"AN EXCELLENT GUIDE TO SUBSEQUENT EXPLORERS"

THE SCIENTIFIC INFLUENCE OF LEWIS AND CLARK’S GEOLOGICAL DISCOVERIES
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On the cover

*Missouri Breaks Geology*

Lewis and Clark's detailed lithologic descriptions of the Missouri Breaks and White Cliffs regions of the upper Missouri River, presented nearly verbatim in Nicholas Biddle's *History*, were richly appreciated by nineteenth-century geologist Ferdinand Vandiveer Hayden, who found the captain's descriptions to be "so accurate." An example is this observation, edited by Biddle, from May 27, 1805: "The water is bordered by high rugged bluffs, composed of irregular but horizontal strata of yellow and brown or black clay, brown and yellowish white sand, soft yellowish white sandstone, hard dark brown freestone, and also large round kidney formed irregular separate masses of a hard black ironstone, imbedded in the clay and sand."
Volunteers: Lifeblood of the foundation

Volunteers are not just important to the Lewis and Clark Trail Heritage Foundation; they are the foundation. With apologies to our excellent professional staff, one must acknowledge that the foundation simply could not function without volunteers. Knowing that I will be incomplete, let me count the ways, the categories in which we are served.

Our 36 chapters are composed exclusively of volunteer members, some 3,000 of them, and in addition we have several hundred members who do not belong to a chapter, usually due to their geographic location. Volunteers plan meetings, including regional meetings for two or more chapters, as Dick Hohnbaum and his committee did for Oregon and Washington last November. Collectively these members accomplish most of the work that is done for the Lewis and Clark cause, from teaching lessons in schools to donating books to local libraries. We are a membership organization that serves the public at large in addition to our own members.

Fifteen volunteers comprise the LCTHF board of directors. They serve at some considerable sacrifice to their financial balance sheet, a subject I explored with some feeling in last month's The Orderly Report. Currently, a dozen committees, all of whose members are volunteers, assist the board. Half of these are led by people who are not directors, including the very important Governance Committee (Jane Schmoyer-Weber), Membership Committee (Jim Rosenberger), Awards Committee (Ken Jutzi), Financial Affairs Committee (Ladd Seaberg) and Annual Meeting Committee (Barb Kubik).

A great way to get better acquainted with the board and its work is to serve on a committee, so let me list the other seven: Diversity (Chris Howell), Eastern Legacy (Jim Mallory), Education (Larry McClure), Past Presidents (Ron Laycock), Living History (Bud Clark), Third Century Campaign (Jim Brooke) and Trail Stewardship (Stephenie Ambrose Tubbs). Talk with any of us if this interests you, or write to Karen Seaberg, president-elect, if you would like to serve.

One can serve in many ways without being on a committee, of course. An excellent example would be the dozens of volunteers who have worked with Wendy Raney, our director of field operations, on the Lewis and Clark National Historic Trail, thus far chiefly on the Lolo Motorway and upper Missouri River. Another example would be H. Carl Camp and Jerry Garrett, our volunteer proofreaders for We Proceeded On. Editor Raney would be the first to tell you how much they add to the quality of our highly respected quarterly.

Foundation member Gib Floyd of Kuna, Idaho, took on a trail project last year that involved a great deal of time, skill and energy. We received a grant to construct river mileage markers to be placed along the upper Missouri. Gib made twenty signs in a relatively short period of time. They were posted on Bureau of Land Management acreage along the river last summer.

Kathy Murray and Lois Baker are our directors of library and education services at the William P. Sherman Library and Archives in Great Falls, but they are paid to share a half-time position. That is made possible by the volunteers who work in the library and archives. The central office also has the assistance of several volunteers, not all of them living near...
Foundation volunteer Gib Floyd of Kuna, Idaho, constructed 20 river mileage markers like this one at Hole-in-the-Wall on the upper Missouri River.

Great Falls. Donna Rosentrater, for instance, lives in Greeley, Colorado, and has volunteered to compose ads for the foundation for WPO, resulting in a considerable savings for the organization.

Our annual meeting essentially is put on by volunteers from a chapter or often two chapters working together. This year’s meeting is hosted by the Home Front and Carolina chapters. I know for a fact that their planning committee, co-chaired by Malou Stark and Ann Tufts, has been working hard for nearly two years.

Meanwhile, Steve and Judy Powell have created an instructional guide and DVD for chapters to use in working with the Boy Scouts of America on projects and programs. They will be distributed at the annual meeting and posted on our Web site later this summer for chapters to use.

When a few weeks ago I mentioned the subject of my August WPO essay to Carol Bronson, she literally exclaimed, “Volunteers? They’re essential. Wonderful! It’s high time they received a little more recognition.”

So how much do we depend on volunteers? We can only begin to count the ways. My above examples, of course, are just a few of the many that could be cited. But we thank them one and all, from the bottom of our hearts!

—Jim Gramentine
President, LCTHF

2007 Meritorious Achievement Award — Lewis and Clark Trail Heritage Foundation

Dear Fellow Members of LCTHF:

At the annual meeting in Charlottesville I was honored to receive this award for Lewis and Clark Road Trips and its website. Now I am asking for your help in achieving further development of the Lewis and Clark heritage tourism trail.

In October, 2007 the Lewis and Clark Road Trips website will begin hosting three ongoing public forums: a Trail Travel Forum, a Lewis and Clark Journals Forum, and a Photo & Video Trail Gallery.

I am leading a Journals study group at the Omaha Public Library, and we are asking groups to form around the country. Anybody can contribute to the internet forums, which will be moderated. Local groups and individuals can share comments, travel stories and images with others around the world on the website. The website and my monthly newsletter will have more information.

Sincerely,
Kira Gale

kira@lewisandclarktravel.com

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August 2007
Letters

After the expedition; Honoring Lewis; Regional meetings

Robert Moore’s article, “Lewis and Clark: Remaking the American West, 1808-1838,” (WPo, May 2007) was a meaningful contribution to the growing discussion of the explorers’ post-expedition roles and provided ample food for thought. One morse, however, this reader found indigestible: Moore’s interpretation of William Clark’s treatment of his slave, the mononymic York.

We read that Clark “can be seen as a stern father figure to his slave York,” although by all reliable accounts the two men were close contemporaries, and York had been Clark’s companion since their early boyhood. The implied analogy with the explorer’s fatherly role in the lives of his O’Fallon nephews and Jean Baptiste Charbonneau is like putting blueberries and olives in the same jar. While Clark served as mentor, nurturer and disciplinarian to his nephews and to Sacagawea’s son, it is a stretch to see him playing any but the last-mentioned role in York’s life.

Even less convincing is the theory that Clark’s insistence on holding York in bondage long after the expedition “may have been a political statement” to reassure French Creole slaveholders. Clark held a houseful of slaves both young and old in St. Louis. Why would freeing just one of them have meant so much? Would the French not have understood how York’s remarkable performance on the epic journey justified—even in a slaveholding culture—his graduation to freedom?

Despite Clark’s accomplishments, it is hard to see his ongoing enslavement of York as anything but an exercise in arrogance. Let us not try to invent historical motives for the petty personal failings of historical figures. As we have seen repeatedly in recent history, it is more often petty personal motives that guide historical failures.

Mark Chalkley
Baltimore, Md.

Finally, a couple of articles that discuss Meriwether Lewis’s life after the expedition, not his death! The articles by Robert Moore, and Thomas Danisi and John Jackson (WPo, May 2007) fill in the time of Lewis’s life that historians (who, by the way, repeat historians who repeat historians) say Lewis did nothing but feel depressed about his life and was unable to motivate himself to write or organize the journals, or assume the duties of governor of the Louisiana Territory.

It has always “depressed” me that when people read about Lewis’s death by suicide, they take the authors’ (Dare I say historians?) viewpoint without doing any additional reading or research of their own. The two articles don’t dwell on Lewis’s death, but rather emphasize what he did from Sept. 23, 1806, to March 8, 1808, which was very positive on Lewis’s part.

I have traveled from St. Louis to Fort Clatsop more than 20 times since 2001, telling the Lewis and Clark story to hundreds of people. I have told the same story to hundreds more people while cruising the Columbia and Snake rivers more than 40 times in the same period. Finally, I have given talks to hundreds of people in cities and towns all over the Pacific Northwest about Lewis and Clark.

Very few of these people had any concept of Lewis’s death by suicide, but those who had read the theory believed it must be true because historians say it was so.

I think it a terrible slander to the memory of Lewis not to present both sides of the controversy. I have done this for the last eight years, fairly to both sides.

I plan to commemorate the 200th anniversary of Meriwether Lewis’s death in October 2009 in a lecture series and book signing tour across the country. My opening statement will be, and always has been, “I can’t prove it was murder, but you can’t prove it was suicide.” No one can prove what happened 200 years ago in a remote wilderness!

Thank you Mr. Moore, Mr. Danisi and Mr. Jackson for your articles and thank you Ms. Editor for your time.

Don Popejoy
Spokane, Wash.
Honoring Meriwether Lewis

The Home Front Chapter of the Lewis and Clark Trail Heritage Foundation and The Locust Hill Graveyard Foundation have joined forces to honor Meriwether Lewis.

In legislation dated March 22, 1932, the Virginia General Assembly designated Meriwether Lewis a great Virginian worthy of being honored with a bust in the old hall of the House of Delegates in the Virginia Capitol in Richmond. Seventy-five years later, this joint project will place his bust there.

The Lewis bust will join those of other noted Virginians in the old hall including Revolutionary statesmen and Confederate leaders.

Next door to the old hall, the rotunda houses a magnificent, life-size statue of George Washington, the only sculpture of him completed during his life. Niches along the rotunda walls contain busts of the other seven Virginia-born presidents: Thomas Jefferson, James Madison, James Monroe, William Henry Harrison, John Tyler, Zachary Taylor and Woodrow Wilson.

Virginia's Capitol is the seat of the oldest English-speaking continuous lawmaking body in the western hemisphere. It hosts more than 150,000 visitors a year. Placement of the Lewis bust in the old hall offers the opportunity to tell the Lewis and Clark story in another important location.

The project sculptor is Dr. John Lanzalotti of Williamsburg Sculpture, one of America's finest contemporary sculptors. The bust will be based on Dr. Lanzalotti's previous bust of Lewis, which he created using Charles B.J.F. de Saint-Memin's watercolor of Lewis done shortly after the expedition.

For more information, please contact the Home Front Chapter, P.O. Box 4737, Charlottesville, Virginia, 22905 or the Locust Hill Graveyard Foundation, 2200 Owensville Road, Charlottesville, Virginia, 22901, or at mcswain@citilink.net.

TOM MCSWAIN
Shepherdstown, W.V.

Appreciation for regional meetings

We would like to thank the Lewis and Clark Trail Heritage Foundation for initiating regional meetings. We have attended meetings in Omaha, Nebraska, and Kansas City, Missouri, and have found them to be informative and enjoyable. We appreciate the local chapters for all of the planning they put into hosting a regional meeting. These meetings provide a way for members to make new friends and get reacquainted with people who share a common interest in Lewis and Clark. Thank you for all of your hard work.

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In collaboration with the University of Montana, a touring exhibit of Charles Fritz’s L&C paintings can still be seen at the following venues:

Yellowstone Art Museum, Billings, Mont.
June 3 - August 20, 2006
MacNider Art Museum, Mason City, Iowa
September 2006 - January 2007

WPO welcomes letters. We may edit them for length, accuracy, clarity and civility. Send them to us c/o Editor, WPO, P.O. Box 3434, Great Falls, MT 59403 (e-mail wpo@lewisandclark.org).

Jennifer Scott, left, and Mary Duncan read an interpretive sign at Clark's Hill/Norton State Historic Site in Cole County, Missouri, at a regional meeting in April 2005. The Lewis and Clark Expedition camped near the site, and Clark ascended the hill to view the confluence of the Missouri and Osage rivers.

Dick Prestholdt enjoys a tour of Fort Necessity National Battlefield during the April 2006 Eastern Legacy regional meeting.

August 2007 We Proceeded On — 5
Convention wisdom has long held that the scientific discoveries of Meriwether Lewis and William Clark lay dormant for 100 years because of their failure to publish the proposed scientific volume from their original journals. According to Meriwether Lewis’s prospectus, the first part of the planned publication would include a “narrative of the voyage;” the second part would cover the scientific research “under the heads of Botany, Mineralogy, and Zoology;” and the third part would contain William Clark’s map of the West, plus celestial observations establishing the latitude and longitude of important places along the expedition’s route. After years of delay and Lewis’s untimely death, only the “narrative of the voyage” (including Clark’s map) was published, but the planned volume of scientific research was not.

Many Lewis and Clark scholars have commented on this unfortunate consequence by highlighting what they consider to be the scientific shortcomings of the two-volume History of the Expedition under the Command of Captains Lewis and Clark, edited by Nicholas Biddle and brought to press by Paul Allen in 1814. This viewpoint is best summarized by Dr. Gary Moulton in his essay, “Introduction to the Journals,” found in volume 2 of The Journals of the Lewis & Clark Expedition. In it he says: “Very few of Lewis’s impressive notes on natural history appear in Biddle’s work ... the Biddle paraphrase was by no means all that Jefferson had hoped; in particular, the omission of the scientific findings helped establish a view of the expedition, common to this day, as primarily a romantic adventure.”

This critique of Biddle’s work remains unchallenged when considered within the narrow biological definition of natural history, primarily in the disciplines of botany and zoology. However, a careful comparison of Biddle’s History with the captains’ original journals reveals a startling fact: in the domain of another, broader dimension of natural history—the earth science of geology—there is a high level of correspondence between the two sources. The general nature of Lewis and Clark’s observations, unlike their exacting morphological descriptions of plants and animals, allowed their earth science notations to pass through Biddle’s “scientific filter” as he prepared the captains’ journals for publication.

Paradoxically, the very lack of specific details, such as mineralogical chemical analyses, as well as the absence of dense scientific jargon, allowed Biddle to use Lewis and Clark’s geology notations as tangible, scene-setting features in the day-to-day travel narrative that is the hallmark of Biddle’s History. Not only were these observations available to early nineteenth-century geologists, but they also had an influence on subsequent inquiry into the geology of the American West.

The Extent of Geological Science in Biddle’s History

The author previously has demonstrated that the original Lewis and Clark journals were rich in geological documentation and that the captains fulfilled Jefferson’s goals for this science. To summarize, a meticulous interpretive review of Moulton’s edition of the Journals indicates that the captains made some kind of geological
notation (e.g., notes on stratigraphic relationships, lithology, types of mineral resources, erosion or mass wasting, etc.) in 45 percent of their daily journal entries from the day the expedition left Camp River Dubois on May 14, 1804, to their arrival at the site of Fort Clatsop on December 7, 1805. These computations exclude times of (1) extended encampments to hold councils, obtain astronomical data, make repairs or gather provisions; (2) the winter 1804–1805 layover at Fort Mandan; and (3) the month-long Great Falls portage from mid-June to mid-July 1805. If the myriad sedimentological notations (e.g., notes on “ancient beds of the river,” the cut-and-fill deposition occurring in the river channels, the type of sediments carried by various rivers, creeks and streams, etc.) are included in this calculation, the incidence of Lewis and Clark’s daily geological observations exceeded 60 percent of their entries enroute to the West Coast.6

The same interpretive review of the outbound journey was conducted using Biddle’s History. The result of this comparative assessment indicates that Biddle’s History contained geological observations in 39 percent of the outbound daily narrative. Combined geological/sedimentological observations were present in 53 percent of the narrative. The slight decrease in the overall percentage of geological notations in Biddle’s History, as compared with the captains’ original journals, was entirely comprised of entries where Biddle excised (1) mention of a rock lithology; (2) a distinguishing descriptive feature of a rock outcrop; or (3) what he undoubtedly viewed as redundant descriptions of the Missouri River’s erosive power and sweeping, meandering nature. A few of these omissions suggest that Biddle opted not to use the geological information contained in either Lewis’s fragmentary “Codex Fa/F” or the remarks in “Codex O,” Lewis’s geographical treatise on the Missouri River (“A Summary view of the Rivers and Creeks”), composed at Fort Mandan.

However, each of these omissions involved either a fairly insignificant detail or a geological characteristic that could be found in another narrative passage. Thus, Biddle’s edits did not subtract from the overall geological content. As a result, every important geological observation that Lewis and Clark made in their original journals was published in Biddle’s History. The sidebar on page 11 illustrates a few examples of geology notations that the captains studiously recorded, and it should be evident that Biddle’s subsequent paraphrasing did not alter the essential geological facts that they noted in their journals. Therefore, Lewis and Clark’s geological observations were available to any geologist fortunate enough to purchase or borrow a copy of the original Biddle’s History published by Bradford and Inskeep, or one of the subsequent English-language reprints published in London and Dublin between 1814 and 1817.

WILLIAM MACLURE AND SIR CHARLES LYELL

In 1809, Scottish-born William Maclure, one of the founders of the Academy of Natural Sciences in Philadelphia, and considered to be the father of American geology, published the first regional geological map of America. This map extended from the Atlantic Ocean to the Mississippi River, but because it preceded

Glacial drift geology in Montana
Nicholas Biddle’s paraphrasing of Lewis and Clark’s geological observations kept intact all the essential geological facts recorded by the captains, such as Lewis’s April 22, 1805, description of the surficial appearance of glacial drift deposits that the expedition encountered in North Dakota and Montana: “The hills of the Missouri near this place exhibit large irregular broken masses of rocks and stones … These rocks and stones consist of white and gray granite, a brittle black rock, flint, limestone, freestone, some small specimens of an excellent pebble, and occasionally broken stratas of a black coloured stone like petrified wood.”
the publication of Biddle's *History* by five years, there was no mention of the Lewis and Clark Expedition. When a revised second edition of Maclure's *Observations on the Geology of the United States* was issued in 1817, the geological map still did not incorporate any of the captains' observations; however, Maclure made the first reference to Lewis and Clark in the geological literature when discussing mountain ranges on the continent: "in crossing the stony mountains on the west side of North America, between the sources of the Missouri and Columbia river, two very hot springs were found by Captain Lewis." This undoubtedly refers to Lolo Hot Springs in Montana (September 13, 1805) and Jackson Hot Springs on Warm Spring Creek, east of Jackson, Montana (July 7, 1806), which actually was encountered by Clark, not Lewis.

Perhaps the earliest reference to Biddle's *History* in the international geological literature can be found in the 1830 edition of British geologist Charles Lyell's *Principles of Geology*. Lyell, one of the founding fathers of modern geology, used the captains' observations from October 1805 as an example of how terrestrial areas could become flooded by natural causes: "Captains Clark and Lewis found a forest of pines standing erect under water in the body of the Columbia River in North America, which they supposed, from the appearance of the trees, to have been only submerged about twenty years." However, despite this citation, it doesn't appear that Lyell thoroughly reviewed Biddle's *History* for its full geological content (in fact, later editions of *Principles of Geology* would add the phrase "about the year 1807" to this Columbia River comment, which obviously is incorrect).

There is evidence, then, that Biddle's *History* crossed the desks of two pioneering geologists during the first 15 years after its publication, but neither William Maclure nor Charles Lyell availed himself of its rich lode of geological observations. Given the relative obscurity of the published editions, some fortuitous event would be needed to get Lewis and Clark's geological observations into the hands of an experienced geologist who could disseminate their discoveries through the scientific literature of the period.

**Henry Darwin Rogers and Nicholas Biddle**

Appropriately enough, it would be through an enterprising American geologist that Lewis and Clark's geological observations would be revealed to the larger scientific community. As the first state geologist for New Jersey and Pennsylvania, Henry Darwin Rogers would achieve fame in the geological arena for his numerous groundbreaking geological survey reports of these states and for his theory of Appalachian mountain building. A heretofore unexplored connection between Rogers and Nicholas Biddle, forged before Rogers began his intensive state geological survey work in 1835, may have been the critical link that allowed the geological documentation in Biddle's *History* to be published in the scientific literature of the nineteenth century.

Rogers, after stints as a teacher and an educational reformer, moved to Philadelphia in mid-1833, and over the next year or so, joined the American Philosophical Society, the Academy of Natural Sciences, and most importantly, the Franklin Institute, an organization whose mission statement was to raise the level of science in the United States. Among the institute members was none other than Nicholas Biddle, who proposed Rogers for membership on January 18, 1834. Shortly thereafter, in the spring of 1834, the University of Pennsylvania added a course in geology and Rogers subsequently was elected the university's professor of geology and mineralogy. It is possible that Biddle, a university trustee, helped arrange this appointment. It is surmised that around this time, through Biddle, Rogers formally was introduced to the scientific observations of Lewis and Clark. As discussed above, Biddle's *History* included virtually all of the captains' detailed geological remarks and Biddle surely would have recognized its value to a professional geologist, particularly one who had a keen interest in mapping the nation's geological resources. Rogers immediately began synthesizing the information in Biddle's *History*, along with information from other explorers, to fill the void in contemporary knowledge regarding the geology of the American West.

**Rogers, Biddle's History and the Geology of the American West**

The degree to which Biddle's *History* completely changed...
Rogers’s view of western geology can be deduced by comparing two papers he produced in 1834. The first, entitled “Report on the Geology of North America,” was read on behalf of Rogers on September 9 and 12, 1834, at the Fourth Meeting of the British Association for the Advancement of Science in Edinburgh, Scotland. There was no mention of Lewis and Clark in this lengthy work. Some of the conclusions at the end of the paper, such as “there is no evidence of the existence of true chalk in North America. Genuine flints have not yet been found in any bed,” indicate that Rogers had not yet acquainted himself with Biddle’s History. But shortly thereafter, evidence of Rogers’s assimilation of the geological findings in Biddle’s History can be found in the Proceedings of the Geological Society of London, where on November 19 and December 3, 1834, another paper Rogers had developed, entitled “Some Facts in the Geology of the Central and Western Portions of North America, collected principally from the statements and unpublished notices of recent travelers,” was read into the society’s record. In his acknowledgments of the original sources of this essential information, Rogers reported that the information that revealed the “structure of the country” was “extracted from the journals of Long and Lewis, and Clerke and Nuttall,” the misspelling of Clark and Nuttall not being the fault of Rogers, but rather the secretary transcribing the minutes of the meeting.

Certain passages in Rogers’s Geological Society of London paper accurately reprised the captains’ geological notations. For example: “In ascending the Missouri from its confluence with the Mississippi the banks are in many places composed of limestone cliffs” and “above the junction of the Platte with the Missouri are beds of sandstone and dark blue shale, and a little higher, adjacent to Au Jaqou [James River], are high, perpendicular cliffs of a formation considered to be true chalk.” These statements concisely summarized Lewis and Clark’s observations of the Paleozoic-age limestone formations along the river in present-day Missouri up through their notations of the impure chalk/marl (the Niobrara Formation) near the confluence of the James River in South Dakota and in the vicinity of the Calumet Bluffs. Rogers also may have been referring to the captains’ June 7, 1804, description of the multicolored flint (chert) inlaid in limestone near present-day Rocheport, Missouri, when he stated: “pebbles ... are numerous lower down the river.”

Rogers took special note of Lewis and Clark’s industrious coal notations by stating, “above the Big Bend occurs also an extensive range of horizontal beds of lignite, sandstone, shale, and clay, forming cliffs 200 and 300 feet high, and continuous for several days’ journey.” He recognized Lewis’s deductive elimination of active volcanism in the Great Plains when he stated that “no recent volcanic production appears to have been yet brought from the country east of the Rocky Mountains.” The observations regarding coal and the absence of volcanism were the highlights of the captains’ geological journal entries in Nebraska, South Dakota and North Dakota in September and October 1804 and in North Dakota and eastern Montana throughout April and May 1805.

Lewis and Clark’s May 26, 1805, notation of “concreted shells” (an occurrence of limestone formed by densely packed, cemented masses of fossil shells) showed up in Rogers’s statement that rock formations on both the Missouri and Yellowstone rivers contained a “matrix in which the shells are imbedded” and that these “fossils have been brought from the beds of the Missouri and Yellowstone rivers.” Additionally, Rogers noted that “silicified trunks of trees are stated to have been noticed on the banks of the streams, and are considered ... to have fallen from the bluffs,” an apparent reference to

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**Petrified wood outcrop in North Dakota**

Lewis and Clark’s observations of petrified wood, as rephrased in Biddle’s History on April 16, 1805, “we found several stones which seemed to have been wood, first carbonated and then petrified,” were noteworthy enough to be highlighted in Henry Darwin Rogers’s summary (in 1834) of North American geology.
Sulphur Spring in Great Falls, Montana

Henry Darwin Rogers specifically described the occurrence of hot springs and sulphur springs in his 1834 summary of western U.S. geology, bolstered by Biddle's paraphrase of Lewis's June 16, 1805, observation of "a large sulphur spring falling over the rocks on the north... It is situated about two hundred yards from the Missouri... The water is perfectly transparent, strongly impregnated with sulphur." Rogers concluded his paper with a mention of "the thermal springs which abound along the base on each side of the Rocky Mountains and... are stated to vary in temperature from blood-heat to the boiling point... many sulphureous springs occur." Like Maclure, Rogers probably was referencing Lewis and Clark's discovery of Lolo Hot Springs and Jackson Hot Springs in addition to Sulphur Spring near the Great Falls of the Missouri (June 16, 1805).

This same Geological Society of London narrative was reprised verbatim two years later at the end of a long description of United States geology in Hugh Murray's massive three-volume The Encyclopaedia of Geography, which assured a much broader distribution of Lewis and Clark's most important geological discoveries.  

What undoubtedly strengthened Rogers's conviction of the accuracy of Biddle's History were the reports of Joseph Nicolas Nicollet, a French mathematician and topographer best remembered for leading three expeditions to map the upper Mississippi basin in the 1830s, and retracing Lewis and Clark's route up the Missouri River to present-day Pierre, South Dakota, from April 4 to June 12, 1839. That Nicollet used Biddle's History is assured, as he specifically referred to Lewis and Clark numerous times in his 1843 report to the United States government, and during several presentations in 1841 and 1843 to the Association of American Geologists and Naturalists. For example, at the April 28, 1843, meeting of the association, Nicollet remarked, "The course of the river was continually changing—so much so that many of the bends described by Lewis and Clark could not now be recognized... it resulted that the travelling distances of his party, differed much from those of Lewis and Clark." During his trip upriver, Nicollet sought to re-examine the same rock outcrops mentioned in Biddle's History, including "River banks... which are mentioned by Lewis and Clark as containing alum, copperas, cobalt, &c.; and then seven miles higher up, there is another succession of river hills of the same character." This obvi...
Comparison of original L&C journal geological notations with Biddle's *History* edition

**Original Journals**

I believe it to be the strata of Coal seen in those hills which causes the fire and burnt appearances frequently met with in this quarter. Where those burnt appearances are to be seen in the face of the river bluffs, the coal is seldom seen, and when you meet with it in the neighborhood of the strata of burnt earth, the coal appears to be precisely at the same height, and is nearly of the same thickness, together with the sand and a sulphurous substance which usually accompanies it. (Lewis, April 16, 1805, in Moulton, Vol. 4, p. 45)

The broken hills of the Missouri about this place exhibit large irregular and broken masses of rocks and stones; some of which tho' 200 feet above the level of the water seem at some former period to have felt its influence, for they appear smooth as if worn by the agitation of the water: this collection consists of white & grey granite, a brittle black rock, flint, limestone, freestone, some small specimens of an excellent pebble and occasionally broken strata of a stone which appears to be petrified wood, it is of a black colour, and makes excellent whetstones. (Lewis, April 22, 1805, in Moulton, Vol. 4, p. 60)

The hills and river Cliffs which we passed today exhibit a most romantic appearance. The bluffs of the river rise to the height of from 2 to 300 feet and in most places nearly perpendicular; they are formed of remarkable white sandstone which is sufficiently soft to give way readily to the impression of water: two or three thin horizontal strata of white free-stone, on which the rains or water make no impression, lie imbeded in these Cliffs of soft stone near the upper part of them. (Lewis, May 31, 1805, in Moulton, Vol. 4, p. 225)

... 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, the limestone appears to be of an excellent quality of deep blue colour when fractured and of a light lead colour where exposed to the weather. It appears to be of a very fine grain... (Lewis, July 27, 1805, in Moulton, Vol. 4, p. 433)

I observe a great alteration in the Current course and appearance of this pt. of the Missouri. In places where there was Sand bars in the fall 1804 at this time the main Current passes, and where the current then passed is now a Sand bar - Sand bars which were then naked are now covered with willow. Several feet high; the enterance of Some of the Rivers & Creeks Changed owing to the mud thrown into them... (Clark, August 20, 1806, in Moulton, Vol. 8, pp. 310-311)

**Biddle Edition**

There is indeed reason to believe that the strata of coal in the hills cause the fire and appearances which they exhibit of being burned. Whenever these marks present themselves in the bluffs on the river, the coal is seldom seen, and when found in the neighborhood of the strata of burnt earth, the coal with the sand and sulphurous matter usually accompanying it, is precisely at the same height and nearly of the same thickness with those strata. (History, Vol. 1, p. 189)

The hills of the Missouri near this place exhibit large irregular broken masses of rocks and stones, some of which, although two hundred feet above the water, seem at some remote period to have been subject to its influence, being apparently worn smooth by the agitation of the water. These rocks and stones consist of white and gray granite, a brittle black rock, flint, limestone, freestone, some small specimens of an excellent pebble, and occasionally broken strata of a black coloured stone like petrified wood, which make good whetstones. (History, Vol. 1, p. 193)

These hills and river cliffs exhibit a most extraordinary and romantic appearance: they rise in most places nearly perpendicular from the water, to the height of between two and three hundred feet, and are formed of very white sandstone, so soft as to yield readily to the impression of water, in the upper part of which lie imbeded two or three thin horizontal strata of white freestone insensible to the rain. (History, Vol. 1, p. 238)

A ridge of hills which now approach the river with cliffs apparently sinking like those of yesterday. They are composed of a solid limestone of a light lead colour when exposed to the air, though when freshly broken it is of a deep blue, and of an excellent quality and very fine grain. (History, Vol. 1, p. 324)

Since we passed in 1804, a very obvious change has taken place in the current and appearance of the Missouri. In places where at that time there were sandbars, the current of the river now passes, and the former channel of the river is in turn a bank of sand. Sandbars then naked, are covered with willows several feet high: the entrance of some of the creeks and rivers changed in consequence of the quantity of mud thrown into them. (History, Vol. 2, p. 412)

—John W. Jengo
ous reference to the captains' geological descriptions on August 22, 1804, is yet another indication of the scientific value that geologists placed in Biddle's History. Just as Lewis and Clark had discovered 35 years earlier, Nicollel stated that "many have erroneously supposed that volcanoes existed on the Upper Missouri. This, however, is a mistake. The smoke and pseudo-pumice, he supposed to proceed from the same source, the ignition of the iron pyrites and lignite, which are found in great abundance in the plastic clay." Rogers, who attended this informative April 28, 1843, association meeting, felt compelled to support Nicollel's explanation of these "pseudo-volcanoes" by declaring that, based on statements from prior explorers (presumably including Lewis and Clark via Biddle's History), "in whose statements implicit reliance could be placed, that high up on the Missouri and Yelllowstone, there were these hills of burning clay, and that after they were burnt out they sunk [sic] down, leaving permanent memorials of the fact." Rogers continued to credit Lewis and Clark in his published works on United States geology. For example, in closing remarks to his magisterial review of the geology of the United States in Alexander Keith Johnston's The Physical Atlas of Natural Phenomena (1856), which now included a colored, continental geological map that he had been working on since the mid-1840s, Rogers prominently listed the captains first in the "Maps and Memoirs Consulted in the Construction of the Map" reference section: "Information regarding the Great Western Plains, Rocky Mountains, Oregon, Utah, &c. by Lewis and Clark, Colonel Long, Captain Bonneville, Parker, Bryant, &c." along with Captain John Charles Frémont.

In Johnston's The Physical Atlas, Rogers appeared to have used the captains' geological observations recorded during their traverse of Montana from near present-day Poplar through the Missouri Breaks and White Cliffs region to Great Falls when he described the distribution of the Cretaceous-age rocks in this fashion: "along the Missouri and its upper tributaries, where the formation is exposed through a length of more than a thousand miles, the [Cretaceous] series consists in like manner of limestones, clays, and sands ... an interesting constituent of the formation is the sulphate of lime or gypsum, which belongs to it more or less throughout its whole wide distribution." This correlates well with the captains' rock identifications throughout this region and their collection of numerous specimens of crystalline gypsum (selenite) that were sent back East from Fort Mandan. Lewis and Clark's diligent documentation of "carbonated wood" and "coal" throughout this territory and in the lower reaches of the Yellowstone River the following year probably was the original primary source of Rogers's statement: "Lignites and fossil plants, though generally in an obscure and fragmentary condition, are frequently found on the Missouri, and especially on the Yellowstone, one of its great Rocky Mountain tributaries, large deposits of lignite have been met with, having the aspect and extended stratification of beds of coal." Because of the captains' precise descriptions, Rogers was able to confidently classify these deposits as lignite, noting that such deposits can be "often mistaken by travellers for genuine coal." That Rogers felt confident about using the captains' work was indicated a year earlier when he exhibited his expansive geological map at the May 16, 1855, meeting of the Boston Society of Natural History, an august body of some of the country's leading scientists. The minutes of the meeting describe the map, which would be published in Johnston's The Physical Atlas the following year, as extending "from the Atlantic to the Pacific, including..."
the regions explored in the late expedition to the West. It is based wholly upon reliable, and the most satisfactory authorities, and nothing which is at all speculative has been introduced."34 At an earlier meeting of the Society on April 18, 1855, it was recorded in the meeting minutes that "Prof. H.D. Rogers called attention to the numerous and extensive deposits of Lignite reported as occurring in the region of the Upper Missouri ... and there can be no doubt the discovery of true coal fields in the far interior of the continent is a matter of national interest."35 The geological discoveries of Lewis and Clark appear to have informed much of what Henry Darwin Rogers "called attention to" in the various geological papers and geographical atlases to which he contributed over the course of his long and distinguished career.36

Ferdinand Vandiveer Hayden

As director of the U.S. Geological Survey of the Territories, he was effusive in his praise of Lewis and Clark's accurate geological observations and descriptions, and he considered Biddle's History to be "an excellent guide to subsequent explorers."

Ferdinand Vandiveer Hayden and Accolades for Lewis and Clark

A prime example of the ripple effect that radiated throughout the nineteenth-century scientific community when groundbreaking geological observations from heretofore unexplored regions of the West were published, such as those contained throughout Biddle's History, would be Ferdinand Vandiveer Hayden. He was a trailblazing American geologist and head of the U.S. Geological Survey of the Territories, which focused on Nebraska, Wyoming, Colorado, Idaho and Montana. Revisiting the same intriguing geological terrain first described by the captains, Hayden traveled up the Missouri River to present-day Pierre, South Dakota, in 1853. That tour was followed by an investigation of the Missouri River up to Fort Benton and the Yellowstone River up to the mouth of the Big Horn River in 1854-1855. After subsequent trips exploring the Missouri and Yellowstone rivers in 1856 and again in 1859-1860, Hayden began to publish a series of papers describing the geology of this vast area. He clearly was familiar with the captains' geological notations in Biddle's History because he specifically referred to their description of the Missouri Breaks region in an 1860 report. In it he remarked that "Lewis and Clarke in their interesting account of an expedition to the sources of the Missouri, give a brief but accurate description of the physical features of this remarkable region," and he mentioned that they provided more "detail on the picturesque portions near the 'Stone Walls,'" the region we refer to today as the White Cliffs.37

Hayden was far more effusive in his praise of the captains three years later in the historical introduction of his magnificent 218-page dissertation on the geology and natural history of the upper Missouri, published in Transactions of the American Philosophical Society and in a government-issued, final summary report published in 1869.38 Hayden's opening remarks about Lewis and Clark in this latter publication merit an extended quotation:

While my own labors, which have extended over a series of years [1853 to 1866] ... have brought out the greater part of the definite scientific results, I do not wish to pass by the valuable labors of those frontier men who were not as well prepared to develop the continuous geological structure over large areas. The first reliable explorers who added anything of value to the scientific knowledge of the upper Missouri district, were those enterprising travelers, Lewis and Clarke, who made an expedition up the Missouri river and across the mountains to the Pacific ocean and back, during the years 1804, 1805, and 1806. Considering the period when this expedition was undertaken and the grand results brought out by their report, it may justly be regarded the first [scientific] expedition ever made on this continent. The descriptive portion of their journal is excellent, indeed almost unsurpassed for beauty and accuracy [though Lewis and Clark appeared] ... to have no definite idea of the geological age of the country examined by them. Still they gave so accurate descriptions of the general physical features of the bluffs, coal-beds, &c., that their report has proved an excellent guide to subsequent explorers. They often mention beds of "stone coal," (lignite) different strata of sands, sandstones, clays, &c.39

It is evident that Hayden fully used the sections of Biddle's History describing the terrain Lewis and Clark encountered throughout the autumn of 1804 and spring of 1805 when they made some of their finest geological observations. Biddle left virtually unchanged their descriptions of the extensive occurrences of "carbonated wood" (lignite), the descriptions of the stratigraphic relationships of the rock formations throughout the Missouri Breaks, and of course, Lewis's famed "a most
extraordinary and romantic appearance” and “visionary enchantment” passages describing the White Cliffs of the Missouri River. Like Rogers and Nicolle before him, Hayden described “the spontaneous ignition of the lignite beds, by which the superincumbent strata are fused and heated to various degrees of compactness, sometimes giving the hills the appearance of an accumulation of fragments of burnt bricks,” with “many of these light vesicular masses” being carried downriver, thus inspiring “the opinion that there were volcanic products somewhere near the sources of the Missouri.” In these observations, one immediately can recognize Lewis’s April 16, 1805, journal entry as paraphrased in Biddle’s History (see sidebar on p. 11) and his clever comment that accompanied the “Lava & pumice Stone” specimen that was sent back from Fort Mandan to President Thomas Jefferson just days earlier, i.e.: “The tract of Country which furnishes the Pumice Stone seen floating down the Missouri, is rather burning or burnt plains than burning mountains.”

As Hayden clearly appreciated, of all the rock descriptions documented by Lewis and Clark, the distribution of lignite was the easiest for nineteenth-century geologists to piece together from Biddle’s History. The captains had noted its presence in the region proximate to the confluence of the Missouri and Yellowstone rivers and how its composition differed from the more mature coal deposits found in the East. Biddle chose to retain the captains’ remarks that these deposits were of an “inferior” or indifferent quality, as reflected in their entries for October 20, 1804; April 9, 1805; and July 28, 1806. They often called these lignite deposits “carbonated wood,” which is an excellent description of these organic, carbonized deposits that often retain their original woody texture. Because this scientific detail was published in Biddle’s History, Hayden could state with confidence that “It has been known since the time of Lewis and Clarke that a deposit containing lignite, &c., existed on the Upper Missouri,” crediting the captains with the discovery of this valuable geological resource.

IN DEFENSE OF BIDDLE

The theme of “failure” has been one of the most vigorously debated aspects of post-expedition history, exemplified by the scholarly opinions—such as those in the sidebar on page 15—regarding the value of Biddle’s History and the recently published Lewis and Clark in Context, The Shortest and Most Convenient Route, in which this author contributed a long paper on the under-appreciated geological accomplishments of the expedition. Geology often is cited as one of the primary exhibits in the failure argument, a consequence of the prevalent perception that Lewis, and then Clark, failed to publish the scientific discoveries of the expedition.

This can be refuted on two counts. First, Lewis and Clark’s observations on geology did pass virtually unaltered through Nicholas Biddle’s editing and were, in fact, revealed to the world in 1814; thus, these scientific findings did not remain concealed until the original journals were edited for publication by Reuben Gold Thwaites a century after the expedition. It should be conceded that Biddle’s History was not an ideal substitute for a scientific volume solely devoted to the natural history of the expedition. Such a publication would have been more effectively disseminated among the explorers and professional geologists who followed in the footsteps of the captains, resulting in a greater acknowledgement of Lewis and Clark’s accomplishments. Yet, Biddle’s History no longer should be characterized as having a “dearth of scientific substance” or “no science” or “little scientific information” for use by early American scientists working in the West.

Second, as a licensed geologist and practicing scientist, the author believes that scientists and historians can have very divergent views of what constitutes “failure.” Although it is true that the captains’ descriptions of
Scholarly Opinions on the Scientific Content of Biddle's History

Because Lewis'[s] projected history of the expedition never saw the light of day, Nicholas Biddle's work in 1814 omitted most of the natural history and other scientific data, and the Lewis and Clark journals were not published until 1904-5, the two captains were late in receiving full credit for their scientific contributions.


The book as published was, of course, not all that Biddle's prospectus had announced it would be; there was no accompanying scientific volume. Looked at from any angle, this exclusion was most regrettable.


The Biddle narrative and map came off the press in 1814 ... Although the book was to become a classic, Jefferson was far from satisfied with it. To him only half the story had been told; the scientific portion entrusted to Dr. Barton was still unpublished.


The delay in publication of the accounts of the Lewis and Clark Expedition, coupled with the fact that, when their accounts did appear they contained little scientific information, had allowed Lewis and Clark to be scooped scientifically by the reports of other early American scientists working in the West. The result was that the elite image of the expedition was not a terribly positive one in regard to the intellectual contributions made by the captains.


In an edition of only 1,417 copies, was the story of the expedition as a glorious western adventure. Biddle ... did try to tell a good story. His readers found that story but precious little science.


In spite of all the scientific ambitions held out for preparation of the volumes of the expedition ... missing from Biddle's narrative was much of the scientific documentation that would have completely distinguished it from the popular narratives that preceded it while ensuring its contemporary place in Enlightenment scientific history.


The two-volume report of the Lewis and Clark Expedition, edited by Nicholas Biddle and published in Philadelphia in 1814 ... is flawed in a number of ways, however. It lacks any visual documentation and is notably weak in scientific content ... the narrative's dearth of scientific substance was calculated and intentional. Scientific information was omitted from volumes one and two so as to not duplicate the contents of a planned third volume, which was to focus exclusively on the scientific discoveries of the expedition.

One of the great tragedies of the Lewis and Clark legacy is that the third volume was never produced.


—John W. Jengo

rock and minerals, geological processes and geomorphic landscapes would be supplanted by far more accurate descriptions and mapping over the ensuing 200 years, under no circumstances should this relegate Lewis and Clark's work into the category of "failure." In science, all initial observations ultimately are superseded by better information and all nascent theories revised by more authoritative and accurate hypothesis. When this happens, scientists do not refer to the initial discoveries as failures, but rather as groundbreaking, essential foundations from which future studies were launched.

There can be no better evidence regarding the completeness and value of Lewis and Clark's geological notations, paraphrased and better punctuated, but technically unaltered in Biddle's History, about the geological features and resources that lay throughout the expedition route than the fact that this information was considered accurate enough to be integrated by nineteenth-century geologists into the first geological surveys and geological maps of the American West. I can think of no better examples than the efforts of Henry Darwin Rogers and Ferdinand Vandiveer Hayden to illustrate the full manifestation of Jefferson's Enlightenment ideals and philosophy of continental exploration that he had astutely set in motion:
These expeditions are so laborious, & hazardous ... They are headed therefore by persons qualified expressly to give us the geography of the rivers with perfect accuracy, and of good common knowledge and observation in the animal, vegetable & mineral departments. When the route shall be once open and known, scientific men will undertake, & verify & class it's subjects.44

Unequivocally, Lewis and Clark did return with hundreds of geological observations, accentuated by descriptions of "perfect accuracy," and "scientific men" did subsequently undertake, verify and classify the geology of the American West with the captains' journals as their guide. This unmistakable and resounding attainment of Jefferson's vision as it relates to the geological sciences will be, in my view, one of the enduring successes of the Lewis and Clark Expedition.

John W. Jengo, a member of the Philadelphia Chapter, is a professional geologist who currently works as a principal hydrogeologist in an environmental consulting firm in Pennsylvania. His last Lewis and Clark geology article, published in the August 2005 issue of WPO, discussed the fate of the mineral specimens collected on the expedition. He was a presenter at the 2003 annual meeting in Philadelphia.

NOTES


2 Nicholas Biddle and Paul Allen, eds., History of the Expedition Under the Command of Captains Lewis and Clark, to the sources of the Missouri, thence across the Rocky Mountains and down the River Columbia to the Pacific Ocean, 2 volumes (Philadelphia: Bradford and Inskiep; and Abm. H. Inskiep, New York, 1814). Hereafter cited as Biddle's History. All quotations or references to journal entries in the ensuing text are from Biddle's History, by date, unless otherwise indicated.


It would be an interesting exercise to re-evaluate Biddle's History for these and other biological sciences given the detailed botany, zoology, ornithology, and fish/shellfish notes in History's Vol. 2 (pp. 148-201), in addition to the other natural history entries throughout this edition.


6 William Maclure, Observations on the Geology of the United States of America; with some remarks on the effect produced on the nature and fertility of soils, by the decomposition of the different classes of rock (Philadelphia: Abraham Small, No. 112, Chestnut Street, 1817), p. 26. In addition, the differences in the depiction of western rivers and mountain ranges between Maclure's 1809 and 1817 maps indicate that latter illustration was modified to include the new geography unveiled on Clark's map published in Biddle's History.

7 Charles Lyell, Principles of Geology, being an attempt to explain the former changes of the Earth's surface, by reference to causes now in operation, 3 volumes (London: John Murray, Albemarle Street, 1830-1833), Vol. 1, p. 190.

8 Charles Lyell, Principles of Geology, or, the modern changes of the Earth and its inhabitants considered as illustrative of geology (London: John Murray, Albemarle Street, 1853), p. 270.


10 Ibid., pp. 31-32. In yet another connection with the expedition, the last university course that focused on geology (that is, fully separated from natural philosophy and chemistry) was taught by Lewis mentor Robert Patterson, Sr. in 1824.


14 Ibid. The reference to "Long" is undoubtedly referring to Stephen Harriman Long's 1819-1820 expedition to the Colorado Rockies, and the three-volume Account of an Expedition from Pittsburgh to the Rocky Mountains, published in 1823. "Nuthall" is presumably Thomas Nuttall, who is familiar to Lewis and Clark aficionados as the botanist who retraced the expedition route from St. Louis to the Mandan villages in 1811; Nuttall also is renowned for his explorations of the Great Lakes, southeastern United States, Arkansas Territory, Pacific Northwest, Hawaii and California.

15 Ibid., p. 104.

16 Ibid.

17 Ibid., p. 105.

18 Ibid.

19 Ibid., pp. 105-106.

20 Hugh Murray, The Encyclopaedia of Geography: comprising a complete description of the Earth, physical, statistical, civil, and political; exhibiting its relation to the heavenly bodies, its physical structure, the natural history of each country, and the
industry, commerce, political institutions, and civil and social state of all nations, 3 volumes (Philadelphia: Carey, Lea, and Blanchard, 1836), Vol. 3, Book V – America, Chapter XII – United States, pp. 402-403. Hugh Murray (1779-1846) was a distinguished geographer, a Fellow of the Royal Society, and a Fellow of the Royal Geographical Society who is best remembered for The Encyclopaedia of Geography.

This journey was memorialized in Joseph Nicolas Nicollet, *Report Intended to Illustrate a Map of the Hydrographical Basin of the Upper Mississippi River, made by J.N. Nicollet, while in employ under the Bureau of the Corps of Topographical Engineers* (Washington: Blair and Rives, printers, 1843), p. 170.

The many admirers of William Clark’s mapping skills would not be surprised to learn that Nicollet, himself a talented map maker, also remarked, “Such is the unsettled course of the river ... Yet, on arriving at any prominent station, as the confluence of a large river, the amount of the partial course of the river ...” Yet, on arriving at any prominent station, a talented map maker, also remarked, “Such is the unsettled course of the river ...”

Another European-trained geologist, Jules Marcou, also included Biddle’s *History* as a reference source for geological information in his mapping of American geology; see Jules Marcou, *Geology of North America; with two reports of the prairies of Arkansas and Texas, the Rocky Mountains of New Mexico, and the Sierra Nevada of California*, originally made for the United States government (New York: Wiley and Halsted, 1888), p. 144.


Ibid., pp. 155-156. Nicollet, referring back to Biddle’s *History* once again, stated that he did not observe any active “pseudovolcanoes” during his journey up this particular stretch of the Missouri, which “would seem to have been the case at the passage of Lewis and Clark at the beginning of this century,” see Nicollet, *Report*, p. 40. For specifics on how the captains ascertained the relationship between the ignite beds and layers of burnt earth along the Missouri River, see Jengo, “Mineral Productions of Every Kind,” pp. 157-158.

Henry Darwin Rogers, “Geological Map of the United States, and British North America” in Alexander Keith Johnston, *The Physical Atlas of Natural Phenomena, A New and Enlarged Edition* (Edinburgh and London: William Blackwood and Sons, 1856), p. 34 (erroneously labeled as p. 32). Alexander Keith Johnston (1804-1871) was a noted cartographer, publisher, and the Geographer Royal for Scotland best remembered for his *Physical Atlas*, which presented the botany, geology, hydrology, meteorology and zoology of the known world. The other explorers mentioned immediately after Lewis and Clark were Stephen Harriman Long, Captain Benjamin Louis Eulalie de Bonneville, Reverend Samuel Parker, and Edwin Bryant, all of whom published journals or accounts of their western treks to the Rockies, Oregon or California territories, as did Frémont.

Ibid., p. 32.

Ibid., p. 33 (erroneously labeled as page 31).

Ibid.

Proceedings of the Boston Society of Natural History, (1854 to 1856), (Boston: Boston Society of Natural History, 1856), Vol. 5, p. 207. Rogers also would personally present the same map at the 25th meeting of the British Association for the Advancement of Science, held in Glasgow, Scotland, in September 1855.

Ibid., p. 190.

Before leaving Henry Darwin Rogers, it bears mentioning that a tantalizing connection existed between Rogers’s father, Patrick Kerr Rogers, and the “author” of the Lewis and Clark enterprise. Patrick Kerr Rogers had corresponded with Thomas Jefferson in 1819 concerning a professorship of natural philosophy, chemistry and mineralogy at the newly established University of Virginia, a position that the elder Rogers sought based on his experience delivering lectures on chemistry and natural philosophy in Philadelphia. In Patrick Kerr Rogers’s correspondence to Jefferson some five years later, he mentioned the intensive studies that his sons, which now included a young Henry, were actively engaged in. Despite their shared interest and aptitude in natural philosophy, neither man could have foreseen that Henry Darwin Rogers would be the primary instrument by which the geological observations of Lewis and Clark would find a significant place in nineteenth-century scientific literature. *Life and Letters of William Barton Rogers*, 2 volumes (Boston and New York: Houghton, Mifflin and Company, 1896), pp. 29-31 (Patrick Kerr Rogers to Jefferson, March 14, 1824).


Hayden, *Geological Report*, p. v. Hayden goes on to say that “a small collection of cretaceous fossils obtained by these travelers, enabled Dr. Morton to show the existence of the cretaceous formation on the upper Missouri.” The mystery of Samuel George Morton, a physician and amateur paleontologist, and his analyses of purported expedition fossils was touched upon in John W. Jengo, “‘Specimen of the Stone’: The Fate of Lewis and Clark’s Mineralogical Specimens,” *We Proceeded On*, Vol. 31, No. 3 (August 2005), pp. 17-26.


Lewis and Clark understood the importance of sea otters to American trade, but were unable to provide a full and accurate report on their presence on the coast

By Marguerite S.E. Forest

The Lewis and Clark Expedition had made it halfway down the lower Columbia River when on October 22, 1805, near the Great Falls, John Ordway and Joseph Whitehouse became the first members of the Lewis and Clark Expedition to sight sea otters, *Enhydra lutris*.

Ordway wrote: "we Saw a number of large Sea otter below the falls in the whorl pools and eddys." The next day, Captain William Clark recorded: "Great numbers of Sea Otters in the river below the falls, I Shot one in the narrow chanel to day which I could not get." Expedition members were familiar with a wide variety of fur bearers and it was clear to them that they were seeing a different animal, one they had looked forward to encountering.

They knew they were nearing their destination. Clark had climbed the hills at Wallula Gap and at Muscle Shell Rapids' to scout ahead. On October 18, he had seen a conical, snow-covered peak far to the southwest, likely Mt. Hood. The next day, he "discovered a high mountain of emence hight covered with Snow" and wrote "this must be one of the mountains laid down by Vancouver, as Seen from the mouth of the Columbia River."

They had named a variety of places after river otters, *Lutra canadenis*, commenting on the trade of their furs and avidly hunting them along the journey from Camp River Dubois. On August 20, 1805, while staying with the Lemhi Shoshones just west of the Continental Divide, Captain Meriwether Lewis spent considerable time describing the Indians' clothing and he called the river otter and ermine tippets they wore "the most eligant peice of Indian dress I ever saw."

**JEFFERSON'S INTEREST IN OTTERS AND THE MARITIME FUR TRADE**

From Thomas Jefferson's confidential letter to Congress dated January 18, 1803, and from his instructions to Lewis on June 20, 1803, it is clear that increased control of the fur trade was a major impetus for the Lewis and Clark Expedition. The letter notes that the Missouri River country is "inhabited by numerous tribes, who furnish great supplies of furs and peltry to the trade of another nation" and that "[a]n intelligent officer ... might explore the whole line, even to the Western Ocean, have conferences with the natives on the subject of commercial intercourse, get admission among them for our traders, as others are admitted." The instructions to Lewis specify: "Should you reach the Pacific ocean, inform yourself of the circumstances which may decide whether the furs of those parts may not be collected as advantageously at the head of the Missouri ... as at Nootka sound or any other point of that coast; & that trade be consequently conducted through the Missouri & U.S. more beneficially than by the circumnavigation now practised."

British and Russian ships had dominated the Pacific fur trade in all but one of the 15 years between 1785 and 1799. From 1800 to 1802, there had been a boom in
had interviewed various Indians and traders for the information included in Clark's statistical table, "Estimates of the Eastern Indians." In columns "m" and "n" of the table, most of the Indian tribes were noted as a source or potential source of river otter skins, indicating their profusion and their importance to the fur trade. They were not, however, the most important species.

Sea and river otters (of the Lutrinae sub-family), along with weasels, martens, ermines, ferrets and wolverines (all members of the Mustelinae sub-family), as well as badgers (Taxidinae, Melinae and Mellivorinae) belong to the extended family of Mustelidae. Except for wolverines and badgers, they all have long, slender, flexible bodies. Otters are the most aquatic members of this family of carnivores. River otters are found in fresh water ecosystems around the world, except in Australia, Madagascar, other oceanic islands, and in very arid or arctic areas. Sea otters are found only on the coasts of the North Pacific Ocean, from northern Japan to northern Mexico. They both eat a wide variety of aquatic organisms, but sea otters favor shellfish and other invertebrates over fish, and their teeth are more suited for crushing than shearing.

Sea otters are smaller than most marine mammals, but larger than the Mustelinae. At Ft. Clatsop on February 23, 1806, Lewis and Clark noted that sea otters were as large as a common mastiff dog. Males can weigh up to 75 pounds and reach five feet in length, including the tail, while females are slightly smaller. They have webbed hind feet, broader than river otters, and though they cannot swim as fast as other marine mammals, they are much more mobile on land.

One behavioral characteristic distinguishes sea otters: they prefer to swim on their backs unless disturbed. In this position, they use rocks to crack the shells of their prey, and mothers hold young pups on their stomachs to keep them out of the water until their fur thickens.

Unlike most marine mammals, sea otters do not have a thick layer of blubber for insulation. Instead, they have the densest fur in the world, with up to a million hairs per square inch, compared with 300,000 for fur seals and 100,000 for an entire human head. Their long guard
hairs are waterproof and give the pelt a silver sheen, while their thick under-fur traps air and is extremely soft. In their February 23, 1806, entries, Lewis and Clark called sea otter fur the richest, most delicious and delightful in the world; “deep thick silky in the extreme.”

This luxurious fur made sea otters one of the main targets of the maritime fur trade. While sea otter pelts were traded in the smallest numbers, they had “by far the most valuable” fur. Seal pelts sold in Canton, China, in 1801 were worth 80 cents and beaver pelts six dollars in Spanish currency. Sea otter pelts were worth nearly $22 each.

CONTROVERSY OVER THE SIGHTINGS

The incentive of valuable pelts must have focused the attention of the Corps of Discovery on sea otters as soon as they thought they were close to the Pacific Ocean. They continued to report sea otters the rest of the way down the river following Whitehouse and Ordway’s initial sighting. The journal entries may have been copied from each other or may reflect discussions among members of the corps. Even so, they appear to indicate five different sea otter sightings at distinct locations along the lower Columbia River.

Most current accounts, however, argue that these animals could not have been sea otters. Lewis and Clark journal editor Gary Moulton’s footnotes to the journal entries support this idea. For example, about the animal Clark shot at the Great Falls of the Columbia, Moulton explains, “The sea otter, Enhydra lutris, never leaves salt water. They had evidently observed the harbor seal, Phoca vitulina richardii, a species new to science. The captains later corrected this error; see ... February 23, 1806.” In his notation, Moulton cited from Paul Russell Cutright’s book, Lewis and Clark Pioneering Naturalists, in which he stated:

For reasons not at all clear, students of Lewis and Clark have accepted Clark’s original identification as true, completely disregarding, or unaware of, the fact that the sea otter (Enhydra lutris) never leaves salt water. Among these students have been men with sound zoological backgrounds, like Elliot Coues, for example, who ordinarily had no hesitation in pointing out errors in the Lewis and Clark journals when he found any. That this mistake evaded detection for so long is all the more surprising since Clark himself later corrected it. Writing at Fort Clatsop on February 23, he said: ‘The Sea Otter is found only on the sea coast and in salt water. Those animals which I took to be the sea otter from the Great Falls of the Columbia to the mouth, proves to be the Phosis or Seal which at a little distance has every appearance of the sea otters.’

There are several problems with this interpretation. Most importantly, while sea otters are marine mammals, it is not true that they never leave salt water. Many early reports are quite clear on this fact. In the late 1800s, people with sound zoology backgrounds certainly were aware that sea otter behavior had changed significantly as a result of intense hunting pressure. Furthermore, it is unlikely that harbor seals would have been found as far upstream above so many rapids as Great Falls. Their ancestors evolved into marine mammals much earlier.
than sea otters, and they adapted to be far less mobile on land than otters or other pinnipeds such as sea lions.

**SEA OTTER BEHAVIORAL CHANGES**

There is ample evidence that sea otters used to spend much more time on land and in fresh water. The most detailed early descriptions are those of Georg Wilhelm Steller, a German naturalist on Danish Captain Vitus Bering's voyage of sea exploration to Alaska for the Russians in 1741-1742.

Steller's first descriptions of the Alaskan sea otters at Cape St. Elias, today's Kayak Island, highlighted major differences in their habits compared with those of Kamchatka Peninsula in the Russian Far East. He observed "lots of sea otter, whose excrement often [was] found everywhere on the shore," and he commented that "the inhabitants, with enough other food sufficiently supplied, must not be much concerned about them, because otherwise they would come ashore as infrequently as they do now in Kamchatka ever since the time when so many people developed such a liking for their pelts."20

Shipwrecked on what became known as Bering Island, the first thing Steller noted was the sea otters. He wrote: "[w]e were not yet on the beach when something struck us as strange, namely, some sea otters came from shore towards us into the sea."21 Some of the crew promptly killed two sea otters and two seals for their pelts, ignoring their companions' desperate need for food. Soon, however, sea otters became the dietary staple because it was so easy to hunt them on the island. Pelts were left to spoil or be eaten by foxes.22

As the crew recovered from scurry during the long winter, they hunted for sea otter pelts with which to gamble. The animals became much more wary, but remained on the island. Steller noted the extra distances the crew went to hunt them. "In March and April ..., when the sea otters were altogether driven from the north side around our dwellings, we went overland to the south side and carried back the otters, twelve, twenty, thirty, to forty versts."23

Steller's comments make it clear that sea otters spent considerable time on land and in fresh water. He noted that in winter especially, they went:

- from the sea to land to sleep, rest, and engage in all sorts of play with each other. At low tide, they lie on the rocks and dried-out sand banks, at high tide ashore on grass or snow a quarter, half, or even a whole verst from the shore but mostly close to the shore. ([T]hey feel entirely secure, engage in their Venus game on land, and bear their young there—different from the way it is in Kamchatka and the Kurile Islands, where they go ashore either never or very rarely.24

In his final paragraphs, Steller noted that, with a "slight expense," sea otters could be tanned.25 He had not "the least doubt that they would propagate themselves in a pond or river, since they care little for sea water, and I have seen that they remain for several days amusing themselves in lakes and rivers."26

In spite of Steller's obvious admiration, between 700 and 900 sea otters had been killed by the time the sailors managed to build themselves a boat to sail back to Kamchatka.27 This profusion of pelts helped propel the Russian advance into North America. Just 13 years later, sea otters on Bering Island nearly had been exterminated, and the fur hunters had moved eastward, along the chain of the Aleutian Islands.

By the early 1800s, the Russians had coerced many indigenous Aleutian Islanders into hunting sea otters all the way from the Aleutians to southeast Alaska. The common hunting method was to use traditional, light, skin-covered baidarkas, forerunners of modern fiberglass kayaks, to surround sea otters on the ocean and harpoon them.28 By the late 1800s, Americans had joined the hunt. In 1897, Captain C.L. Hooper of the Bering Sea Patrol wrote a detailed report on the state of sea otters in the Aleutians and proposed regulations to control their decline. He specifically mentioned not only reductions in numbers and range, but also changes in behaviors:

- Being constantly harassed, clubbed, and shot on shore, caught in nets by white men, their hauling grounds made uninhabitable by the camp fires of the hunters and defiled by fisheries and the decaying bodies of their slaughtered companions, the sea otter of the Aleutian Islands has not only decreased in numbers, but has actually changed its habits. It no longer comes out upon the land to feed, rest, or give birth to its young.29

From the middle of the sea otter range in Nootka Sound, British Columbia, a primary port for the maritime fur trade, there is other evidence about early sea otter behavior. One of the most frequently reproduced illustrations of the sea otter was drawn in 1778 by John Webber, official artist on Captain James Cook's third voyage. Cook's notes about sea otters in this region state that they lived "mostly in the water" and were more varied in "size, colour, and fineness of the fur" than
those described in the Russian accounts. The resulting confusion was clarified only when they finally saw a sea otter, rather than just a pelt, "a whole one, that had been just killed, which was purchased from some strangers who came to barter, and of this Mr. Webber made a drawing."\(^{30}\)

Another report from Nootka Sound in the early 1800s indicates that sea otter behavior was only then being impacted in the central part of their range. John R. Jewitt, who spent from 1803 to 1805 as a captive of Chief Maquinna of the Yuquot, wrote that sea otters were "in general very tame, and ... permit a canoe or boat to approach very near before they dive. I was told, however, that they are become much more shy since they have been accustomed to shoot them With [sic] muskets, than when they used only arrows."\(^{31}\)

From the southern end of the sea otter range in lower and upper California, there are early descriptions of sea otter behavior that are different from later accounts. As the Spanish moved north up the West Coast from Mexico, southern sea otter pelts became a part of the established Manila galleon trade.\(^{32}\) At first, these sea otters were easy to kill on land. Adele Odgen, key historian of this southern sea otter trade, wrote: "records indicate that in all localities the animals came ashore much more frequently in former days before extensive hunting was pursued."\(^{33}\)

In 1733, Father Sigismundo Taraval reported that sea otters on Cerros Island, off the southwest coast of Baja California, were "found in such numbers of them together that the seamen killed about twenty of them by following them only with sticks."\(^{34}\) In 1786, Jean-Francois de Galup de la Péruse commented that the Indians at Monterey caught sea otter "on shore with snares, or kill them with large sticks, when they find them at a distance from the sea. For this purpose they conceal themselves behind the rocks, this animal being frightened at the least noise, and plunging immediately into the water."\(^{35}\)

Reports about locations where sea otter were hunted make it very clear that they lived not only off shore, but also in San Francisco Bay and its estuaries, an environment comparable to the lower Columbia River. In 1806, on his voyage to California, doctor and naturalist George Heinrich von Langsdorff wrote about "seals of various sorts, and above all things, the valuable sea otter swimming in numbers about the bay, nearly unheeded."\(^{36}\) He also noted that both "sea-dogs [harbor seals] and sea-otters were taken in nets, though in very small numbers."\(^{37}\)

Von Langsdorff also went on an excursion to the Mission of St. Joseph, now San Jose, at the southern end of San Francisco Bay. On their return, they saw in a narrow, muddy channel "a good many sea-otters, one of which we shot, but it took refuge in one of the smaller channels, and we were not disposed to lose our time in pursuing it." For two days they were lost in these backwaters, an area similar to the numerous marshy islands of the Columbia estuary, where "[Sea] otter Isd" was labeled on Atlas map 81 of the Lewis and Clark Expedition. Eventually, they found another channel leading to the bay. It was "full of sea-otters and sea-dogs; many lay on the muddy shores, and others were swimming with their heads just above the water ... Three sea otters ... who lay sleeping almost close to our boat, presented a temptation not to be resisted, and these we did kill and carry away with us."\(^{38}\)

Even after the Russians had coerced Aleutian Islanders into hunting furs in California, sea otters continued to frequent the islands of San Francisco Bay. As late as 1827, Auguste Bernard Duhaut-Cilly noted that "Kodiaks, with their light canoes, enter at night into San Francisco Bay, skirting the shore opposite the fort, ... they settle for a time upon some of the small inner islands, and in perfect safety there, fish for the sea otter."\(^{39}\)

One can imagine similar descriptions of hunting being written about the estuarine environment of the lower Columbia River. One brief description from this region does support these accounts. From 1811 to 1814, Gabriel Franchere worked for the Pacific Fur Company at Fort Astoria, close to where Lewis and Clark had camped the previous decade. His narrative includes good ethnographic details about Chinook tribal culture. After describing cedar canoes and their specially designed paddles, Franchere noted that "[t]he object of the crescent shape of the blade is to be able to draw it, edge-wise, through the water without making any noise, when they hunt the sea-otter, an animal which can only be caught when it is lying asleep on the rocks, and which has the sense of hearing very acute."\(^{40}\)

These accounts are not intended to provide an exhaustive analysis of sea otter behavior at the start of the maritime fur-trade era. Nevertheless, it is clear that the image of sea otters surrounded at sea by Aleutians in baidarkas armed with harpoons, the form of hunting enforced by the Russians and well described and illustrated by Henry W. Elliott in Our Arctic Province, may not represent previous behavior.\(^{41}\) Instead, this account is evidence of how two factors, sea otter habits
and Aleutian Island technology, mutually intensified each other. As fur hunting increased and expanded, areas where normal sea otter behavior could be observed were reduced, and Aleutian technology was refined and widely distributed to ensure continued hunting success.

Elliott noted that surround hunting was used only in calm, clear weather. Another method was to club sea otters to death when they came on land to shelter from severe storms, and a third was to trap them with nets when they ventured into sea caves. By the late 1800s, even the orthodox hunting at sea with harpoons had given way to shooting with rifles. Clark's attempts to shoot sea otters on the Columbia were a precursor to this method, which was used later in nearby parts of the dwindling sea otter range. On the south coast of present-day Oregon, traveler William Wells participated in such a sea otter hunt from the cliffs near Coos Bay, and reported that the surf-shooting method was used regularly. On the coast of Washington, to the north of the Columbia River, the Quinault Indians erected tall, three-legged beach derricks to enhance their shots.

Today, especially in more developed regions, it is cause for scientific comment and query if sea otters are observed foraging and eating or giving birth on land. Even so, since sea otters were protected by the International Fur Seal Treaty in 1911, it has become clear that they are venturing once more onto shore and into estuaries.

In an early scientific report on sea otters of the Commander Islands, including Bering Island, Ilia Ilich Barabash-Nikiforov noted that they are "diurnal animals, sleeping at night on shore or on isolated rocks." He provided detailed descriptions of their night beds and the trails to and from them. He wrote that "[t]he sea otter whelps on shore or on rocks that rise above the water" and actually witnessed such an event. As sea otters re-established themselves on the Aleutian Islands, they also ventured back onto land there. By the late 1930s, scientists had been able to collect enough scat, presumably from land, to conduct analyses that determined sea otter feeding habits and food preferences. Recently, sea otter have been recorded coming ashore in such widely diverse places as a Bering Island beach, a tidal flat at Orca Inlet in Prince William Sound and the banks of Elkhorn Slough in California.

The importance of estuaries to sea otters has been shown in recent studies in the Aleutian Islands, where killer-whale predation has reduced their number severely. In exposed areas, not even hauling out onto intertidal rocks provides sufficient protection. Killer whales will rush at rocks where sea otters are resting to create a wave that flushes them into the water where they can be caught and eaten. On Adak Island, the sea otter population that stays inside Clam Lagoon is stable, while the population in adjacent Kuluk Bay has been decimated. At the other end of their range, one of the largest groups of sea otters on the California coast can be seen at Seal Bend, about a mile up Elkhorn Slough from Monterey Bay.

Comparisons of Harbor Seals and Sea Lions

Fossil remains of the earliest-known forms of the sea otter, *Enhydritherium terraenovae*, dating from five to seven million years ago have been found "only in marine rocks or in faunas with at least an estuarine component." One example of this giant ancestor was found at Moss Acres Ractrack in northern Florida. These remains include "a skull, mandible, part of the axial skeleton, and most of both the fore- and hindlimbs," enough to show that it was more of a habitat and dietary generalist than a marine specialist. It was "reasonably competent for terrestrial locomotion" but, unlike modern sea otters, still used its forelegs for swimming.

In contrast, the *Phocida* (true seals) diverged from the *Otaridae* (fur seals and sea lions) and the *Odobenidae* (walruses) 20 million to 25 million years ago in the Miocene Epoch. Despite an earlier evolution into marine mammals, these pinnipeds seem more dependent in some ways on land than sea otters. All of them mate on land, give birth and nurse there for various periods. One study on the lower Columbia River includes maps of haulouts for harbor seals, *Phoca vitulina richardii*, and the less common sea lions, *Zalophus californianus californianus*, as far upstream as the confluence of the Cowlitz River in nearby Carroll Slough, fewer than 70 miles from the ocean.

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As their name implies, harbor seals are known for swimming into harbors and up estuaries, but sea lions also will do so. Observations indicate they will go even farther upstream. Based on concern about salmon predation, it was noted that “[h]arbor seals regularly occur more than 50 miles upriver [and] California sea lions occur as far as the Bonneville Dam (about 145 miles upriver)” in the Columbia River. The rarity of such observations for modern-day sea otters may be an artifact of the hunting pressure from the 1700s to the early 1900s.

Like their pinniped relatives, harbor seals have flippers rather than paws. However, their front flippers are shorter than those of the Otariidae, and their hind flippers extend straight back, so they cannot be rotated under the body to assist with movement on land. As a result, seals are less mobile on land than sea lions, and certainly much less so than sea otters. Perhaps of special interest to those who wonder what the Corps of Discovery really saw on its journey down the Columbia River is recent news about sea lion C404, Cecil, and his companion who frequent the water below Bonneville Dam in pursuit of spring chinook salmon. In 2005, they began to swim and climb up the fish ladder and had to be chased away with screamer shells.59

Lewis and Clark named several geological formations after seals, including conspicuous Phoca Rock. In their February 23, 1806, journal entries, they noted the variety of seals found on today’s Oregon coast and in the lower Columbia, and commented on their difficulty in distinguishing among them, “not having seen them myself sufficiently near for minute inspection nor obtained the different kinds to make a comparison.”60 They did not seem to make any distinction between harbor seals and sea lions, and they also did not get close enough to distinguish either species from sea otters. Both captains wrote that “seal are found here in great numbers, and as far up the Columbia river as the great falls above which there are none.”61 Their notes about seal numbers probably were correct, but those about location seem wrong. Less inclination to venture as far upstream as sea lions, and less terrestrial mobility than sea lions or sea otters, make it very unlikely that harbor seals would have been sighted in the many “bad rapids” of the Columbia Gorge as far upstream as Celilo Falls. On the other hand, if sea lions can make it up the fish ladder, they probably could have made it up the rapids. Even more terrestrially mobile sea otters could have done so.

Harbor seals and sea lions prey on fish, while sea otters prey mainly on invertebrates, especially shellfish. So while pinnipeds may be swimming upstream in search of salmon, it is less likely that sea otters would do so. In rocky areas, sea otters focus on species that provide the most calories, such as abalone, rock crabs and sea urchins. In estuaries, they focus on shallower burrowing shellfish to reduce the amount of excavation required. In the early 1800s, shellfish were abundant in the Columbia River, including large beds of freshwater mussels. These were noted by Clark at two places along the river, on October 19, 1805, at Muscle Shell rapids near the mouth of the Umatilla River and on November 1, 1805, at the rapids below the Great Shute, later called Cascade Rapids, just above tide water. Clark’s course notes state, “This rapid has large banks of Muscle Shells,” and one can imagine sea otters venturing up from the tide water in search of such prey. This is the second place where Clark reported “Great numbers of Sea Otters, they are So cautious that I with difficulty got a Shot at one to day, which I must have killed, but could not get him as he Sunk.”

EXPEDITION SIGHTINGS REMAIN UNCLEAR

On February 23, 1806, in winter camp at Ft. Clatsop near what is now Astoria, Oregon, Lewis and Clark wrote very similar descriptions of sea otters. They noted their sizes, the shapes of their ears and tails, and the number of their toes.

Lewis wrote “[t]he Sea Otter is found only on the sea coast and in the salt water.” Clark tried to clarify that “[t]hose animals which I took to be the Sea Otter from the Great Falls of the Columbia to the mouth, proves to be the Phosia or Seal which at a little distance has every appearance of the Sea Otters.” Lewis added, “but the indians here have undeceived us” on this issue. They also seem to have been led by the example of Alexander Mackenzie, who reached Bella Bella on the
British Columbia coast in 1792. He recorded many sea otters, then later wrote, "We saw great numbers of animals which we had taken for sea otters, but I was now disposed to think that a great part of them, at least, must have been seals."70

As we have seen, the captains’ explanations for their change in opinion, that sea otter are found only on the sea coast and in salt water, simply are not true. Sea otters did frequent estuaries like that of the Columbia River as well as other coasts. The reason sea otters now are found in isolated coastal locations is because hunting pressure there was less than in the more accessible estuaries and because these areas tend to remain less developed.

It is doubtful that the new animals first reported at the Great Falls were harbor seals. They do not venture so far upstream and they lack the agility to climb the rapids. In contrast, sea lions do go farther upstream in pursuit of salmon and are agile enough to climb rapids. Sea otters also may have ventured that far upstream in search of mussels.

We will never know exactly what species the Corps of Discovery saw at different locations on their trip down the Columbia River. In some places, the later assertion that they saw harbor seals does not hold up. In many places, they could have seen sea otters, sea lions or harbor seals, without being able to distinguish among them. One option is to say the corps saw sea lions farther upstream and harbor seals down lower, but this compromise ignores the very real possibility that they may indeed have seen sea otters in the lower Columbia River, especially in the tidal reaches below Cascade Rapids. On their way to the ocean, the captains named one of the islands in the estuary after sea otters and, on their return journey, one of the men purchased a sea otter skin there. It seems likely that these were estuarine sea otters, like those observed and hunted by von Langsdorff in southern San Francisco Bay.

Whatever Lewis and Clark saw while on the West Coast, the importance of sea otter pelts to their mission cannot be overstated. During their stay at the mouth of the Columbia River, the captains went to considerable effort to buy as many sea otter skins and robes as they could, and they recorded attempts of others to trade there. They took their sea otter pelts with them, back across the Rocky Mountains, despite many difficulties. On July 5, 1806, when fording the “West fork of Clarks River,” now the West Fork Bitterroot River in Montana’s Ravalli County, water flowed over the backs of two small pack horses. Clark noted that “unfortunately my trunk & portmanteau Containing Sea otter Skins flags Some curiosities & necessary articles in them got wet, also an esportment of Medicine, and my roots.”71

On September 23, 1806, the day of their arrival in St. Louis, Lewis detained the post several hours to write a letter to Jefferson. His first paragraph described the best route to follow across the continent and what means of transport should be used along each part. The second paragraph was one extended sentence on the route’s potentials and problems. The route offered “immense advantages to the fur trade,” but not for articles that were “bulky brittle nor of a very perishable nature.” His third and fourth paragraphs dealt with the acquisition and transport of furs “by the rout proposed to the East Indies.” In the fifth paragraph the “valuable Sea Otter of the coast” is mentioned in Lewis’s description of the fur potential of the Columbia River. A few paragraphs later, Lewis wrote:

I have brought with me several skins of the Sea Otter, two skins of the native sheep of America, five skins and skeletons complete of the Bighorn or mountain ram, and a skin of the Mule deer beside the skins of several other quadrupeds and birds natives of the countries through which we have passed. I have also preserved a pretty extensive collection of plants, and collected nine other vocabularies.72

Access to sea otter furs clearly was an economic priority, but some pelts that the corps acquired on the Columbia River also became personal treasures. After his death on the Natchez Trace on October 11, 1809, the “Memorandum of Lewis’s Personal Effects” listed “One Handsome dressed Sea Otter skin,” annotated with a W.C. for William Clark.73

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Notes

1 The Great Falls of the Columbia River today are known as Celilo Falls.
2 Gary E. Moulton, ed., The Journals of the Lewis & Clark Expedition, 13 volumes (Lincoln: University of Nebraska Press, 1983-2001), Vol. 9, p. 243. Entry for October 22, 1805. All quotations or references to journal entries in this article are from Moulton.
3 Ibid., Vol. 5, p. 327. Entry for October 23, 1805.
4 The Muscle Shell Rapids of the Columbia River today are known as Umatilla Rapids.
5 Moulton, Vol. 5, p. 304.
6 Ibid., p. 127. Entry for August 20, 1805.
10 Jan Decher, Lectures on Mammal Evolution, especially lecture 27, “Order Carnivora III—Families Mustelidae and Felidae” (2000). The lectures are available on the University of Vermont’s Web site, www.uvm.edu/~jdecher. Skunks used to be included in this family, but are now classified separately as Mephitinae.
13 Riedman and Estes, p. 15.
14 Ibid.
21 Ibid., p. 127.
22 Ibid., p. 132.
23 Ibid., pp. 143-144. One verst equals .66 miles.
24 Ibid., p. 148.
25 Ibid. Steller may have been aware that otters were tamed and trained to herd or hunt fish in Asia, as described by Sewell Newhouse, The trapper’s guide: a manual of instructions for capturing all kinds of fur-bearing animals and caring their skins; with observations on the fur trade, hints on life in the woods, and narratives of trapping and hunting excursions (Wallingford, Conn.: Oneida Community, 1967), p. 36.
26 Steller, p. 148.
27 Ibid., pp. 145 and 217.
28 Despite this intense hunting, there is one possible indication that Alaskan sea otters still hailed out on land to give birth at this time. Georg Heinrich von Langsdorff, the doctor and naturalist who traveled to California with Count Nikolai Petrovich Rezanov, the Russian ambassador to Japan, between 1805 and 1807, often commented on the size of the hunting parties and the reduction in number of sea otter pelts in his Voyages and Travels in Various Parts of the World, during the years 1803, 1804, 1805, 1806, and 1807 (London: H. Colburn, 1813-1814). One of his unpublished drawings from this voyage is titled Rocky beach with family of sea-otters. Unfortunately, the limbs of these creatures resemble the flippers of sea lions rather than the webbed paws of sea otters. The title was supplied, rather than included, on the picture, so perhaps it should be viewed skeptically, as an example of how easy it is for those not familiar with marine mammals to confuse these species. Rezanov had strong personal and official interests in the financial well-being of the Russian American Company. The purpose of the voyage to California was to obtain supplies for the Russian fur hunters in Sitka, Alaska.
30 James Cook, A Voyage to the Pacific Ocean. Undertaken, by the Command of His Majesty, for Making Discoveries in the Northern Hemisphere. To Determine the Position and Extent of the West Side of North America; Its Distance from Asia; and the Practicability of a Northern Passage to Europe. Performed under the Direction of Captains Cook, Clerke, and Gore, in His Majesty’s Ships the Resolution and Discovery, in the Years 1776, 1777, 1778, 1779, and 1780. In Three Volumes. Vol. I and II Written by Captain James Cook, F.R.S. Vol. III by Captain James King, L.L.D. and F.R.S. Illustrated with Maps and Charts, from the Original Drawings Made by Lieut. Henry Roberts, under the Direction of Captain Cook; and with a Great Variety of Portraits of Persons, Views of Places, and Historical Representations of Remarkable Incidents, Drawn by Mr. Webber during the Voyage, and Engraved by the Most Eminent Artists (London: Published by the Order of the Lords Commissioners of the Admiralty. Printed by W. and A. Strahan, for G. Nicol, Bookseller to his Majesty, in the Strand, and T. Cadell in the Strand, 1784) Vol. 2, pp. 221-549. Quote from p. 295.
31 John R. Jewitt, Narrative of the adventures and sufferings of John R. Jewitt; only survivor of the crew of the ship Boston, during a captivity of nearly three years among the savages of Nootka Sound: with an account of the manners, mode of living, and religious opinions of the natives. Embellished with engravings (Middletown: Loomis and Richards, 1815; Ithaca, N.Y.: Mack, Andrus & Co., 1849), p. 80.
The Manila galleon trade was one of the most persistent, perilous and profitable commercial enterprises in European colonial history. Between 1565 and 1815 it carried the treasures of Asia to the West via Mexico in exchange for New World silver and the manufactured goods of Europe. One galleon a year would embark on the trip. 


Ibid., p. 2.


Ibid., p. 213. In 1801–1804, Alexander Baranov, the first chief manager of the Russian American Company, had contracted with Joseph O'Cain, a captain from New England, to ship Aleutian Islanders south to California to hunt sea otters. They killed 1,100 and split the furs between them. This trip marked the start of intense Russian sea otter hunting in California. Von Langsdorff probably was aware of this initial success and compared it to the smaller scale hunts of the Spanish.

Ibid., p. 199.


Gabriel Franchere, *Narrative of a voyage to the northwest coast of America in the years 1811, 1812, 1813, and 1814, or The first American settlement on the Pacific*, translated and edited by J.V. Huntington Redfield (New York, 1854).


Ibid., pp. 142-144.


Ibid., p. 259.


The Associated Press, "Daring sea lion makes a run up a fish ladder" (April 4, 2005) and the *Columbia Basin Fish and Wildlife Bulletin*, "Screamer Shells Shoal Sea Lion Away From Fish Ladders" (April 15, 2005), p. 1.


Ibid.


Ibid., p. 374. Clark's entry for November 1, 1805.

Clark's entry for October 19, 1805.

Ibid.

Ibid., p. 369.

Ibid., Vol. 6, p. 339. Lewis's entry for February 23, 1806.


Ibid. Lewis's entry for February 23, 1806.


Westward expansion was a powerful force among Americans even before the United States won its independence from Great Britain. By the time of the Revolutionary War, the western movement had a firm foothold in American society. The Louisiana Territory, purchased in 1803 during the presidency of Thomas Jefferson, was fully as large as the United States itself. Even before completing negotiations, Jefferson intended to send an exploring party across the Mississippi River to the Rocky Mountains and beyond to the Pacific Ocean. His goal was to find an all-water route to the Pacific Ocean and to expand commerce and trade with indigenous people of the West, thus making direct trade with the Orient easier and more profitable.

Rivers served as highways for the historic journey of Captains Meriwether Lewis and William Clark and the other members of the Corps of Volunteers for North West Discovery, as they officially were known. They traveled down the Ohio, up the Mississippi and the Missouri (through the mountains), then down the Clearwater, Snake and Columbia to the Pacific Ocean. The rivers were, and continue to be, mainstays of American life.

During the recent Lewis and Clark Bicentennial, many comments were made about how the rivers of today are not the same rivers traversed by Lewis and Clark. One cannot fully understand why and how these rivers are operated by the U.S. Army Corps of Engineers today, unless one understands the history of what prompted changes to the rivers.

**Navigation**

The Corps of Engineers traces its origins to the Battle of Bunker Hill during the Revolutionary War. At the time, many officers including George Washington saw the need for technical education so the Army would have skilled, engineer officers in the future. In 1802, Thomas Jefferson signed the Peace Act that established the Corps of Engineers and the U.S. Military Academy at West Point, an engineering and scientific school. Fortification was only one part of military engineering. An engineer's utility extended to include surveying, improving harbors, and constructing public buildings, roads, bridges and canals.

One of the early obstacles encountered by the Lewis and Clark Expedition was the Falls of the Ohio near present-day Louisville, Kentucky, and Clarksville, Indiana. A two-mile-long series of limestone ledges...
The Cascade Rapids of the Columbia River flowed freely prior to construction of the Bonneville Dam, circa 1935. The dam, which spans the river between Oregon and Washington, is 40 miles east of Portland, Oregon, in the Columbia River Gorge.

created a 26-foot drop on the Ohio River. These rapids blocked passage by all but the smallest boats. Lewis and a small crew brought the keelboat from the Pittsburgh, Pennsylvania, area during a dry year. He paid farmers to use teams of draught animals to drag his keelboat over exposed ledges and sandbars.

Later, a major lesson learned during the War of 1812 was that the nation needed an improved defense and transportation system. With that in mind, a primary objective was to improve rivers, harbors and roads to permit rapid movement of troops against an invading enemy as well as better and faster access to supplies.

In 1819, John C. Calhoun, then Secretary of War, recommended that the Corps of Engineers be directed to improve navigation of the nation’s waterways. Calhoun reasoned that such civil works projects would aid not only in the movement of both the Army and its supplies, but also would contribute to national economic development. Congress accepted Calhoun’s recommendations and in 1824, authorized the president to use the Corps of Engineers to survey road and canal routes of national importance and improve navigation on the Ohio and Mississippi rivers. Shortly thereafter, the Corps of Engineers began removing snags and floating trees from these rivers as well as improving the Ohio River by deepening channels across gravel and sand bars.

Navigating any of the western rivers (those west of the Appalachian Mountains) could be challenging if not downright dangerous. River flows were susceptible to huge variations based on precipitation in the river basin. As the century progressed, more vessels with larger cargoes attempted to proceed downstream and upstream on the Ohio and other rivers. Slow sporadic movement on the unpredictable rivers and through torturous rapids no longer was practical.

In the 1800s, fur traders on the Mississippi and Missouri rivers created lucrative steamboat traffic. Supplies and equipment of traders, and goods to be used in the Indian trade formed the principal upstream cargo, while large quantities of furs and pelts were shipped downstream. As the century progressed, steamboats contributed greatly to the economy by transporting passengers and agricultural and industrial supplies such as building materials, cotton and sugar. Wood to fuel the steamboats was obtained by cutting down countless trees along the major river systems. The stumps and root systems that were left, later fell into the rivers and became additional hazards to navigation.
By 1830, the Corps of Engineers used snagboats to remove obstructions in river channels. Snagboats developed by Captain Henry M. Shreve successfully removed extensive obstructions along the lower Mississippi and Red rivers and later the Missouri, Ohio and upper Mississippi rivers. These snagboats could lift a submerged tree weighing 75 tons lodged up to 20 feet deep.

Steamboat traffic increased during the middle of the nineteenth century with the discovery of gold in California and the subsequent migration of settlers to the West. However, the rivers were unreliable. During common periods of low water, the rivers had shallow and swift currents, rock ledges, uncharted shoals and sandbars, and, in the case of the Mississippi River, small waterfalls. These hazards made the rivers too treacherous to safely navigate.

Between 1877 and 1929, a series of 51 dams were constructed along the entire length of the Ohio River to improve navigation. These dams impounded pools of water with low-flow velocities while the locks also made it possible for vessels to pass through the dam either upstream or downstream from one slack water pool to the next, and to move major bulk commodities such as grain, coal and petroleum. Today, the Corps of Engineers operates and maintains 20 locks on the Ohio River, as well as eight locks on the Allegheny River and nine more on the Monongahela River, the two tributaries whose confluence forms the Ohio River at Pittsburgh.

FLOOD DAMAGE REDUCTION

Congress did not authorize a comprehensive hydrographic study of a major river basin until 1850, when floods along the Mississippi River drew congressional attention to the need for a practical plan for flood control and navigation improvements. By 1879, growing pressure for navigation improvements and flood control prompted Congress to establish the Mississippi River Commission responsible for executing a comprehensive plan for flood control and navigation works. Congress authorized the commission to build and repair levees only if the work was part of a general navigation improvement plan. However, monumental floods along the Mississippi River in 1912 and 1913 drew national attention to the need for federal flood relief legislation.

In 1917, Congress passed the first Flood Control Act. This legislation appropriated money to the Corps of Engineers for flood control on the lower Mississippi and work on the Sacramento River. After another year of devastating floods in 1927, Congress passed the Flood Control Act of 1928. With that act, Congress authorized the Corps of Engineers to construct a series of 29 locks and dams on the upper Mississippi River. Most of these lock and dams were built in the 1930s and were located between the confluence of the Mississippi and Missouri rivers north of St. Louis, Missouri, to Minneapolis, Minnesota.

Following catastrophic floods on the Ohio River in 1936, Congress enacted the Flood Control Act of 1936. Congress recognized that flood control was the responsibility of the federal government in cooperation with states, political subdivisions and localities. Congress gave responsibility for federal flood control projects across the nation to the Corps of Engineers.

In the years following the passage of this law, Congress authorized the Corps of Engineers to construct nearly 400 reservoirs nationwide, whose primary benefit was reduction of flood damage. However, flood control alone could never have justified the construction of these reservoirs. Thus, multi-purpose projects came into existence.

HYDROPOWER

By 1900, Congress already had exerted partial federal control over dam building. The Corps of Engineers played only a small role in hydropower development, allowing the bulk of the plants to be constructed by private entities. By the end of the 1920s, at the direction of Congress, the Corps of Engineers was heavily involved
in surveying rivers for navigation, flood control and irrigation, as well as power generation. Power generation at multi-purpose projects took hold during the New Deal and proliferated after World War II.

Stretching from the Continental Divide southeast to the Mississippi River at St. Louis and from the Canadian border south to the Osage River basin in Kansas and Missouri, the drainage basin of the Missouri River was one area where the potential for multi-purpose projects was strong. Recurring floods throughout the basin had caused extensive destruction. Periods of severe and widespread drought caused enormous suffering and economic loss. The Flood Control Act of 1944 called for a multi-purpose plan for Fort Peck Dam, constructed in northeastern Montana in 1933, and five additional main stem dams to be built by the Corps of Engineers on the Missouri River.

When the Lewis and Clark Expedition bumped down the rapids of the lower Columbia, they encountered a landscape that was much different from the dry uplands they had left behind. In fewer than 100 miles, they traveled from the arid, high desert of today's central Oregon and Washington to a land of abundant water and lush vegetation. They traveled on a mighty, untamed river, studded with sandy islands and flanked by thickly timbered marshy lowlands.

Beginning during the Depression, a series of multipurpose dams were built on the Columbia and Snake rivers. The largest hydropower dam built by the Corps in the United States are on these rivers in the Pacific Northwest. The biggest of these is the John Day Dam on the Columbia River. The lock has a lift of 110 feet and the generator has a capacity of nearly 2,200 megawatts. By 1976, the last of these lock and dams was completed and Lewiston, Idaho, became the nation's farthest inland seaport on the West Coast.

Congressional oversight

From the earliest beginnings of the Corps of Engineers, both Congress and the cabinet official overseeing the U.S. Army carefully monitored and guided the involvement of the Corps in civil works projects. In fact, in 1800, it was Secretary of War James McHenry who suggested that engineer officers possess talents that serve the country not only in war, but also in peacetime.

Since the Corps of Engineers was permanently established in 1802, few operational and organizational changes have been made without the explicit authorization of the U.S. Congress, the Department of War (now

Modern Corps manages rivers responsibly

Through its Civil Works program, today's U.S. Army Corps of Engineers carries out a wide array of projects that provide coastal protection, flood protection, hydropower, navigable waters and ports and water supply. They also provide quality public outdoor recreation experiences to serve the needs of present and future generations. Environmental stewardship and natural resource management programs are carried out at all Corps of Engineers projects, managing thousands of square miles as forest and wildlife habitat, monitoring water quality at its dams, operating fish hatcheries in cooperation with state agencies and in some cases, restoring the environment at projects built in earlier days.

A diverse workforce of biologists, engineers, geologists, hydrologists, natural resource managers and other professionals meets the demands of changing times and regulations. As part of its Civil Works mission, the Corps of Engineers maintains direct control of 609 dams, maintains and/or operates 257 navigation locks, and operates 75 hydropower facilities generating 24 percent of the nation's hydropower and three percent of its total electricity. Of the more than 8,000 miles traveled by the Lewis and Clark Expedition, more than 95 percent was through lands or waters currently owned or managed by the Corps of Engineers.

The Corps' military and civilian engineers, scientists and other specialists work hand-in-hand as leaders in engineering and environmental remediation matters. The Corps of Engineers supports or manages many environmental programs, which run the gamut from clean-up on former military installations contaminated by hazardous waste or munitions, to establishing wetlands that help endangered species survive.

Two centuries ago, the expedition traveled the western rivers on their way to the Pacific Ocean and back. The waterways they traveled had supported commerce between tribes for centuries. The experiences of Lewis and Clark with drought, high water, hidden hazards and rapids mirrored the problems encountered by a rapidly growing nation. On behalf of the country, the Corps of Engineers attempted to tame these rivers for safe passage, power, dependable sources of water, flood damage reduction and later, recreation.

Today, there is a better understanding of the nature of rivers and the impacts that choices made in the past have had upon the watersheds. The Corps of Engineers employs professionals in a variety of fields to best manage the competing uses of the rivers with environmental principles. Lewis and Clark likely would not recognize many miles of the rivers today, but they would approve of the commerce and communities that have sprung up along the waterways. Lewis and Clark carried the spirit of their young nation and the Corps of Engineers with them. They truly exemplified the Corps of Engineers' motto, Essayons, "Let Us Try."

For more information about the U.S. Army Corps of Engineers, visit http://www.usace.army.mil/.

—Jeannine Nauss and Kenneth Wilk

August 2007 We Proceeded On — 31
Wing dikes at Indian Cave Bend on the Missouri River on November 9, 1934. These river structures were designed to constrict the river in shallow places, resulting in a narrowing and deepening of the channel.

Department of Defense) and the Department of Army. Although form and style have varied according to the political orientation of any given administration, the policies of the Secretary of the Army have ensured that the Corps of Engineers remains the flexible, competent engineering organization that has continuously served the country for two centuries in peace and war.

Jeannine Nauss is the national coordinator for the Lewis and Clark Bicentennial for the U.S. Army Corps of Engineers. Kenneth Wilk is her assistant. Together they coordinated all Corps of Engineers' Lewis and Clark activities across the nation during the planning and execution phases of the bicentennial. Prior to the bicentennial, Nauss worked for the Corps of Engineers in the planning and operations divisions in the Omaha District and Wilk was a park ranger in the Kansas City District.

Notes
1 Since 1775, more than 50 officers have held the highest position among the U.S. Army Corps of Engineers. Lieutenant General Robert L. Van Antwerp recently was appointed the 52nd chief of engineers and commander of the Corps of Engineers.
3 In the 1816 mobilization studies based on the lessons of the War of 1812, the Corps of Engineers reported that the national defense should rest upon four pillars: a strong Navy at sea; a highly mobile regular Army supported by reserves and National Guard; invincible defenses on the seacoasts; and improved rivers, harbors and transportation systems that would permit rapid armed concentration against an invading enemy and swifter, more economical logistical lines.
4 In his congressional testimony, Secretary of War Calhoun told Congress, “It is in a state of war when a nation is compelled to put all of its resources ... into requisition and that its government realizes in its security the beneficial effects from a people made prosperous by a wise direction of its resources in peacetime.” “Report of the Secretary of War to Roads and Canals In Pursuance of a Resolution of the House of Representatives—January 11, 1819.”
5 On April 30, 1824, Congress passed the General Survey Act authorizing the president to use U.S. Army engineers to survey road and canal routes of national importance, from a commercial or military point of view.
6 Shreveport, Louisiana, is named for Captain Henry M. Shreve, superintendent of the western rivers.
7 The Missouri River Basin covers 528,906 square miles draining land in Canada, Montana, North Dakota, South Dakota, Wyoming, Nebraska, Colorado, Minnesota, Iowa, Kansas and Missouri.
8 Three of five of the largest man-made lakes in the United States are on the Missouri River. They are Fort Peck Lake in Montana, Lake Sakakawea in North Dakota and Lake Oahe in North Dakota and South Dakota.
Essays offer perspectives on Lewis and Clark history and modern tribal issues

Lewis and Clark through Indian Eyes
Alvin M. Josephy, Jr., ed.
Alfred A. Knopf
196 pages / $24 cloth

As its title suggests, Lewis and Clark through Indian Eyes examines the Corps of Discovery from the perspective of Native Americans. The nine essays collected in this volume by the late historian Alvin M. Josephy embrace many subjects and a range of styles, from the personal to the historical. Some of the writers represented are familiar to LCTHF members from their association with the Lewis and Clark Bicentennial (several were members of the Council of Tribal Advisors).

Josephy asked each contributor to respond to a single, seemingly simple question: "What impact, good or bad, immediate or long-range, did the Indians experience from the Lewis and Clark Expedition?" Their answers, he added, "would remain in the unfiltered voices of the writers, no matter the theme, tone, or decibel level."

The results are eclectic, challenging, informative and at times exasperating. Predictably, some essayists accuse Lewis and Clark of cultural obtuseness and blame them implicitly for the myriad sorrows inflicted upon tribes in the years following the expedition. In what has become the new conventional wisdom, the captains emerge as less than heroic figures who willfully misrepresented the purpose of their mission.

Robert Conner, a member of the Federated Tribes of the Umatilla Indian Reservation, discussing the implications of the European concept known as the Doctrine of Discovery, notes: "Discovery was not just exploration. It was and is a legal construct complicating the standard historical narrative of the innocence of the expedition's journey." In this version of history, Lewis and Clark were imperial agents who "knowingly conducted reconnaissance with foresight and intent to dispossess Indians of their lands."

With this as a given, she then asks if Americans should "still applaud their journey." Her answer, surprisingly, is a qualified yes, for Conner believes we still can admire the captains for their courage, diligence, astuteness of observation and generally for "a job well done." Not to be overlooked, their detailed journals later served tribes pressing land claims against the very government that sent them.

Some of the essayists barely refer to the historical Lewis and Clark and use the subject to riff on topics of contemporary Indian affairs or to reflect on their own family histories and tribal cultures. Bill Yellowtail, a Crow and former Montana state senator, casts a whimsically ironic eye on his ancestors' pilfering of William Clark's entire horse herd. His piece, titled "Meriwether and Billy and the Indian Business," is mostly about the need for Indian entrepreneurship. Quoting parts of the paternalistic speech Clark wrote for the Crows (which went undelivered, since they never met face to face), Yellowtail muses on how his relatives might respond to it today: "Probably we would say: Meriwether and Billy. Welcome back after all these years. Bring horses."

The late Vine Deloria, Jr., a Lakota and historian best known for his polemical Custer Died for Your Sins: An Indian Manifesto (1969), indulges in fantastical speculations about the expedition's problems with grizzly bears, suggesting that a spiritual connection between Indians and grizzlies might have triggered the bears' aggression toward the white interlopers: "Some mysteries we can never unravel."

Most WPO readers will be drawn to the essays that mine oral histories for details about the expedition. Allen V. Pinkham, Sr., a Nez Perce, fleshes out an incident, described in the captains' journals for May 5, 1806, that nearly
Undid the good relations the corps enjoyed with his tribe. It involved an altercation between Lewis, who had just sat down to dine on a freshly killed dog, and a young Nez Perce who mocked his fondness for canine flesh by tossing a live puppy in his lap. (An enraged Lewis threw the puppy back and threatened to tomahawk the man for his "insolence.") In the Nez Perce account, the dog sacrificed to Lewis's appetite belonged to a woman forced to give it up—the dog was a family pet. Her young daughter was especially upset, prompting another family member to fling the pup at Lewis.

Pinkham expands on the well-known story about the old woman, befriended years earlier by Canadian fur traders, who convinced her kin not to kill the explorers when they strangled out of the Bitterroot Mountains in September 1805. He also writes about Halatookit (Daytime Smoker), a warrior allegedly born of a sexual encounter between William Clark and a Nez Perce woman. Halatookit fought with Chief Joseph against the U.S. Army in 1877 and died in exile in Oklahoma, "virtually unnoticed by white society."

Students of Lewis and Clark who accept the documented version of Sacagawea's life and death will be intrigued by an alternative history offered by Gerard A. Baker, a Hidatsa and the National Park Service superintendent for Mount Rushmore National Memorial. According to tribal tradition, Sakakawea (as the Hidatsas spell her name) was Hidatsa by birth. The Shoshones abducted her and her brother when she was a girl. Later, homesick for her people, she returned to her native village, guided by four wolves that killed game for her to eat along the way. As a young woman she married Toussaint Charbonneau, and they eventually had four children (three girls and a boy). After the expedition, she lived to be an old woman and died in 1869 at age 82, near Glasgow, Montana.

And the standard version of Sacagawea's origins—that she was Shoshone by birth and abducted by the Hidatsas? Baker quotes an elder's account recorded in 1925: "The interpreter got it wrong and it has been wrong ever since." Baker himself, no doubt sensitive to his former position as superintendent of the Lewis and Clark National Historic Trail, demurs on the factuality of the Hidatsa version: "There are many stories and many claims as to who Sakakawea was. I personally believe that we will never know." (For the record, the documentary evidence strongly suggests that Sakagawea died in 1812 in South Dakota, albeit some Shoshones believe she died in 1884 in Wyoming.)

Historians dispute the once-popular notion that Sacagawea "guided" Lewis and Clark, yet that canard crops up in Josephy's introduction and in several of the book's essays. (Which in no way diminishes her critical importance as an interpreter and in other ways.) We are not dealing with conventional history here, and Lewis and Clark through Indian Eyes is one of the more unconventional books inspired by the bicentennial. It is also one of the few appearing under the imprint of a major publisher, Knopf. This probably has something to do with its being a main selection of the Book-of-the-Month Club and the History Book Club—a distinction that will give it a wider readership than it perhaps deserves. (For one thing, the essays assume a knowledge about the expedition that few general readers possess.) Some of the essays challenge old conventions while reinforcing new ones that may or may not stand the test of time. Others remind us yet again that the Corps of Discovery's story is no longer the exclusive domain of dedicated buffs and a few historians bound by the traditional protocols of their trade.

—J.I. Merritt

The reviewer is a former editor of WPO.
New expedition connections to Cape Girardeau

The February 2005 issue of WPO included an article on the Corps of Discovery's connections to Cape Girardeau, Missouri, by Jane Randol Jackson, director of the Cape Girardeau County Archive Center. Jackson's continued research over the past two years has uncovered additional information regarding the sale of Reuben Field's land patent, the marriage of Alexander Willard and the Lorimier Family of the Cape Girardeau District.

Reuben Field
Reuben Field was in the Cape Girardeau district in December 1808, according to court records, which stated that he lent $1,000 to local citizens Andrew Ramsey, Sr., and Jr. Field's name later appeared in the will of Andrew Ramsey, Sr.: “a warrant that I purchased of Rheuben Field granted to Robert Frazier” is to be given to Ramsey's daughter if other land he bequeathed was not available.

Alexander Hamilton Willard, Sr.
Alexander Hamilton Willard, Sr., married Eleanor MacDonald on Feb 14, 1807, in St. Louis, Louisiana Territory. He was married when he voted in Cape Girardeau in 1809 and sold his property in 1810. His property had a picket fence and a hewed-log house with a lap-shingle roof near Major Louis Lorimier's spring, a wonderful home for the newlyweds.

The Lorimier family
On November 23, 1803, Lewis described the Lorimier family in his journal:

"the daughter is remarkably handsome & dresses in a plain yet fashionable stile or such as is now Common in the Atlantic States among the respectable people of the middle class, she is an agreeable affable girl, & much the most descent looking female I have seen since I left the settlement in Kentuckey a little below Louisville." Among these children were Louis, Jr., a trader like his father; Auguste Bougainville and William, who received appointments to West Point; and Agatha, perhaps the attractive daughter Lewis noticed, according to Lewis and Clark journal editor Gary Moulton.

I believe the daughter in question was not Agatha, but Marie Louise. In Louis Lorimier’s will, dated March 12, 1808, he requests that his estate "...be equally divided between my six children by my said wife Pemampieh namely — Louis, twenty three and a half years of age, August[ec] Bougainville aged 18 years & 8 months, Marie Louise twenty one and a half years old, Agatha[er] aged sixteen years and four months ...".

Meriwether Lewis was in Cape Girardeau November 23, 1803, five years before the will was written. Marie Louise would have been 16 and Agatha, 11. A 16-year-old girl was of marrying age and would have been more likely to draw Meriwether Lewis's attention. Another interesting fact in the will is item number 2, which states:

“It is my will that my grandson William, the son of my daughter Marie Louise born before her marriage, and about three years old, be liberally educated and that a sufficient sum be reserved and appropriated by my Executors to defray the expenses of his maintenance and education."

William would have been born in 1805. Meriwether Lewis was in St. Louis until May 20, 1804.

Pierre Chouteau accompanied the Osage chiefs to Washington City leaving St. Louis May 19, 1804. In Amos Stoddard’s letter to Secretary of War Henry Dearborn on May 7, 1804, he wrote: "So extremely solicitous was he (Auguste Bougainville Lorimier) to go on with Mr. Chouteau, that his father at last consented. His father has applied to me to recommend him as a cadet." Was Louis Lorimier, Sr., in St. Louis at the time? Did Lorimier take his family to St. Louis to say goodbye to cousin George Drouillard before the expedition left to go up the Missouri? His sons Louis, Jr., and Auguste Bougainville were to leave for West Point with Chouteau and the Osage chiefs when they left for Washington.

Lewis was much taken by one of Lorimier’s daughters, perhaps she, too, went to St. Louis to say goodbye to Drouillard, her two brothers and Meriwether Lewis. At any rate, about nine months later, Marie Louise gave birth to a child she named William.

By 1814, Marie Louise Lorimier Rodney, wife of Thomas Smith Rodney, was dead. That year, Louis, Jr., is listed as the guardian of 9-year-old William Lorimier, grandson of Louis Lorimier, Sr. Cape Girardeau County Deed Book F shows Louis, Jr., acted on behalf of William to purchase Outlot No. 86, 146 acres next to his mother’s property. On May 26, 1834, William sold all 146 acres for $200. Lorimier family researcher Joseph Luther says the younger William died in 1839. According to Luther,
For the Record (cont.)

the Lorimier family believes that Meriwether Lewis was the father of Marie Louise's son, William Lorimier. The last descendant of William the author is familiar with was a lady named Helen Uhl Collins. Her photograph closely resembles the Charles Willson Peale portrait of Meriwether Lewis. (Photos on p. 35.)

Passages: Darrell Martin

Darrell Ray Martin was born Aug. 25, 1965, on the Fort Belknap Indian Reservation in Montana. He traveled and worked various jobs after attending high school in Hays, Montana. He married Rhonda Geboe and had a daughter, Amanda Rae, in 1988. For several years he worked for Zortman-Landusky Mining Company. In 1990, he and Rhonda divorced.

While working as a teacher in Hays, Darrell met Zane and they married in a private ceremony on July 3, 1991.

Darrell was considered a go-getter and didn't hesitate to take on new challenges. He worked as the tourism director, vice-president and president of Fort Belknap Tribes and he served on many boards nationally. He also served on the Montana Lewis and Clark Bicentennial Commission, including a term as chairman and was actively involved in the Montana Tribal Tourism Alliance.

He and Zane owned and operated several tourism-based businesses including a bed and breakfast. They made friends with people from all over the world. People instantly loved Darrell's friendliness, his sense of humor and his fun-loving approach to life.

In December 2004, he accepted a position with the National Park Service as the American Indian liaison for the Lewis and Clark National Historic Trail during the bicentennial of the Lewis and Clark Expedition. He believed it was very important for the American Indian story to be told and heard. As with all his endeavors, Darrell put his whole heart into his job.

He most recently served as the assistant chief of interpretation and the American Indian liaison for the National Parks Midwest Region and was stationed at Mount Rushmore in South Dakota.

As great as Darrell's interests and energy were, his love for his family was just as immense. He was extremely proud of his family—Zane, J.D. and Amanda—and often shared stories about them. He adored his new granddaughter, Kaylee Rose. He left us very young, but he was ancient in his travels and good deeds. He understood and was proud of his Indian culture and ways.

Darrell is survived by his wife, Zane Martin; his stepson, J.D. French; his daughter, Amanda Rae Martin Bear Comes Out; his son-in-law, Jordan; his granddaughter and Kaylee Rose; his mother, Margaret June Martin; three brothers, Stan, Gerald and Harold Martin; two sisters, Fern and Aretha Martin; his father and mother-in-law, Freeman and Barb Peabody; a brother-in-law, Shane (Jennifer) Peabody; and numerous nieces and nephews. He was preceded in death by his father, Harold "Prune" Martin.

Gerard Baker, former superintendent of the Lewis and Clark National Historic Trail and current superintendent of Mount Rushmore National Memorial is sponsoring a scholarship fund in Darrell's name. The fund will pay for one American Indian student in good academic standing to work at Mount Rushmore in the fields of natural resources and interpretation. The Mount Rushmore Society will match the funds raised in 2007.

Notes
1. "Will of Andres Ramsey, Sr.," Located in the Will Register Book A of Cape Girardeau County (Jackson, Missouri: Cape Girardeau County Archive Center), pp. 40-41.
4. Ibid., p. 109, n. 12.
6. Probate Records, Cape Girardeau County Archive Center, Box 20, Bundle 416, Item No. 3.
8. Stoddard Papers (St. Louis: Missouri Historical Society).
9. Petition to Partition Thomas Smith Redney, Case #659, Box 14, File 13, Territorial Papers, Cape Girardeau County Archive Center.

—Jane Randol Jackson
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