not be expected to speak on behalf of the Expedition’s purposes without explicit instructions from Lewis himself through such interpreters as he was able to assemble. It wasn’t that Sacagawea was weak in Shoshone, though she had been away for a long time, but that at least two other translators stood between her and whatever it was that Captain Lewis was attempting to communicate.

Our Story of Eagle Woman, *Sacagawea* is a fascinating book and it is an important book, even if it is wrong about the identity and biography of Sacagawea. We need more Native books about Lewis and Clark. The authors of this book have gathered into one place all the accumulated oral tradition the Hidatsa have about Sacagawea. The stories they tell are extraordinarily interesting, even if they are not all explicitly about the woman in question. The book has excellent short summaries of Mandan, Hidatsa, and Arikara history before and after the Lewis and Clark Expedition. Any earnest Native perspective about what happened in the American West between May 14, 1804, and September 23, 1806, is important to add to our evolving understanding of the story. The authors of *Our Story* may possibly be right. We all know that the life and character and achievement of Sacagawea are characterized more by mystery, perplexity, and confusion than by any unchallengeable conclusion. She is an enigma, and she has been loaded over 220 years with all sorts of nonsense about her life, *most of it promulgated by White historians, novelists, fantasists, and mythmakers!* It’s not Native Americans, certainly not the Hidatsa, who have made her be the guide of the Expedition, the diplomat, the exemplar of domesticity, the pioneer suffragist. What we actually know about this fascinating and elusive woman would not fill a passport book,

and yet she has been swollen, almost entirely by White people, into one of the most “recognized” Native American women in our history. But most of what has ever been said or written about her is unsubstantiable.

Where was Sacagawea born? We don’t actually know.

When and where did she die? We don’t actually know.

What happened to her after the Expedition ended? We know a little, but not much.

What exactly did she contribute or add to the Expedition that would not have happened if she had never met Lewis and Clark? This is much harder to formulate than you might think.

When she met Lewis and Clark, was she primarily Shoshone and partly Hidatsa? Or was she by now mostly Hidatsa and yet still partly Shoshone? Or was she solely Hidatsa? Or Hidatsa-Crow?

Each of us has a name we go by, no matter what name our parents or family gave us. If the woman in question were here today and we asked her, what is your preferred name, what would she say? For all we know it was something other than Sacajawea, Sacagawea, Sakakawea, or Janey.

We need all the thoughtful contributions we can muster in our effort to understand the Lewis and Clark story. I marked scores of passages in *Our Story of Eagle Woman, Sacagawea*, and learned a great deal about the nation that claims her. My hope is that I can sit down with Calvin Grinnell and Gerard Baker and ask a hundred questions. For the rest of my life, when I think about Sacagawea I will now have no choice but to include the Hidatsa origin story in my imagining of this elusive and remarkable woman, who lifts the Lewis and Clark story into the empyrean of American memory and mythology.

And I would give anything to be led by wolves to my true home, wherever that is. ■

Clay Jenkinson



Sacagawea/Sacajawea’s birthplace, Salmon, Idaho. Sculpture by Agnes Vincen Talbot.

Review

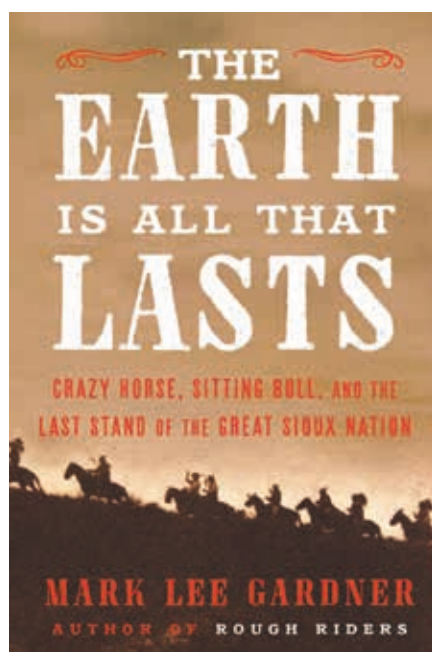
The Earth Is All That Lasts: Crazy Horse, Sitting Bull, and the Last Stand of the Great Sioux Nation

By Mark Lee Gardner
Mariner Books (Harper Collins
Publishers), 544 pages, 2022,
\$28.99

Reviewed by Mark Jordan

What? Another book about Crazy Horse? Sitting Bull? The Little Big Horn? Custer? Well, in *The Earth Is All That Lasts: Crazy Horse, Sitting Bull, and the Last Stand of the Great Sioux Nation*, Custer plays a decidedly minor role in this ambitious look at the ultimate defeat of the Lakota (Sioux) in the American Plains of the 1870s. Author Mark Lee Gardner traces the lives of these two key Native Americans in their quest to keep their lands and preserve their way of life in the face of the juggernaut that would ultimately destroy it.

The author opens the book with one of the most vivid real-time descriptions of the Battle of the Little Big Horn that I have ever read. Images of the battle jump off the page as the onslaught takes place. I could almost taste the dust and feel the sweat as Crazy Horse led his warriors into the melee that cost Custer his life and the Seventh Cavalry an ignominious defeat. Crazy Horse's soldiers cried, "Take courage, the earth is all that lasts." Crazy Horse was reported to have said, "It is a good day to fight, a good day to die." The intensity and descriptive power of Gardner's writing in this first chapter led me to believe that this would be a thoroughly



enjoyable if not academic read.

Indeed, Gardner crafts effective prose, although he tends to lapse into cliché or banality at times. His sentences smoothly elucidate the progress of Sitting Bull's and Crazy Horse's lives against the advancing swarm of Americans. These stories have been told many times, in many ways, from many different vantages, by many different authors. Gardner weaves his story from several different perspectives, but mostly from that of the Natives. That the Natives lost and the Americans won is too well-known for any comment. Gardner, despite recognizing the inevitability, dramatically unfolds the history. Hope never left Sitting Bull. Desire to crush the invaders consumed Crazy Horse. Only the overwhelming might of numbers and technology pushed these two proud men and their followers to capitulate.

The author weaves together the history of each of the protagonists, from their birth to their achieving the status of two of the most important Native Americans in the face of "Manifest

Destiny." Crazy Horse became the greatest of great warriors. Sitting Bull, at first a warrior, became a holy man capable of envisioning the future. The two men rarely interacted, but their influence impacted all their adherents. Crazy Horse ultimately routed Custer; Sitting Bull envisioned the victory but was not a participant in the battle, though later he would be accused of having been involved in the killing.

Gardner's narrative incorporates extensive source material to bolster his telling. Despite abridgement, we get a reasonably full picture of the two men. The basic flow of the narrative is – rightfully so – sympathetic to the plight of the persons whose homelands were being purloined from them through false treaties, force, outright slaughter – even cultural genocide.

Crazy Horse surrendered the year after the Battle of Little Big Horn, the river known as the Greasy Grass by the Natives, in 1877. Sitting Bull fled to Canada where the reception was less than hospitable. After four fallow years he returned to the United States to surrender. Incarcerated on their respective reservations, they suffered almost identical fates, though Crazy Horse's death occurred in 1877, shortly after his surrender while Sitting Bull's did not take place until 1890, shortly before the massacre at Wounded Knee.

In those intervening years, Sitting Bull became a celebrity, touring with Wild Bill Cody for one season. Capable of signing his autograph, Sitting Bull drew large audiences wherever he traveled. Gardner reminds us, however, that many White Americans reviled Sitting Bull for participating in the massacre at the Little Big Horn, even though he had not done so directly. This is an early example of the



Crazy Horse Memorial, not far from Mount Rushmore National Memorial in the Black Hills of South Dakota. Photo by Mark Jordan.

observation that truth is not the daughter of time.

Gardner does not shy away from describing the brutality on both sides of the battlefield – and in some cases the wanton attacks on those perceived as enemies. Lest we forget, the Plains Natives were a warrior culture, something that Lewis and Clark did not fully understand or appreciate in their attempt to bring peace among the tribes of the Upper Missouri. A warrior proved his prowess by killing. Some of the killing was accompanied by the brutal mutilation of enemies. White “revenge” differed little. One of the photos in the book shows this quite graphically.

Gardner’s sources include written accounts, newspaper coverage, details from histories collected from Native Americans who knew the two men, and the oral histories of the Oglala and Lakota. A look at his copious notes gives an idea of just how much Gardner culled from those sources. The book’s text covers 400 pages. It is followed by 100 pages of notes. How I wished, with each such reference, that we had similar extensive records of

Native American responses to the Lewis and Clark Expedition. Unfortunately, most twentieth-century historians found little value in Native American stories about Lewis and Clark. The thoroughness of Gardner’s use of such materials made it clear how much the poorer we are owing to the absence of these sources.

The presence of Gardner’s extensive notes is doubly interesting. I envisioned this to be a book of popular

history, and it reads as such. I did not expect such elaboration of the source material. Gardner chose not to use internal superscript reference numbers. Instead, his source and explanatory notes come at the end of the book. Each note is identified by page number, then a few quoted words from the text, followed by the material Gardner thought belonged in the note. Some were mere citations of sources, while others incorporated information that Gardner felt necessary to supplement his sources or his presentation of the facts. I found this an awkward way of correlating text to notes. I approached my review of the notes by finishing the chapter, then reading the notes, then determining if it merited a cross-check back to the text.

The notes also contained hints, and at times more than hints, of Gardner’s choice of which facts among diverging source material to include. In general, a reader can determine when Gardner preferred one source over another. Sometimes he justifies the choice. In other instances, readers, if we are so inclined, can decide if Gardner forces us to make a choice, or if we

should go elsewhere to validate that choice. There are certainly more than several cruxes in the history of the period involving the individuals covered in this book. While Gardner’s account rings true as he has developed it, it might not agree with other historical interpretations of this period, an issue for the knowledgeable reader to investigate. History is not made of absolutes. If this is how Gardner sees the history of Crazy Horse and Sitting Bull, his vision is sustainable, though not everyone might agree.

The book includes significant illustrations. Drawings by Sitting Bull, housed in the Buffalo Bill Wild West Center and the National Anthropological Archives, show the Lakota holy man’s securing victories over his enemies. Gardner includes photographs of many of the individuals whose stories appear in the narrative. But alas, none of Crazy Horse, for whom there is no known photograph. These illustrations add nicely to the stories Gardner tells.

The Earth Is All That Lasts raises other interesting challenges. Gardner does not seem particularly fond of Red Cloud, another great Oglala warrior who led what Whites used to call the Fetterman Massacre, but which the Lakota refer to as the Battle of the Hundred in the Hand. Here Red Cloud engineered a masterful destruction of a small company of the U.S. Army, perhaps not as significant as that at the Little Big Horn, but a rousing success, nevertheless. At some point, despite his prowess, Red Cloud saw – like Crazy Horse and Sitting Bull would later see – that ultimately fighting against an enemy whose killing technology grew exponentially would be futile. So Red Cloud “surrendered.” This surrender and the ensuing



Sitting Bull Monument at his grave in Mobridge, South Dakota. Photo by Mark Jordan.

rapprochement with the Americans jarred Gardner's sense of the honor so powerfully exhibited by Crazy Horse and Sitting Bull. But Red Cloud, lionized in the biography *The Heart of Everything That Is* by Bob Drury and Tom Clavin, lived until 1909. He probably never achieved the peace he had sought, but his reservation life was free of the battles that beleaguered Crazy Horse and Sitting Bull and brought on their early deaths. The facts do not appear to differ between the two books, but the interpretation of those facts offers very different perspectives.

Neither Crazy Horse nor Sitting Bull had peaceful ends. Both were killed, most likely at the instigation of their White jailers. Both killings were regarded as "accidental" at the time, two bungled arrests, one in western Nebraska and one in northern South Dakota.

Crazy Horse was killed less than a year after surrendering, by a bayonet thrust under what are still confusing circumstances, both as to the manner of his being brought to Camp Robinson and as to who ran the bayonet into

his body. Gardner scours the sources and gives a vivid account.

Sitting Bull did better. Upon his surrender he became a celebrity, though his "jailer," James McLaughlin, did everything in his power to denigrate Sitting Bull. McLaughlin, despite Sitting Bull's notoriety, sought to keep a tight leash on the Hunkpapa holy man. Of Sitting Bull's controversial death, Gardner tells the vivid story.

His detailed accounts make the reader feel the wounds as they were being inflicted on the two defenseless men, both of whom were perceived by their captors to represent serious impediments to American hegemony.

Sitting Bull's end came while his jailers were attempting to "civilize" the Natives. Government policy discouraged their captives from using their own language. They could not engage in their centuries-old ceremonies – more cultural genocide. The Ghost Dance, a religious rite that would reunite the living with the dead, return buffalo herds to the prairie, and chase away the Americans, made an appearance on reservations, though prohibited under this civilizing regimen. Oddly, the Ghost Dance incorporated elements of American religion, including the appearance of a Messiah. Feeling threatened, the authorities tried to prevent the dance and urged Sitting Bull to bring about its end. He would not.

James McLaughlin qualifies as Gardner's leading villain. Yet evaluating McLaughlin, too, depends upon

perspective. To himself and many Whites (even some Natives) he was merely doing his job. He himself wrote as much, as did others who wrote about him. Gardner's book attempts to correct that impression. But this raises the question: how do we look at history? At some point, we need to sort it out. Gardner does a wonderful job of working through sources and opinions, albeit those of his choosing.

McLaughlin, so sick of Sitting Bull that he would do anything to frustrate or eliminate him, sent out his Native police force to arrest the holy man. In the melee that ensued, Sitting Bull was killed. As with Crazy Horse, the evidence regarding the killing is not unambiguous, but at the end of the day on December 15, 1890, Sitting Bull had joined his Lakota brother in arms among the dead. He survived Crazy Horse by thirteen years, probably better suited for longer survival than Crazy Horse.

Choices can be made in interpreting the historical record. Gardner has made his. Let the readers decide if those choices comport with their own vision of these two charismatic men who helped create a significant history in the face of American expansion. ■

Mark Jordan has been a canoeing and kayaking aficionado for almost fifty years. He has canoed extensively in the United States and across Canada, all the way to Hudson Bay. He has canoed and kayaked in Central and South America, Australia, New Zealand, and Antarctica. His love of canoeing brought him to the Lewis and Clark Expedition, which he has studied for the last forty years. He teaches and lectures on the Expedition and in 2020 received the Lewis and Clark Trail Heritage Foundation's Meritorious Achievement Award for his teaching and lecturing.



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