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• Baleen, Blubber & Train Oil from Sacagawea’s “monstrous fish”
• Reviews, News, and more
The Rocky Mountain Fur Trade Journal

VOLUME 11 - 2017

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We Proceeded On welcomes submissions of articles, proposals, inquiries, and letters. Writer's guidelines are available by request and can be found on our website, lewisandclark.org. Submissions may be sent to Robert Clark, WSU Press, P.O. Box 645910, Pullman, WA 99164-5910, or by email to robert.clark@wsu.edu.
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Robert A. Clark
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**The Lewis and Clark Trail Heritage Foundation, Inc.**

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As Keepers of the Story—Stewards of the Trail, the Lewis and Clark Trail Heritage Foundation, Inc. provides national leadership in maintaining the integrity of the Trail and its story through stewardship, scholarship, education, partnership and cultural inclusiveness.

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The Bicentennial Plus Ten

More than ten years have passed since the 2003 to 2006 Bicentennial Commemoration of the Lewis and Clark Expedition. This is a good time to assess what we have accomplished since then, where we stand now, and where we need to go to achieve our goals.

LCTHF Members in the Bicentennial

By all accounts, the Bicentennial was a heady time. Many of the friends and partners of the Lewis and Clark Trail Heritage Foundation (LCTHF) came into the big tent to share the excitement of the commemoration. LCTHF Bicentennial Committee members Harry Hubbard, Stu Knapp, and Bob Gatten incorporated the National Council of the Lewis and Clark Bicentennial. Over the years LCTHF members who served on the Council included David Borlaug, Larry Epstein, Jim Fazio, Jerry Garrett, Karen Goering, Jane Henley, Jim Holmberg, Gordon Julich, Ron Laycock, Gary Moulton, Patti Thomsen, Jane Weber, Dick Williams, and Phyllis Yeager.

Funding was more than adequate as many of the federal agencies—the National Park Service (NPS), United States Forest Service (USFS), Bureau of Land Management (BLM), Army Corps of Engineers, Bureau of Reclamation (BR), and others—played a role in ensuring inclusiveness, sufficient resources, and safety of all participants including presenters, reenactors, and the public. Many members of the LCTHF held leadership positions for their agencies including Dick Fichtler (BLM), Margaret Gorski (USFS), Mike Loesch and Paige Cruz (Army Corps of Engineers), Steve Moorehouse (BR), and Dick Williams (NPS). Jan Donelson, current president of the Discovery Expedition of St Charles, and Katie Bump, USFS at Lemhi Pass, were also important participants.

Since the Bicentennial

So what has our foundation accomplished in the ten years since? The answer is: a lot. We have, as a direct result of the Bicentennial, two grant programs—Bicentennial Trail Stewardship and Education—that are up and running and have distributed more than $250,000 in the past five years. We also offer a junior and senior prize for National History Day projects on Lewis and Clark. We assumed editorial and technical responsibility for the website Discovering Lewis and Clark in partnership with the NPS and the Lewis and Clark Fort Mandan Foundation. The LCTHF's own website receives more than 150,000 visits a month from all over the world.

We have continued publication of our journal, We Proceeded On, and past issues are now available on line, thanks to the work of Kris Townsend and Dan Sturtevant. We have re instituted both an online and print version of our newsletter, The Orderly Report. Sue Buchel, Ella Mae Howard, Shelly Kath, and the William P. Sherman Library and Archives Committee have been organizing the archives, processing the accession of the the Don Nell Visual Resource Collection, developing an oral history program, and making the library’s collections available online.

Our membership continues to organize and participate in local, regional, and annual meetings of chapters and the LCTHF. Through these programs our members reach out to our friends and partner organizations. The involvement of the NPS in the 2016 Annual Meeting at Harpers Ferry National Historical Park, thanks to the work of Paige Cruz, Phillip Gordon, Mike and Lorraine Loesch, and Jerry and Janice Wilson, is a prime example of such cooperative ventures. This cooperation will be duplicated by Jeff Dietz and Tom Rust at the 2017 Annual Meeting in Billings, Montana, during which a field trip to Pompeys Pillar National Monument is scheduled. Larry McClure and the 2018 Annual Meeting Committee will similarly be partnering with Richard Basch, the NPS, and tribal representatives at Fort Clatsop in Astoria, Oregon, in planning an engaging program.
We can be justly proud of the LCTHF’s accomplishments over the past ten years. But they are just the beginning. Rather than resting on our well-deserved laurels, we need to move forward to build capacity. And that starts with developing social capital which, as opposed to fiscal capital (ie, the budget), is limitless. Social capital is the fruit of the relationships developed among our members as part of the community that is the LCTHF. The community is the integrating force coordinating our mission with those relationships, and it is important for us to learn how members wish to participate in the community. Let us accomplish this not by surveys, but by gathering together, exchanging ideas, and getting to know one another. Our annual, regional, and chapter meetings are the ideal settings for making the kinds of connections that encourage people to present ideas and develop a sense of commitment to our organization. Your officers and board of directors are asking members to tell us what they would like to do and in what way they would like to make a contribution.

LCTHF’s Committee Structure

Our foundation has recently instituted a new and robust committee structure, developed by Lou Ritten, Jim Sayce, and Kris Townsend. They have grouped the committees under the four umbrellas that most closely correspond to the committees’ core functions: Operations, Membership Resources, Stewardship (Financial), and Outreach. Although the committees may change as our needs change, our current complement is as follows. The Operations committees include Operations, Personnel, and Past Presidents. The Membership Resources committees include Membership, Chapters, Volunteer Coordination, Awards, Meetings, and 2019 50th Anniversary. The Stewardship committees include Finance, Grants Management, Bicentennial Trail Stewardship, and Montana Sign. The Outreach committees include Education, WPO, TOR, Library, LCTHF Website, Discovering Lewis and Clark Website, Friends and Partners, and Marketing. You are invited to join any of the committees. This is where the true work of the organization gets accomplished, where members can make their voices heard and make a difference.

Our Membership

Members, currently enrolled and yet to join, are the heart and soul of the LCTHF. The organization exists to serve our members, who in turn carry out our mission. In order to move forward we need to grow our membership. Our gift membership program offers a $5.00 Amazon gift card for each gift membership purchased. Both the givers and recipients of the gift memberships will be entered into the drawing for a $100 Amazon gift card to be held at the LCTHF business meeting in Billings this summer. We encourage everyone to attend the Annual Meeting, but the winner of the $100 Amazon gift card need not be present to claim the prize. The LCTHF also needs a way to identify potential members who have the time, talents, passion, and resourcefulness to see us through the next years and beyond. Please contact me directly at president@lewisandclark.org with any suggestions you may have for recruiting new members to the LCTHF.

I look forward to greeting all of you at the 48th Annual Meeting of the LCTHF in Billings, Montana, July 23–26, 2017. The registration materials are available at rochejhone@weebly.com. It promises to be a very informative and enjoyable gathering of people who share a common interest. Once in the area, our members can opt to explore more of the Lewis and Clark National Historic Trail in both directions along the Yellowstone River and even part of the Nez Perce National Historic Trail that runs near the town of Laurel just west of Billings.

We hope to see you there! 

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Lindy Hatcher of Great Falls, Montana
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Steve Lee of Clarkston, Washington
Philippa Newfield and Philip Gordon of San Francisco, California

In Memory of Dr. William Settle of Sanford, NC
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Photograph of Trapper Peak, Bitterroot Mountains, Montana, courtesy of Steve Lee.

We Proceeded On

The Journal of the Lewis & Clark Trail Heritage Foundation

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Braving freezing temperatures along the Ohio River on December 18, 2016, dignitaries, local residents, and Lewis and Clark enthusiasts gathered to dedicate the new 2,500-foot Lewis and Clark Bridge crossing the Ohio River from southern Indiana to Louisville, Kentucky. The name is an ode to Indiana and Kentucky’s shared historical prominence in the Lewis and Clark Expeditions. The two met in the area in 1803 while organizing their expedition to the West.

“Naming this bridge the Lewis and Clark Bridge speaks to the shared prosperity between Indiana and Kentucky, just as Lewis and Clark together charted a course that would put the United States of America on a path to greatness,” outgoing governor Mike Pence said in a statement. “As the Crossroads of America and the Bluegrass State continue to play a shared role in our national economy as models of industry and commerce, the Lewis and Clark Bridge will allow for us to grow, build, create, and move products together and power our economies for years to come.”

Pence had originally considered the name Ronald Reagan Bridge. According to Phyllis Yeager, LCTHF member, “I believe Governor Pence had changed his mind by May because of what he said in his address to the NRA Convention held in Louisville—all before he was selected to be Trump’s running mate. I believe that the many e-mails, letters, and phone calls from so many people, including LCTHF members throughout the U.S, changed his mind. One of those who did so was Steve Lee, President of the LCTHF. Many others helped. If you contacted him, thank you very much.”

At the May NRA convention, Pence recounted some local history and charged those in attendance to take a lesson from Meriwether Lewis and William Clark, who embarked on their journey to explore the Louisiana Purchase from the Falls of the Ohio, located just across the river from Louisville.

“They took with them undaunted courage, faith, and freedom,” he said. “I would say in these uncertain times, we too must face this moment with courage, with faith, and with the same commitment to carry freedom forward through this election and beyond.”

Yeager expended much effort to lobby for the name change. She put the Executive Director of the Indiana Department of Tourism in touch with Lewis and Clark leaders in Kentucky. “I reached out to Jim Mallory and leaders at DESC, Locust Grove, Frazier History Museum, and the Filson Club (Jim Holmberg). Mark Newman contacted his counterpart in Kentucky.”

On December 18th Yeager was honored to be at the opening ceremony and joined other dignitaries on one of the first buses to travel over the new bridge.
Ladd Seaberg, long an active member and supporter of the Lewis and Clark Trail Heritage Foundation, passed away on January 29, 2017, after a long illness.

Born in Beaumont, Texas, on June 14, 1946, Ladd’s interest in science led to his entering a Regional Science Fair in Houston, Texas, where he won first place. Another first place award followed from the U.S. Air Force, and as a result he was offered a summer job in 1964 at Wright Patterson Air Force Base in Dayton, Ohio. There he met Karen Cray, also a first place award winner and recipient of a summer job. Ladd and Karen married in 1966 and soon completed their studies at Texas Tech University in 1969.

After graduation, Ladd and Karen returned to her hometown of Atchison, Kansas. Ladd spent the next 48 years devoted to family, MGP Ingredients (a leading supplier of premium distilled spirits and specialty wheat proteins and starches), and the city of Atchison. He was named president of MGP in 1980 and retired as Chairman of MGP’s Board in 2009, having also served as chief executive officer for twenty years.

A lifetime member of and generous contributor to the LCTHF, Ladd spearheaded the funding and purchase of land and the construction of a walking bridge at the Independence Creek Lewis and Clark Historical Site in Atchison. He also played a significant role in both the funding and building of the Kanza Earth Lodge at that historical site.

A former pilot, Ladd was instrumental in the purchase of Muriel, the last remaining Lockheed Electra 10-E for Atchison. As a founder and charter member of the Amelia Earhart Bridge Committee, he initiated action leading to the construction of the new bridge over the Missouri River at Atchison in 2012.

Along with his wife, Karen, his father-in-law, Cloud L. Bud Cray, MGP chairman emeritus, and other family members, Ladd received the Cray-Seaberg Vision of Excellence Award from the Santa Fe Depot Board of Trustees in 2014. This distinguished award was established to honor individuals and families who demonstrate exceptionally outstanding community leadership.

Ladd will be most remembered as a devoted husband, loving father, grandfather, and son, and great friend and trusted comrade.
One of the Lewis and Clark expedition’s most significant challenges during the course of their 1803-1806 trek to the Pacific Ocean and back was their exploration of the mouth of the Columbia River in November and December 1805, and their protracted efforts to locate a suitable location to establish winter quarters. Despite the subsequent dreary months of rainy weather and a spartan food supply, Meriwether Lewis and William Clark faithfully persisted in documenting not only the material culture of the native inhabitants, but also the rich natural history of this new environment, as evidenced by their detailed journal descriptions of mammals, birds, reptiles, and fish along with plants and trees. Virtually unnoticed among the prodigious scientific output written while ensconced at Fort Clatsop would be two unique mineralogical specimens, one nearly forgotten save for a little known mineralogical catalogue entry at the Academy of Natural Sciences in Philadelphia, the other a meticulously documented sample described in both captains’ journals. As the following examination of these two specimens will illustrate, the Lewis and Clark expedition was at a significant distance from, but not yet beyond, the influence of the vast eruptive events, dynamic upheavals, and massive earth movements that created the Columbia Plateau and Columbia River Gorge.

“Magnetic Iron sand, borders of the Pacific ocean near the mouth of Columbia river”

Lewis and Clark collected a multitude of mineralogical specimens throughout the expedition, ever mindful that observations of the “mineral productions of every kind” were an essential part of the scientific mission President Thomas Jefferson had outlined for them in his preexpeditionary instructions to Lewis. The best documented mineral and rock specimens, assembled from late 1803 through early 1805, were sent east from Fort Mandan with Corporal Richard Warfington and the keelboat in April 1805. With regards to this Fort Mandan mineral collection, it can be comparatively straightforward to identify probable collection sites of the more unique minerals when collection activities were recorded in the captains’ journals, even when those references are somewhat vague. However, one of the most intriguing Lewis and Clark mineral specimens was collected after departing Fort
Haystack Rock (right) and The Needles as viewed from Cannon Beach (site of the beached whale visited by William Clark on January 8-9, 1806) are the picturesque landmarks that mark both the end of the Lewis and Clark Trail in Oregon and the westernmost subaerially exposed evidence of the vast eruptive events, dynamic upheavals, and massive earth movements that created the Columbia Plateau, the Columbia River Gorge, and Tillamook Head.
The Black Sands and White Earth

Mandan and was not documented in the expedition journals or specifically mentioned in any known expedition-related specimen list or correspondence. The documentation of this specimen’s existence is found solely in the circa 1812 catalogue of the mineral collection of Adam Seybert, physician, gentleman-scientist, and Philadelphia’s leading mineralogy expert: “Magnetic Iron sand, borders of the Pacific ocean near the mouth of Columbia river. Captn. Lewis.”

This was the same Adam Seybert who added supplemental mineralogical comments to augment Lewis’s original descriptions of the Fort Mandan mineralogical specimens. Because there is no journal record of Lewis or Clark collecting this sand sample, it must be deduced why they were compelled to collect it, whether they had the capability at the time to recognize its magnetic properties, and then to postulate who collected it, and from what location and time frame.

Why would Lewis and Clark collect such a seemingly commonplace sand sample over any other sand deposit along the Pacific Ocean, at the mouth of the Columbia River, or along the river’s estuary? The captains were likely intrigued by the extensive deposits of “black sand” evident on ocean beaches near the mouth of the Columbia River because it was unlike anything that they had encountered on the east side of the Rocky Mountains. If we can presume the Fort Mandan mineralogical specimens were representative of the captains’ collection philosophy, then we can conclude they had dual purposes in mind: ensure the collection was representative of the geology encountered along their route, but also skew the collection (when appropriate) to attractively interesting objects. The artful streaky patterns of shiny blue-black sands with the flowing, abstract patterns found on the beaches of the Pacific Ocean was certainly eye-catching enough to induce Lewis or Clark to collect a sample, but it would be more characteristic of the captains that some attribute of those sands appealed to their pragmatic and Enlightenment nature.

It is now well known that many of these black sand deposits are noticeably magnetic, which raises the question of whether Lewis and Clark had a magnet with them to test the magnetic properties of the sand. A strong indication they did is provided in the inventory of purchases on May 31, 1803, facilitated by Israel Whelen (pursuer of public supplies) in Philadelphia when Lewis was outfitting the expedition. Among the supplies of surveying instruments, including numerous compasses procured from Thomas Whitney (a mathematical instrument maker), was “a Magnet” purchased for $1.9 As such, it is possible that the captains collected this sand sample because they discovered it to be magnetic, a distinctive feature of Pacific Ocean beach sands. However, because no other documentation of this sample exists, we don’t know if Lewis described this sample as magnetic or whether Adam Seybert added that supplemental mineralogical comment when he was cataloguing this specimen. Nevertheless, it can be firmly established that a Lewis and Clark sample of “Magnetic Iron sand” could have legitimately been collected on the “borders of the Pacific ocean near the mouth of Columbia river.”

This leads to the intriguing question of whether Lewis or Clark collected the specimen, and where and when was it collected? As the scientific leader of the expedition, a sample attributed to Lewis doesn’t necessarily mean he collected it. We know William Clark had a strong interest in minerals on the basis of his January 7, 1806, observation and collection of a “white earth” specimen (see discussion below) and his earlier independent assemblage of specimens he subsequently sent to his brother Jonathan from Fort Mandan in April 1805. Therefore, we need to investigate the routes of both captains along the Pacific Ocean coastline and ascertain
where they may have encountered the most promising “Magnetic Iron sand” locations in the winter of 1805-1806.

Forays to the ocean were conducted by the captains on both the Oregon and Washington State coasts. They were similar in their execution: expeditious overland reconnaissances by Lewis or Clark followed by much better documented journeys by Clark. As an initial screening of possibilities south of the Columbia River in Oregon, we might summarily preclude both Clark’s December 8-10, 1805 initial reconnaissance and his longer trip between January 6–10, 1806, down to the area of Salt Camp (this latter trip included proceeding on farther south over Tillamook Head to the beached whale at present-day Cannon Beach). This is because the area where the author has Clark first encountering the beach in the vicinity of the present-day Slusher Lake/ Sunset Beach Recreational Area and the subsequent southward trek down the beach to Salt Camp (in present-day Sea-side) may not have been considered by geographically-astute Lewis or Clark to be “near the mouth of Columbia river.”

Despite this presumption, I didn’t exclude these areas from investigation (see below) because there is direct evidence that Clark explored the beach thoroughly, particularly on December 10, 1805 when he stated: “very early I rose and walked on the Shore of the Sea coast and picked up Several Curious Shells...after amuseing my Self for about an hour on the edge of the rageing Seas I returned to the houses.”

The other potential locations for a magnetic sand sample were along the Pacific Ocean north of the Columbia River in Washington State. There were two separate scouting excursions conducted as part of the exceptionally arduous attempt to reach the Pacific Ocean along the north shore of the Columbia River in November 1805. Upon finally mov-
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ing around Point Distress (today’s Point Ellice), the captains hunkered down in a fairly secure position (now called Station Camp) to send out exploratory parties to Cape Disappointment and its environs. Unfortunately, details of Meriwether Lewis’s November 15-17, 1805, foray remain unknown to us (no account of this scouting trip has been discovered); virtually all we know about this trip is what Clark mentioned upon Lewis’s return to Station Camp on November 17, 1805: “Capt Lewis returned having traversed Haleys [present-day Baker] Bay to Cape Disappointment and the Sea Coast to the North for Some distance.”

We can assume that because Lewis set out on November 15, 1805 and returned all the way back to Station Camp on November 17, the greater part of his coast exploration likely took place on November 16, 1805. We know much more about Clark’s November 18–19, 1805 reconnaissance, enough in fact to deduce when and where he might have encountered “Magnetic Iron sand” deposits. On November 18, Clark and his party “Encamped on the Shore above the high tide” just north of present-day McKenzie Head (Clark’s “a high Seperate bald hill”). It is certain that Clark walked the beach at day’s end because he stated “I picked up a flounder on the beech this evening.” This indicates the party was on the small beach between McKenzie Head and the sheer sea cliffs that wrap around present-day North Head. The following day, Clark and party hiked inland and Clark noted: “[November 19, 1805:] proceeded on through rugged Country of high hills and Steep hollers…to the Commencement of a Sandy Coast.”

Where he descended the “high hills and Steep hollers” isn’t known, but presumably not south of the area of present-day Beards Hollow. From there, Clark and his party “proceeded on the Sandy Coast 4 miles,” before turning back and eventually making their way back to Baker Bay via a cross-cutting inland route, thus completing his reconnaissance of the southern portion of present-day Long Beach, Pacific County, Washington. Over this two-day period, Clark had ample opportunity to encounter black sands at both McKenzie Head and along Long Beach north of Beards Hollow.

Because several potential “Magnetic Iron sand” collection sites exist, I thought it would be interesting to conduct an investigation on where the expedition sample might have been collected, an effort unquestionably complicated by the significant man-made physical changes to the Pacific Ocean coastline in the vicinity of the Columbia River over the last 120 years. Unlike sampling fixed hard rock outcrops elsewhere along the Lewis and Clark Trail, duplicat-
ing the captains’ “Magnetic Iron sand” specimen collection with representative present-day occurrences of beach sand is constrained by several factors that had to be considered and acknowledged.

First, not only is beach sand constantly being eroded and replenished during the natural cycle of winter erosion and summertime deposition, both the Oregon and Washington shorelines near the mouth of the Columbia River have experienced major geomorphic changes because of the construction of the South and North Jetties on Clatsop Spit and Cape Disappointment, respectively. To address this issue, the author consulted historical maps of these areas prior to jetty construction, particularly the invaluable United States Exploring Expedition’s Mouth of the Columbia River map (1841) and the subsequent U.S. Coast Survey’s charting from the 1850s through 1870 to eliminate areas that were not emergent at the time of the expedition’s visit. Off the northwest Oregon coastline in the early 1800s the naturally-occurring Clatsop Spit northwest of Point Adams was submerged. Along the southwest Washington State coastline, the U.S. Coast Survey historical maps clearly show that although sand beaches were present on either side of McKenzie Head, the extensive beach (today’s Benson Beach) that formed seaward of McKenzie Head after the construction of North Jetty was not present in 1805-1806. So, despite the fact that black sand deposits can be found on the present-day emergent Clatsop Spit and Benson Beach, both of these former shoal areas were not considered for sampling because of the irrefutable evidence that these areas have been substantially accreted (built up) and prograded (advanced) toward the ocean since the expedition’s visit for both natural reasons and effects associated with the jetty construction.

Second, it was important to assess the degree to which the author’s present-day samples could be biased low or high in magnetic mineral content as compared to the captains’ “Magnetic Iron sand” sample. The potential of a lower bias existed because the beaches near the mouth of the Columbia are still responding to various man-made disturbances, including a significantly diminished sediment supply discharging from the Columbia because of upstream dams and irrigation withdrawals. Despite the fact researchers believe there is a diminished supply of sand discharging from the Columbia today, significant quantities of Columbia River discharged sand are being transported onto the beaches from offshore deposits, which are acting like sand supply “saving accounts” to partially compensate for the diminished Columbia River discharges. The potential of present-day samples being biased significantly higher than the captains’ sample
because upriver dam obstructions prevent non-magnetic material from reaching the ocean was also evaluated. A study conducted in 1905 prior to almost all dam construction on the Columbia and Snake Rivers indicated high concentrations of magnetic minerals were present at the mouth of the Columbia River in similar percentages and locations to what the author encountered in the investigation described below, suggesting the author’s comparison between today’s beach sand deposits and those encountered by the captains in 1805 are justifiable.

In conducting the investigation, sand samples were collected south of Point Adams near the location where Clark first encountered the beach at the Slusher Lake/Sunset Beach Recreational Area (7.5 miles from Point Adams) and at the beach adjacent to Salt Camp in Seaside (17 miles from Point Adams). A control sample representative of a Columbia River estuary beach deposit was also collected at Hammond just east of Point Adams. Selecting representative sample locations was more challenging north of the Columbia River in the vicinity of Cape Disappointment. Given the amount of beach progradation at McKenzie Head, now completely land-locked nearly a half-mile from the ocean, the author collected samples at Waikiki Beach west of the Cape Disappointment lighthouse just beyond where the Columbia River debouches into the Pacific Ocean and on the beach north of North Head at Beards Hollow, the southernmost location of the extended Long Beach shoreline. To mimic what the captains may have done, the author sampled the most obvious black sand deposits whether they were in foreshore or backshore beach locations.

To determine the percentage of magnetic minerals, the author used an ordinary household refrigerator magnet to separate the magnetic mineral content out of 200-gram representative sand samples. Although every beach sand sample collected contained magnetic minerals, there was a significant difference between the beach sand deposits south of Point Adams (Oregon) visited by Clark versus northward of Cape Disappointment (Washington State) that both Lewis and Clark would have encountered. The sand samples from Salt Camp and Sunset Beach had a 14% and 16% (by weight) magnetic mineral content, respectively. The Columbia River control sand sample from Hammond east of Point Adams was more magnetic (23%) than the Sunset Beach and Salt Camp samples, yet all three samples would be considered weakly magnetic because the magnet generally had to make physical contact with most of the magnetic grains to separate them from the non-magnetic mineral content. Conversely, the magnetic mineral content of the Waikiki Beach sand sample at Cape Disappointment (32%) exceeded the magnetic content of all the Oregon beach locations visited by Clark, but it was the Beards Hollow sand sample that was the most extraordinary. Over 93% of the sample was composed of magnetic minerals and most of the grains were so strongly magnetic that they leapt onto the magnet as it hovered over the sample. Based on this investigation, there appears to be a higher likelihood of the captains recognizing and collecting a “Magnetic Iron sand” sample along the Washington State shoreline.

To cross-check these magnetic mineral percentage results, a review of recent scientific studies on the fate and transport of heavy minerals was conducted to determine whether there was a preferential mechanism to deliver sediments enriched with black “Magnetic Iron sand” at Beards Hollow, the southernmost extent of Long Beach, Washington State, the “Sea Coast” explored by both Lewis and Clark in separate scouting excursions in November 1805. A sand sample collected here by the author was composed of approximately 93% magnetic minerals, suggesting there was higher likelihood of the captains recognizing and collecting a “Magnetic Iron sand” sample along the Washington State shoreline. The scale of the beach deposit is indicated by the one-foot long rock hammer.
ment (including magnetic minerals) to the north side of the Columbia River and why that would occur. Studies of beach sediment distributions have indicated that the predominant drift direction of sand discharging from the Columbia River is northward. Longshore dispersal pattern studies have documented higher concentrations of heavy minerals in close proximity to the mouth of the Columbia River and decreasing concentrations moving up the Long Beach Peninsula and beyond. And finally, without digging into the science of differential settling velocities and rates, variability in transport rates, and selective entrainment stresses, it has been determined that deposition of heavy minerals occurs preferentially closer to the mouth of the Columbia River because the finest grains with the highest density (magnetic minerals magnetite and ilmenite) are the most recalcitrant to mobilize and thus enrich the heavy mineral deposits nearest the Columbia River. Higher heavy mineral concentrations have also been measured on the north side of the Columbia River as compared to the south side, and it has been ascertained that winter-time concentrations of these heavy minerals can be further enriched (in excess of 90%), which would have coincided with the expedition visit (and the author’s).

In summary, both the author’s investigation and the scientific literature indicate a greater chance of “Magnetic Iron sand” being encountered by the expedition in Washington State and close to the mouth of the Columbia River. It is worth reiterating that this supposition is dependent upon the controlling factors of beach sand deposition along the Oregon and Washington shorelines being similar to what they were in 1805 (same mineral source material discharging from the Columbia River watershed, the prevailing net northward drift of Columbia River sands, similar longshore sorting mechanisms of minerals with contrasting densities, etc.). If all these factors were operating in 1805, it appears that either Meriwether Lewis on November 15–17, 1805, or William Clark on November 18–19, 1805, collected the “Magnetic Iron sand” sample on a Pacific Ocean beach during their respective scouting excursions “to Cape Disappointment and the Sea Coast to the North.” In addition to the scientific value of this specimen, its collection represents yet another testament to the diligent scientific discipline exercised by the captains even at times of great peril and uncertainty.

“Strater of white earth”—The Geology of Tillamook Head, Oregon

The mineralogical discovery that figures prominently in the Lewis and Clark journals while at Fort Clatsop was noted by Clark in his notebook journal when describing the challenging ascent over present-day Tillamook Head (located between present-day Cannon Beach and Seaside, Oregon) on the way to the beached whale at Cannon Beach:

[January 7, 1806:] In the face of this tremendous precipice immediately below us, there is a strater of white earth (which my guide informed me) the neighboring indians use to paint themselves, and which appears to me to resemble the earth of which the French Porcelain is made; I am confident that this earth contains argill, but whether it also contains Silex or magnesia, or either of those earths in a proper perpotion I am unable to determine.

Lewis’s January 10, 1806, notebook journal entry is nearly identical, with one subtle and very important addition—the intent to include a specimen number that apparently was never assigned:

in the face of this tremendous precipice there is a stra of white earth (see specimen No. [blank]) which the neighbouring Indians use to paint themselves, and which appears to me to resemble the earth of which the
French Porcelain is made; I am confident this earth contains Argill, but wether it also contains Silex or magnesia, or either of those earths in a proper proportion I am unable to determine.

This documentation suggests Clark had collected a “white earth” specimen during his January 6–10, 1806 excursion that Lewis intended to catalogue as a mineralogical specimen worthy of retention. There should be little doubt Lewis, not Clark, described the “white earth” specimen back at Fort Clatsop and Clark incorporated this description verbatim when transcribing his January 7 draft notes into his notebook journal because there is no “white earth” mineral description in Clark’s First Draft written during the trip to the whale. Similar to the “keffekill” specimen collected in the vicinity of the Walla Walla River, here again we can explore the reasons behind the apparently incongruous presence of a light-colored deposit being encountered at the end of a 450-mile journey through a region dominated by black and gray-basaltic rock, and evaluate the accuracy of Lewis’s mineralogical assessment.

Detailed geological mapping, some yet to be published, indicates Tillamook Head is composed of one of the most predominant basaltic rocks encountered in the Columbia Plateau and Columbia River Gorge (Grande Ronde Basalt), as well as the mudstones and sandstones of the Cannon Beach member of the Astoria Formation. In Miocene time, the area of Tillamook Head was part of an oceanic basin that lay just north of the upper reaches of a northeast to southwest trending, deep-marine submarine canyon complex seaward of, but aligned with, the mouth of the ancestral Columbia River. The mouth of the ancestral Columbia River occupied a wholly different position and orientation (between present-day Wickiup Mountain and Nicolai Mountain in eastern Clatsop County) than the Columbia River of today. The head of the submarine canyon system, along with the adjacent marine shelf/slope, stretched from Seaside southward past Cape Falcon, and was blanketed with deposits of Cannon Beach member deep marine sediments. It was this more than 20–mile wide submarine canyon and shelfal setting that would be subject to the subsequent invasion of Columbia River Basalt Group lava flows, voluminous enough to reach this far westward from their sources hundreds of miles to the east in northeastern Oregon, eastern Washington, and western Idaho.

Upon eruption, Grande Ronde Basalt flows that were being deposited subaerially in the Columbia Plateau and Columbia River Gorge region reached the mouth of the ancestral Columbia River, but then advanced underwater onto the Miocene shelf and continental slope and into the head of the submarine canyon. Upon encountering the water-saturated Cannon Beach member sediments, the denser Grande Ronde Basalt plunged downward through the soft, loosely consolidated sediment like hot fluid asphalt dropped into a vat of wet plaster. Without delving into the physical mechanisms of how and at what depth the density and viscosity of the fluid invasive basalt and the deeper, more compacted marine sediments equalized, a depth was reached where the basalt stopped descending and commenced moving outward (and sometimes back upward to re-erupt onto the Miocene sea floor). It was this outward movement of seams of intrusive molten Grande Ronde Basalt into the Astoria Formation Cannon Beach member, occurring approximately 15.9 million years ago, that would form the future Tillamook Head rock mass. Heating by the molten basalt of closely adjacent layers of Cannon Beach member mudstones had the effect
We proceeded on May 2017

of “baking” and bleaching those gray sediments into Lewis and Clark’s “white earth.”44 Subsequent Coast Range uplift and faulting would elevate these intermixed rocks of Tillamook Head over 1,000 feet above sea level into the “emience mountain”45 Clark and his party struggled to ascend on January 7, 1806.

Investigating this area, I found prominent bands of light-colored strata can be observed in numerous places along the seaward-facing cliff faces of Tillamook Head.46 The vast majority of these outcrops are entirely inaccessible because the cliff locations of Tillamook Head are extremely treacherous and unapproachable by land or from the shoreline; however, a small exposure of this “white earth” can be seen at the Tillamook Rock Lighthouse Viewpoint between Tillamook Head and Bird Point, accessible via the Oregon Coast Trail.47 The author chose this locale north of Bird Point not just for its relative accessibility, but also because a diligent assessment of Clark’s January 8, 1806, journal entry suggests he was on Bird Point the morning after encountering the “white earth,”48 so it was essential not to assess outcrops this far south. Clark’s “Route to the Whale Site” sketch map49 indicates he crossed Tillamook Head via an inland route to end up on the west bank of Indian Creek on the evening of January 7, 1806, so it is necessary to postulate that near the end of the January 7 climb up Tillamook Head, Clark’s party ventured westward on a short and unmapped foray to gain a view of the Pacific Ocean and that was when the “white earth” was observed.50

The Tillamook Rock Lighthouse Viewpoint exposure reminded me of Clark’s January 7, 1806, observation “In the face of this tremendous precipic immediately below us, there is a Strater of white earth,” describing the vertical drop of several hundred feet at the outcrop itself. The character of the exposure changed over the ten years I examined it; the whitish earth outcrop revealed by a fresh landslide observed in 2003 had oxidized to a light yellow some ten years later, suggesting to me that the “white earth” had some proportion
of iron(III) oxide that was oxidizing (rusting). Upon acquiring several samples from this precipitous exposure and breaking apart the specimens, the fresh fractures revealed a bright white and tentatively well-solidified deposit that could easily be crushed into a fine powder. I submitted several representative samples to an accredited mineral analysis laboratory for a battery of diagnostic mineralogical tests while continuing to delve deeper into Lewis’s description of the “white earth.”

Despite the postulated chemical composition of the “white earth” specimen recorded in the journals, it is highly doubtful Lewis performed an experiment on the sample, given the involved process described in Richard Kirwan’s *Elements of Mineralogy,* believed to be the only geology and mineralogy reference book brought on the expedition. A typical *Elements of Mineralogy* procedure for the chemical analysis of “earths and stones” had dozens of individual and complex steps involving numerous cycles of pulverization, evaporation, filtration, dilution, agitation, heating, drying, precipitation, washing, and the additions of both wet and dry reagents throughout the process. Lewis and Clark did not have some of the commonly used acids such as nitrous (nitric) and marine (hydrochloric) to perform many of the tests specified in *Elements of Mineralogy,* nor the undivided time and attention it would have required to conduct what could have been a two-day experiment potentially involving five dozen individual steps.

As such, it is far more likely when referring to *Elements of Mineralogy,* Lewis noted that the Kirwan listed “silex” [silicon dioxide or silica], “argil” [Potter’s clay], and “magnesia” [magnesium oxide] as the three primary ingredients of various porcelain mixtures. However, Lewis conceded that he was unsure whether all three of these constituents were present in Clark’s “white earth” sample. In the sample the author collected from the Tillamook Rock Lighthouse Viewpoint exposure, the XRF analyses indicated that “silex” was the most prominent compound (comprising 68.07% of the sample) and “magnesia” was also present, but at a fairly low percentage (0.84%). The presence of other minerals such as aluminum oxide, sodium oxide, iron(III) oxide, and calcium oxide revealed this “white earth” deposit was a more complicated mixture than what can be typified by Kirwan’s simple three-constituent recipe.

A separate XRD analyses was conducted to determine what “argil” [clay] species might be present in the “white earth” sample. Surprisingly, clay minerals such as kaolinite, montmorillonite-smectite, or illite were not detected in the sample. Chlorite, a group of hydrous aluminosilicate clay minerals ordinarily containing magnesium and iron when they are found at sizes smaller than <2 μm (microns), was present, but in crystalline form at dimensions larger than what can be classified as a clay mineral. The author’s “white earth” sample appeared rich in clay and, when crushed, generated a fine powder that readily adhered to the skin (one could very easily “paint themselves” with this dry residue) because the crystalline materials (the “silex” and the chlorite) were very fine-grained. It is possible the deposit I sampled was either more of a siltstone than a mudstone or was so affected by the low-grade contact metamorphism caused by its proximity to invasive molten basalt that any clay-sized minerals were re-cristallized to silt-size minerals, which is a reasonable assumption given that unmetamorphosed Cannon Beach member mudstones contain considerable clay minerals. Perhaps the captain’s “white earth” sample had surviving quantities of clay minerals or had a clay-like appearance and texture despite the absence of clay minerals, which would explain Lewis’s confidence that “this earth contains Argill.”

As was the case with all the other mineralogical samples collected on the expedition, the captains collected a “white earth” sample with the intent to carry it back East where a proper description and chemical analyses could take place. Alas, Lewis’s attempted cataloguing of the “white earth” specimen at Fort Clatsop was the last known whereabouts of this sample. In a line-by-line review of the 1,984 specimens listed in the circa 1812 catalogue of Adam Seybert’s mineral collection, the author did not recognize a “white earth” specimen in any of the mineral descriptions, including those mineral samples attributed to “Captn. Lewis” or in unattributed specimens collected in the undefined “Western Territory.” The paper trail (what we refer to today as the “chain of custody”) of how the minerals collected between Fort Mandan and the Pacific Ocean ended up in Philadelphia is poorly documented, yet we know that several specimens (like the “Magnetic Iron sand”) survived the trip back East. There were plenty of chances for mineral samples to have been lost during the return journey to St. Louis, in the subsequent shipment of specimens to Philadelphia, or in the acquisition of expedition mineral samples by Adam Seybert. Thankfully though, the captains’ typically diligent documentation aids the search for locations of their mineral specimens, permitting analyses and geological interpretations that were not possible in 1803-1806. As Thomas Jefferson purposely intended for the Lewis and Clark expedition, as well as his other sponsored explorations of the Louisiana Territory: “When the route shall be once open and known, scientific men will undertake, & verify
& class its subjects.” Geologists continue to undertake that work today, not only in the areas of the captain’s “Magnetic Iron sand” and “white earth” specimens, but along the entire length of the Lewis and Clark Trail.

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John W. Jengo, a member of the Philadelphia Chapter, is a professional geologist and licensed Site Remediation Professional who works for an environmental consulting firm in Pennsylvania, specializing in hydrocarbon remediation and dam removals to restore migratory fish passage. He has published numerous articles in We Proceeded On since 2002 on the subject of Lewis and Clark’s mineral collection and the significance and scientific influence of their geological discoveries. He was a presenter at the 2003 annual meeting in Philadelphia.

Notes


2. Donald Jackson, ed., Letters of the Lewis and Clark Expedition with Related Documents: 1783-1854, Second Edition (Urbana, Illinois: University of Illinois Press, 1978), 1:63. Jefferson included very specific mineralogical objectives in the list of subjects he considered worthy of note: “the remains or accounts of any [animals] which may be deemed rare or extinct; the mineral productions of every kind; but more particularly metals, limestone, pit coal, & saltpetre; salines & mineral waters, noting the productions of every kind; but more particularly metals, limestone, pit coal, & saltpetre; salines & mineral waters, noting the temperature of the last, & such circumstances as may indicate their character; volcanic appearances.”

3. For details on the three separate mineral collections Meriwether Lewis assembled during the expedition, see Jengo, “Specimine of the Stone’: The Fate of Lewis and Clark’s Mineralogical Specimens,” We Proceeded On, 31:3 (August 2005), 17-26. Any reference to a mineral specimen in the narrative that is prefixed by ‘Fort Mandan mineralogical specimen’ refers to those minerals sent east from Fort Mandan in April 1805.

4. Such as iron sulfide (e.g., pyrites) and calcium sulfate (selenite) minerals in the bluffs of northeastern Nebraska from southeast of present-day Ponca State Park leading northwestward up to the Calumet Bluffs that the expedition traversed between August 22 and September 1, 1804 where the most intensive Fort Mandan mineral specimen collecting took place. See John W. Jengo, “‘Blue Earth,’ ‘Clift of White’ and ‘Burning Bluffs’: Lewis and Clark’s Extraordinary Mineral Encounters in Northeastern Nebraska,” We Proceeded On, 37:1 (February 2011), 6-18.

5. Description of mineral entry no. 1409 in Catalogue of Minerals, Library of the Academy of Natural Sciences (ANS) of Philadelphia, Collection 372. The existence of this and other specimens collected west of the Continental Divide, including a sample of “Pumice. Pacific ocean. Captn. Lewis.” conclusively proved that the captains continued their mineral collecting all the way to the Pacific Ocean.

6. For details on the important role Adam Seybert played in the subsequent fate of the Lewis and Clark mineral collection and how he likely obtained Lewis and Clark mineralogical specimens for his private collection, including the “Magnetic Iron sand” specimen, see Jengo, “Specimine of the Stone,” 21-23.

7. These deposits have been termed “black sands” because they are composed of several dark-colored minerals, the composition of which will be discussed in subsequent footnotes.

8. This is because the sands contain magnetite, one of the few minerals strongly attracted to a common magnet. Magnetite is a black to silvery gray iron oxide (Fe3O4); however, it is not the only mineral lending a blackish color to these beach sand deposits. Other mineral constituents contributing to the blackness of the sand include ilmenite, a black iron titanium oxide (FeTiO3) that is weakly magnetic because of entrained magnetite, and chromite, a dark gray to black iron chromium oxide (FeCr2O4) [with magnetite substituting for iron in many instances] that is weakly magnetic. There can be many other minerals that compose the sand as a whole depending on location, included lighter-weight and light-colored minerals such as feldspar and quartz.

9. Jackson, ed., Letters, 1:82. This magnet was also listed under the “Recapitulation of Purchases by The Purveyor for Capt. Lewis” under “Mathematical Instruments,” Ibid, 1:96.

10. A wealth of historical literature exists regarding the mineralogy of black sands along the Oregon and Washington coasts, which were “discovered” anew in 1852 for their gold and platinum content and were actively researched particularly during the Great Depression and World War II for their potential practicable economic value (primarily the chromium in the chromite). One of the best early assessments of this work was written by the peerless Joseph T. Pardee in 1934, the very same geologist who unraveled the mystery of the Lake Missoula Floods. See Joseph T. Pardee, “Beach Placers on the Oregon Coast,” United States Geological Survey Circular 8 (Washington, D.C.: U.S. Geological Survey, 1934).

11. It should be noted that when the author examined this catalogue at the ANS in Philadelphia, a note in the flyleaf had the catalogue originally ascribed to Gerard Troost, the first curator at ANS, but that notation was struck as follows “Troost, Gerard (†) in favor of a note stating “Seybert’s hand.” There still seems to be some uncertainty as to whether Seybert wrote out this catalogue around the time the collection was sold to the ANS or an unknown person was cataloguing his collection at this time (Personal Communication, Evan Peugh, Archives Assistant, ANS, March 3, 2016). Nevertheless, I am convinced the mineral collection was Seybert’s, not only because he had a prior history with the Lewis and Clark Fort Mandan mineralogical specimens, but also because many specimens in the catalogue state “Göttingen” and “Lower Saxony” in Germany as collection locales where Seybert was known to have acquired an extensive study collection of minerals while he was in Europe under the tutelage of crystallographer René Haüy.
The Black Sands and White Earth


14. As measured by the author, the Slusher Lake/Sunset Beach Recreational Area and Salt Camp were about 7.5 miles and 17 miles, respectively, from Point Adams in 1805-1806. I have Clark encountering the beach in the vicinity of the Slusher Lake/Sunset Beach Recreational Area based on multiple lines of evidence, including Clark's statement in his January 6, 1806, journal entry about that evening's camp "near the 3 Clat Sop houses I visited on the [December] 9th ulto," the mapping of those houses as depicted in Moulton, ed., *Atlas*, 1: Map 84, and Clark's accounting of the roughly eight miles he traveled the following day (January 7, 1806) to reach Salt Camp.

15. Some terminology definitions are necessary here to compare Clark's use of the term "beach" versus the morphology subdivisions now in common use. Clark's "beech" or "beach" was probably the same as today's broad application of both that term and "shore," which includes the area between the low water line up to the area where dunes are present or where a line of permanent vegetation begins. As such, Clark's "beach" would include the swash zone (the band of wave uprush and backwash) that is part of the *foreshore*, and the area beyond the reach of typical wave action up to a dune and/or vegetation line (the area where people pitch their umbrellas and beach chairs beyond the reach of high tide) referred to as the *backshore*. In terms of Clark's November 18, 1805, notations then, he likely found the flounder in the swash zone *foreshore* area and the party encamped in a backshore location.

16. The South Jetty was built between 1885 and 1895 and then extended between 1903 and 1913 across the submerged Clatsop Spit; the North Jetty was built between 1913 and 1917 across the submerged Peacock Spit. See Robert E. Hickson and Frederick W. Rodolf, "History of Columbia River Jettries," in J. W. Johnson, ed., *Proceedings of the First Conference on Coastal Engineering, Long Beach, California, October 1950* (Council on Wave Research and The Engineering Foundation, 1951), 283-98.


18. These excellently detailed U.S. Coast Surveys allowed inter-annual comparisons to be made that revealed how jetty construction between 1885 and 1917 triggered the extensive morphologic changes at the mouth of the Columbia River and adjacent coastlines. These historic charts (i.e., maps) of the mouth of the Columbia River can be accessed via: http://historicalcharts.noaa.gov/historicalcharts/search.

19. The 1851, 1870 and 1874 U.S. Coast Survey charts show the submerged Clatsop Spit extending over three miles north-west of Point Adams, with bathymetry as shallow as 2 feet.

20. There are numerous studies documenting the complex erosional and sedimentation effects of jetty construction and quantifying the amount of shoreline progradation seaward both south and north of the mouth of the Columbia River. Comprehensive measurements indicate that post-jetty shoreline progradation rates from the 1870s onward were approximately double the pre-jetty shoreline change rates estimated from 1700 to the 1870s. See George M. Kaminsky, Peter Ruggiero, Maarten C. Buijsman, Diana McCandless, and Guy Gelfenbaum, "Historical Evolution of the Columbia River Littoral Cell," in Guy Gelfenbaum and George M. Kaminsky, eds., "Large-Scale Coastal Change in the Columbia River Littoral Cell," *Marine Geology*, 273:1-4 (August 2010), 96-126; the Columbia River Littoral Cell or CRLC is a self-contained area of sediment deposition dominated by Columbia River discharges. However, some beaches that were formerly prograding at a rapid rate have now slowed or are eroding due to "human perturbations to the natural system." See Executive Summary, page 1 in Peter Ruggiero, Meredith G. Kratzmann, Emily A. Himmelstoss, David Reid, Jonathan Allan, and George Kaminsky, "National Assessment of Shoreline Change: Historical Shoreline Change along the Pacific Northwest Coast*, U.S. Geological Survey Open-File Report 2012–1007 (Reston, Virginia: U.S. Geological Survey, 2013).

21. These disturbances include the entrapment of sediment behind numerous upriver dams, the reduced flow of the river due to irrigation withdrawals, continued effects of the jetties, offshore disposal of Columbia River dredged sand (thus removing it from the depositional system entirely), and sea level rise due to climate change.

22. Per Kaminsky et al., "Historical Evolution of the Columbia River Littoral Cell," 118. Data cited in this article estimates river-supply of sand to the Columbia River estuary has been reduced by a factor of 3.

23. Only two dams on the upper Snake River (Swan Falls south of Boise, Idaho and Milner Dam west of Burley, Idaho) out of the present-day total of 34 dams on the Columbia and Snake Rivers, were built prior to 1905.

24. As reported on pages 176-77 in Paul D. Komar and Michael Zhenlin Li, "Beach Placers at the Mouth of the Columbia River, Oregon and Washington," *Marine Mining*, 10 (January 1991), 171-87, a study conducted by David T. Day and Robert H. Richards in 1905 found "relatively large amounts of titaniferous magnetite from the ocean beaches north and south of the Columbia River," in addition to the highest concentration of black sands being found at Cape Disappointment and Beards Hollow, which "demonstrate the existence of black sands on the beaches to the immediate north of Columbia River prior to the construction of the north jetty." These data indicate there was an ample supply of magnetic minerals being delivered to the mouth of the Columbia River and adjacent beaches in the years preceding both the construction of the North Jetty and the
commencement of major dam building. A fascinating side note was that many of Day and Richards’ analyses were conducted as part of the 1905 Lewis and Clark Exposition held in Portland.

25. The author did not consider the sand beaches at the beached whale site in Cannon Beach to be a viable sample test location because it seems highly unlikely the captains would have considered this locale to be “near the mouth of Columbia river,” given it is nearly 25 miles walking distance away from Point Adams, and previous studies have indicated that the Cannon Beach sands contain less than 2% magnetite. See page 46 in William H. Twenhofel, “Mineralogical and Physical Composition of the Sands of the Oregon Coast from Coos Bay to the Mouth of the Columbia River;” Oregon Department of Geology and Mineral Industries Bulletin No. 30 (1946).

26. This may be in part due to magnetite and ilmenite being present as inclusions in some quartz grains.

27. These data should not be construed that all Oregon State beach samples are insufficiently magnetic. For example, sand samples from the Peter Iredale wreck in Fort Stevens State Park, located just 1.9 miles from Point Adams and the mouth of the 1805 Columbia River, had a 60% (by weight) magnetic mineral content; however, this locale is over five miles north of where Clark first encountered the beach on his trips to Salt Camp, and thus not relevant to this investigation.

28. So-called “heavy minerals” are those with a specific gravity (ratio of the density or mass of the mineral relative to the mass of an equal volume of water) greater than 2.85. The high specific gravity (sp. gr.) and weather-resistant nature of magnetite (5.2 sp. gr.), ilmenite (4.7-4.8 sp. gr.), and chromite (4.0-5.1 sp. gr.) causes them to become accumulated in “placer” deposits, defined as deposits of minerals, oftentimes valuable ones such as gold and platinum, that were concentrated due to the action of waves (in ocean environments) or currents (in riverine environments).


31. Li and Komar, “Longshore Grain Sorting,” 440. The dominant heavy mineral fraction also includes hornblende, augite and hypersthene, but the concentrations of magnetite and ilmenite decrease most rapidly with distance from the Columbia River.

32. These heavy mineral concentrations reached 66% just north of the Columbia River and 60% south of the river in summer beach deposits, not only illustrating a greater concentration on the Washington State side, but also how enriched with heavy minerals these black beach sands can be. Li and Komar, “Longshore Grain Sorting,” 432.


34. It is beyond the scope of this article to discuss the precise origin of the magnetite, ilmenite, chromite, and other minerals that probably composed Lewis’s “Magnetic Iron sand.” Suffice to say that erosion of the massive deposits of iron-rich Columbia River Basalt Group (CRBG) lava flows and other rocks in the upriver Columbia and Snake River watersheds, along with contributions from Cascade Range volcanic rocks, and rocks composing the Coast Range contributed the bulk of the material (Twenhofel, “Mineralogical and Physical Composition of the Sands,” 8). In October 2016, John W. Fisher kindly sent the author several samples of notably magnetic sand collected east of Lewiston along the Clearwater River, Lapwai Creek, and Potlatch Creek that drain CRBG lava flows almost exclusively (such as the Grande Ronde, Wanapum, and Saddle Mountains Basalt), demonstrating that basalts are a definite source of magnetic sands. It should be noted however that magnetic minerals could have been delivered to the shoreline by the Columbia River in the modern historical era or were sourced from offshore sand bodies deposited hundreds or thousands of years ago by the Columbia and other rivers and transported back onto the beaches of Oregon and Washington State as sea levels rose.

35. See Jengo, “After the Deluge: Part I,” 12-13, for a discussion of the possible identification and collection locality of a potentially yellowish to grayish-white deposit in the vicinity of the Columbia and Walla Walla River confluence.

36. The intermixed distribution of the Grande Ronde Basalt and Astoria Formation across Tillamook Head (along with isolated occurrences of younger Wanapum Basalt intrusives) was mapped in Alan R. Niem and Wendy A. Niem, Geologic Map of the Astoria Basin, Clatsop and Northwestern Tillamook Counties, Northwest Oregon, Oregon Department of Geology and Mineral Industries Oil and Gas Investigation 14 (OGI-14), 1985, Plate 1, Scale 1:100,000. Alan Niem, Professor Emeritus of Geology, College of Earth, Ocean, and Atmospheric Sciences, Oregon State University, has continued refining the geological map of this area under contract to the United States Geological Survey (USGS), Menlo Park, but as of February 2016, this map had not been published by the USGS (Personal Communication, Alan Niem, February 1, 2016). However, the author downloaded files from the Geologic Resources Inventory Digital Geologic data for Lewis and Clark National Park to assemble a geological map in GIS that reflects the latest mapping and interpretation of Tillamook Head geology.

37. The Miocene Epoch was 23 to 5.3 million years ago.

The Black Sands and White Earth

39. Wickup Mountain is located roughly 20 miles northeast of Tillamook Head; Nicolai Mountain is located just over five miles farther east from Wickup Mountain near the border of Clatsop and Columbia Counties, Oregon.

40. Wells, et al., “Gorge to the Sea,” 761. Only relatively recently was the hypothesis put forth that “coastal basalts” exposed at Tillamook Head, Haystack Rock, The Needles, and other locales were the distal ends of the plateau basalts in the Columbia Plateau and Columbia River Gorge. Their discontinuous, sill and dike character was thought to be a result of a local vent origin, but was actually a consequence of the interaction with water-saturated sediments. See Martin H. Beeeson, Rauno Perttu, and Janice Perttu, “The Origin of the Miocene Basalts of Coastal Oregon and Washington: An Alternative Hypothesis,” *Oregon Geology*, 41:10 (October 1979), 159-66.


42. The age date of 15.9 ± 0.4 Ma was reported in Alan R. Niem and Frank B. Cressy, Jr., “K-Ar Dates from the Nehkahmie Mountain and Tillamook Head Areas of the Northwestern Oregon Coast: Isochrone-West, 7:3 (1973), 13-15.

43. The footnote in Moulton, ed., *Journals*, 6:179, n12 has the origin of Tillamook Head as an “intracanyon flow in the valley of an ancestral Columbia River,” a description more applicable to Crown Point and Mitchell Point in the Columbia River Gorge, which were subaerially-exposed fluvial canyons that were filled with intracanyon basalts flows. Based on recent research, Tillamook Head was formed when intrusive molten Grande Ronde Basalt invaded sediments (primarily mudstones) deposited in deep marine shelfal/slope paleoenvironment adjacent to a deeply submerged submarine canyon.

44. According to Alan Niem, the mudstones were bleached or hydrothermally altered to a low-grade metamorphic state when heated by the invasive molten basalt. Woody carbonaceous material, organic matter, and/or any pyrite present that originally colored the mudstones gray would have been thermally cooked, bleached white, distilled to gases, and/or leached by the superheated hydrothermal fluids circulating through the mudstone (Personal Communication, Alan Niem, April 30, 2016).


46. It should be noted that Roger Wendlick, a prominent Lewis and Clark book collector and enthusiast, conducted a reconnaissance of Tillamook Head in 2001, two years prior to the author’s initial investigation. Upon discovering a recently exposed outcrop of “white earth,” Mr. Wendlick had two separate samples analyzed, which prompted a comparative analysis of those results to the mineralogical information in Kirwan’s *Elements of Mineralogy*. See Roger D. Wendlick, “In Search of the White Earth on the Trail to the Whale,” *Lewis and Clark Trail Heritage Foundation Oregon Chapter Newsletter*, 4:1 (February 2002), 4-11.

47. Formerly referred to as the Old Military Bunker Viewpoint on older Ecola State Park maps.


49. The “Route to the Whale Site” sketch map from Clark’s First Draft is shown as Figure 13 in Moulton, ed., *Journals*, 6:170. The ocean view probably was not sufficient as an observation point to measure course and approximate distances to significant landmarks, which Bird Point the following day (January 8) would provide, but it afforded an opportunity to collect a “white earth” sample.

50. Evidence that Clark’s “white earth” deposit was encountered late on January 7 (and not conflated with a possible “white earth” encounter at Bird Point on January 8) can be found in the sentence following the observation of the “Strater of white earth” when Clark noted that his party “left the top of the precipice and proceeded on a bad road and encamped on a Small run [Indian Creek] passing to the left,” which described their January 7, 1806 camp.


53. The term “argill” was typically used to describe a clay, particularly white-colored clay. The term persists in the word “argillaceous,” used to describe a rock with an appreciable amount of clay; Robert L. Bates and Julia A. Jackson, eds., *Glossary of Geology*, Second Edition (Falls Church, Virginia: American Geological Institute, 1980), 34. Important for our discussion is that “argill” would have been characterized by aluminosilicate minerals composed of aluminum, silicon, and oxygen, particularly clay minerals such kaolinite, montmorillonite-smectite, illite, and chlorite.

54. There are several pages of tables where Kirwan listed these compounds in a dissertation regarding their fusibility in the manufacture of porcelain. See Kirwan, *Mineralogy*, 1:65-66.

55. X-ray fluorescence (XRF) involves bombarding a substance with high-energy X-rays or gamma rays, which results in the emission of X-rays that reveal the characteristics of the elements composing the analyzed material. Both the XRF and XRD results cited in this article were provided in Activation Laboratories Ltd, “Whole Rock Analysis (XRF) and X-ray Diffraction Analysis of Tillamook Head White Earth Sample, *Certificate of Analyses Report No. A16-01399*."

56. X-ray diffraction (XRD) obtains information about the structural identity of crystalline materials when X-rays directed at a sample are diffracted in characteristic directions by the crystal structure of the material, revealing a pattern of diffractions that can be compared to the type patterns of known minerals.


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Baleen, Blubber & Train Oil from
Sacagawea’s “monstrous fish”

By John W. Fisher

Scientists and volunteers spent about a week stripping the blubber and meat from the blue whale skeleton, taking samples for study, bones for a museum display, disposing of the fat by burning, and the flesh by burial. Photograph by Tom Calvanese
The Corps of Discovery's journey west from Three Forks in 1805 took its toll. The expedition's diet of lean red meat, and unfamiliar dried fish and roots, was far from satisfying. They were desperate for the rich hunger-satisfying diet full of fats and oils they had enjoyed on the middle and lower Missouri. We often read of their delight in the occasional marrow bone soup, beaver tail, and oil-rich sturgeon and eulachon on the west coast. All of these are of particular fascination to me as a student of the health and medicine of the expedition. Over the past sixteen years I have tried to obtain examples of all the foods consumed by the expedition, but despaired of ever getting blue whale oil because of the animal's protected status and the consequent restrictions on access and use of any products from its accidental death.

In November 2015 I read of a stranded blue whale on the Oregon Coast and resolved to try to get a sample of blubber and render it into oil just as the expedition did in the winter of 1806 at Fort Clatsop near the Oregon Coast. It was the beginning of a fine adventure.

But first let us explore the expedition's history with whales.

Fish and marine mammal strandings were a common and important food source for coastal Indians and scavengers such as the condor. On 18 November 1805, while at Station Camp near the mouth of the Columbia River, Clark and a party of ten explored the coastline north from Cape Disappointment. While on that junket Reubin Fields shot a condor feeding on whale remains. Detailed measurements were taken of the bird, but drawings and a more detailed discussion of it, Gymnogyps californianus, would be made by Clark on 16 February 1806, and Lewis the following day.

A few weeks later on 27 December, as the corps was finishing the construction of Fort Clatsop, both Private Whitehouse and Sergeant Gass recorded that passing Indians told of a whale washed ashore south along today’s Oregon coast. The next day Sergeant Ordway recorded that Captain Lewis and three men prepared to leave to see the whale, but foul weather prevented their departure. On 29 December Clark provided more details: “we were informed day before yesterday that a whale had foundered on the coast to the S. W. near the Kil a mos N. and that the greater part of the Clatsops were gorn for the oile & blubber,” . . .”

The next few days were spent finishing the fort, celebrating the New Year, and trading with the local Indians. On 3 January 1806, both Captains report: “At 11 A. M. we were visited by our near neighbours, Chief or Tiá, Co-mo-wool; alias Conia and six Clatsops. the[y] brought for sale some roots buries and three dogs also a small quantity of fresh blubber. this blubber they informed us they had obtained from their neighbours the Callamucks who inhabit the coast to the S. E. near whose vilage a whale had recently perished. this blubber

In November 2015 a blue whale washed up on Ophir Beach, southwest Oregon, about 50 miles north of the California border. An extremely rare event, this was the first known blue whale stranding along the Oregon coast since at least the 1960s. Photograph by Jared Hughey
the Indians eat and esteeme is excellent food.” They go on to note that dog and elk marrow bones were the best food the Corps had at that time.

Finally on 5 January, passing Indians traded them some blubber and Lewis reported: “it was white & not unlike the fat of Poark, tho’ the texture was more spongy and somewhat coarser. I had a part of it cooked and found it very palatable and tender, it resembled the beaver or the dog in flavour.” Clark prepared to set out the next morning with twelve men in two canoes to trade for as much blubber as their small amount of merchandise would allow. Men returning from the salt works that day also reported the good meat of the whale.

Lewis provided a keen insight regarding Sacagawea’s strength of character on 6 January. “Capt Clark set out after an early breakfast with the party in two canoes as had been concerted the last evening; Charbono and his Indian woman were also of the party; the Indian woman was very impotunate to be permitted to go, and was therefore indulged; she observed that she had traveled a long way with us to see the great waters, and that now that monstrous fish was also to be seen, she thought it very hard she could not be permitted to see either (she had never yet been to the Ocean).” They set off to the south down the inland bays and crossed creeks near some Clatsop houses, then camped on the shore during the first fair night in two months.

The next day they arrived at the saltmaker’s camp (present-day Tillamook Head, which blocked the shore route, and realized they would have to ascend the steep trail over the 1200-foot-high rocky headland. The exhausted party was forced to camp on top near a small stream.

The party was treated to another fine day on 8 January, affording a great view of the sea coast. They arrived at five lodges of the Tillamook nation near the mouth of Ecola Creek on the north side of present-day Cannon Beach. Clark best described the scene: ’

Crossed a Creek 80 yards near 5 Cabins, and proceeded to the place the whale had perished, found only the Skeleton of this monster on the Sand between 2 of the villages of the Kil a mox nation; the Whale was already pillaged of every valuable part by the Kil a mox Inds. in the vicinity of whose village’s it lay on the Strand where the waves and tide had driven up & left it. this Skeleton measured 105 feet. I returned to the village of 5 Cabins on the Creek which I shall call E co-la or whale Creek, found the nativs busily engaged boiling the blubber, which they performed in a large Squar wooden trought by means of hot Stones; the oil when extracted was Secured in bladders and the Guts of the whale; the blubber from which the oil was only partially extracted by this process, was laid by in their Cabins in large flickes for use; those flickes they usially expose to the fire on a wooden Spit untill it is prutty well wormed through and then eate it either alone or with roots of the rush, Shaw na tâk we or diped in the oil. The Kil a mox although they possessed a large quantities of this blubber and oil were so
prenurious that they disposed of it with great reluctance and in small quantities only; insomuch that my utmost exertion aided by the party with the small stock of mer chindize I had taken with me were not able to procure more blubber than about 300 wt. and a few gallons of oil; Small as this Stock is I prise it highly; and thank providence for directing the whale to us; and think him much more kind to us than he was to jonah, having Sent this monster to be Swallowed by us in Sted of Swallowing of us as jonah’s did.

Judging from the skeleton’s length, it could have been that of a blue whale (*Balaenoptera musculus*), the largest of all living animals. Clark was meticulous in his calculations, but he was measuring a dismembered whale and experts have questioned his figures. Historic data show that the maximum length of blue whales in the North Pacific is about 80 feet, while in the South Pacific they reach over 100 feet.¹

After examining the whale and securing blubber and oil, the party re-crossed Ecola Creek and camped for the night, Clark smoking with and interviewing the Indians for cultural and geographical information. They left early the next morning and again Clark’s words best describe the traverse over Tillamook Head to the Saltworks Camp.

I had the blubber & oil divided among’ the party and Set out about Sunrise and returned by the Same rout we had went out, met Several parties of men & womin of the Chinnook and Clatsops nations, on their way to trade with the Kil a m ox for blubber and oil; on the Steep decent of the Mountain I overtook five men and Six womin with emence loads of the Oil and blubber of the Whale, those Indians had passed by Some rout by which we missed them as we went out yesterday; one of the women in the act of getting down a Steep part of the mountain her load by Some means had Sliped off her back, and She was holding the load by a Strap which was fastened to the mat bag in which it was in, in one hand and holding a bush by the other, as I was in front of my party, I endeavored to relieve this woman by takeing her load untill She Could get to a better place a little below, & to my astonishment found the load as much as I Could lift and must exceed 100 wt. the husband of this woman who was below Soon came to her releif, those people proceeded on with us to the Salt works, at which place we arrived late in the evening.

Clark and most of the party returned late on 10 January to Fort Clatsop and while Lewis’s journal reviews the major events of the trip, Ordway and Whitehouse add some new intriguing details. Both mention the party bringing back “jaw bones” and Ordway adds: “and some other black bones which are handsome.” That could only mean that in addition to blubber and oil, they also brought back some of the 270-400 plates of baleen, the yard long black plastic-like filter feeders from the mouth of the whale. Much later, on 14 March, Clark records yet another reference to baleen in a discussion of trading ships that visit the coast. “we are informed by the Clatsops that they have latterly Seen an Indian from the Quin-na-chart Nation who reside Six days march to the N. W and that four vessels were there and the owners Mr. Haley, Moore, Callamon & Swipeton were tradeing with that noumerous nation, whale bone Oile and Skins of various discription.”

Both Lewis and Clark note the extensive trade network between the Indians living far upstream along the Columbia, near present-day Portland, Oregon, and the coastal Indians. While on their trip up the Columbia River on 6 April they again noted the trade in “train oil” (whale oil) between the Cushooks nation and the Killamucks.²

On 24 January Lewis recorded several species of roots which were commonly eaten with “train oil.” This led me to read the account of John R. Jewitt, a sailor captured and enslaved by the Nootka Indians to the north just prior to the Corps’ time at Ft. Clatsop. His account of two and a half years of captivity provides a detailed look at the extensive use of whale oil in virtually every meal of northwest coastal Indians, perhaps suggesting why they were so reluctant to trade any to the expedition members.³
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The welcome addition of blubber and whale oil to the diet lasted until 29 January, but there was still another treat that came in on 3 February with the return of the salt makers and their two bushels of salt. They also brought some whale meat which they added to their poor elk meat and “finds it verry well—” according to Ordway. Whitehouse added: “The natives call the whale meat E-Co-ley.—” This suggests that the whale meat lasted over a month while the elk meat frequently spoiled in only a few days. It may be the fat content made the difference in spoilage, or it could be the meat was from a new stranding, since whales were far more numerous in 1806 than today.

**Rendering the Blubber into Oil**

Obtaining specimens of protected species for museum displays can be next to impossible, as I found out when I tried to get grizzly bear fat to test Lewis’s observation that the oil had a higher melting point than black bear oil. The United States Fish and Wildlife Service denied my request when I asked for some fat from a grizzly bear mortality.

Thus I was used to tilting at windmills when I read of a blue whale stranded on the Oregon Coast in early November 2015. I tracked down Jim Rice, Stranding Coordinator of the Marine Mammal Institute of Oregon State University at Newport, Oregon. He agreed to collect, as it turned out, thirty pounds of blubber from the whale, but said I had to seek permission from National Ocean & Atmospheric Administration (NOAA), Fisheries, Regional Stranding Coordinator out of Seattle Washington. That process ultimately took about six months.

Because I am an independent scholar not affiliated with any governmental agency, I anticipated I would need letters of interest and support from museums across the country who might like a specimen of blue whale oil to put in their Lewis and Clark exhibits. I sent out over a dozen requests for letters of support and received enough to submit to NOAA.

Finally, on Monday, 23 May 2016, a few days after receiving permission from NOAA, I drove to Newport, Oregon, to pick up 30 pounds of frozen odiferous blubber. The sixty-nine-foot blue whale was emaciated when it died, possibly due to an injury that impeded its feeding, and thus it had only a thin four- to five-inch layer of blubber. Volunteers had taken a week to strip the whale in order to salvage the bones for a future exhibit. While whale strandings in general are somewhat common, blue whale strandings are extremely rare.

In June I gathered my supplies: pint and half pint canning jars, a fifty foot electrical cord leading to an electric hot plate in the back yard, and a brass bucket similar to what the expedition would have used to boil salt water or whale blubber. Two razor sharp knives were quickly dulled as I carefully separated the surprisingly thin (1/16” to 1/8”) skin from the blubber, cut the blubber into two-inch blocks, and dropped them in the bucket. The rendering was much like that of bear or pig fat, and the blubber ultimately yielded eleven pints of whiskey colored whale oil at a temperature of about 140 degrees Fahrenheit. I also saved some of the whale skin preserved with vinegar in the smaller half pint canning jars. Who would have expected the giant whale to have such thin skin? I also added some of the rendered “cracklings” to the whale skin jars. It took three long mornings to complete the “trying-out,” the historic terminology for rendering, and I shipped all the jars back to NOAA in Seattle to be sent to the various museums after the requests and requisite paperwork were completed. NOAA returned a jar for educational purposes so that I can exhibit blue whale oil as I travel the United States presenting programs on the Lewis and Clark Expedition. A special “thank you” to Kristin Wilkinson of NOAA for facilitating this project.

Besides adding much needed high calorie fat to supplement their Spartan diet, it is likely that the expedition made use of whale oil in their oil lamps at Fort Clatsop, which they had in addition to candle lanterns.¹ The rendering of blubber was one more example of the Corps taking every opportunity to render fat along their route.
The unusually thin layer of blubber suggested a starving whale. Photos by author.

The author used a brass bucket, as would the corps, to render the blubber, but over an electric hot plate.

The author cut the blubber into 2 inch cubes to render out the oil. Surprising discoveries were that the grey-blue skin was only about 1/16 to 1/8 inch thick, and that knives had to be resharpened every five minutes to remove the skin and cut the squares.

The blubber was rendered at about 140 degrees Fahrenheit and produced 11 pints of whiskey colored oil.
In addition to accomplishing this experiment of rendering blue whale blubber, this past winter (2016-17) I acquired some grizzly bear fat and more black bear fat . . . but that is another interesting story yet to be told in detail.

Independent scholar John W. Fisher has been studying the Euro-American material culture of the Lewis and Clark Expedition for seventeen years. He is still working on the Sisyphean task of trying to assemble a collection of period artifacts that represent all of those carried on the expedition. Fisher welcomes inquiries and information on that subject. jwfisher1961@gmail.com

Notes

1. John Calambokidis and Gretchen Steiger, Blue Whales, (Stillwater, MN: Voyageur Press, 1997), 20-23, 43-52. John and his wife Gretchen report that data from the first half of the twentieth century, when most blue whales were harvested, indicates females could reach about one hundred feet in length in the Antarctic or Southern Ocean. Hunted to near extinction during the mid-twentieth century, their population is about 1 percent of historical estimates of 200,000 whales. The smaller-sized blue whales off the North American coast reach a maximum length of about eighty feet. The population along the California and Mexican coast seems to be recovering, while severely depleted stocks in the other oceans may take decades.


3. Hilary Stewart, ed., The Adventures and Sufferings of John R. Jewitt Captive of Maquinna (Seattle: University of Washington Press, 1987), 51, 78, 131. Frequently insulted, robbed, and occasionally murdered by the crews of trading ships, the Indians along the Northwest coast sometimes attempted to capture the ships. Ship armourer and blacksmith John R. Jewitt was one of two survivors of a successful attack and capture of the ship Boston on 22 March 1803. The chief allowed him to live because of his valuable skills, but only if he agreed to be the chief's slave. For the next two and a half years he kept a journal of his life among the Nootka Indians. On 19 July 1805 he was ransomed by another ship. The ship continued trading along the coast, and in November returned to the mouth of the Columbia where they met Indians who had traded with Lewis and Clark just two weeks earlier. After returning to New England he published his “Adventures,” one of the most popular journals of the nineteenth century.

4. Donald Jackson, ed., Letters of the Lewis and Clark Expedition, with Related Documents: 1783-1854, 2nd ed. (Urbana: University of Illinois Press, 1978), 1:79. Isreal Whelen, Purveyor for the United States, purchased of Thomas Passmore two “Lanthorns” [lanterns] for a dollar each. These would have been for the beeswax candles the expedition carried. They also carried candle moulds and wicks that could have been used to make candles out of bison or elk tallow. Whelen also purchased two “Lamps.” 25 cents each, that would have been designed for bear oil that the expedition frequently rendered, and would have been perfect for whale oil.
Empires of the Turning Tide: A History of Lewis and Clark National Historic Park and the Columbia-Pacific Region.

By Douglas Deur, with contributions by Stephen R. Mark, Deborah Confer, and Rachel E. Lahoff.


Reviewed by Ted Kaye.

Rarely has a government-funded program produced such clear and cogent benefits for the general public—perhaps not since the Lewis and Clark Expedition itself have we enjoyed such a significant benefit along the Trail from federal largesse.

The National Park Service underwrote a study of “the historical context of the lands now within the Lewis and Clark National and State Historical Parks,” a collection of units of the NPS and Oregon and Washington state park systems comprising ten-plus sites related to the Corps of Discovery’s 1805–06 stay. It engaged Doug Deur, an anthropology professor at Portland State University, to pursue a broad vision to place Lewis and Clark’s story in the context of the events occurring before and after their arrival. The resulting book successfully and artfully combines the expedition’s Pacific Coast story with an engaging regional history.

The text follows an understandable narrative—it begins with chapters on the region’s environment, native people, European exploration. A succeeding chapter focuses specifically on the Lewis and Clark Expedition, then chapters follow on the fur trade, settlement, salmon canning, timber harvesting, the Columbia Bar, military fortifications, recreation, and a conclusion.

The chapter on the Corps paints an accurate picture of its stay on the Pacific Coast, an appropriate summation of the Lewis and Clark story of November 1805 to March 1806. But the book’s greatest value lies in explaining the region’s situation before our explorers arrived and its evolution after they left—in part influenced by the consequences of that visit. I’ve seen no better explanation of the geopolitical situation in which the Expedition took place, and for that alone the book delivers.

This broader history of the region provides the true value. For those who observe the built environment with a keen eye, vestiges of the past abound in the area—pilings of canneries, abandoned gun emplacements, shipwrecks, railroad stations and rights of way—all better understood after reading this book. In fact, foundation members planning to attend the annual meeting in October 2018, would do well to read it in preparation for their visit. Personally, I especially appreciate having this resource in advance of any trip to the coast from my home in Portland.

The book, termed “very much a group effort,” reflects the substantial contributions of a number of fellow researchers, NPS employees and volunteers, tribal resources, federal archivists, subject-matter experts, and staff from nearly every museum in the region. Their participation helped create an engaging, deep resource.

Dr. Deur brings to the work his research interests in “cultural and political ecology, ethnobiology, cultural landscapes, contested spaces, applied research, cultural perspectives on natural resource management and restoration, resident communities’ interests in national parks and protected areas, ethnohistory, and Northwestern North America.” His prose can be inspiring. For example, regarding Russia and Spain in the early eighteenth century, he writes: “While different in many respects, both empires were astonishingly vast and expansionistic, ploddingly autocratic, and increasingly overextended, especially on their most remote Pacific frontiers.”

While it reads as popular non-fiction, the book’s academic bona fides are strong—the bibliography, end notes, and index make up over a quarter of its pages. In a nice touch, the text is presented in old map fonts: Cabin, Cardo, and Merriweather (yes, that might be Clark’s spelling!). Best of all, the book

May 2017  We Proceeded On  31


Reviewed by Robert Clark

Thirty years after the Corps of Discovery traveled west to the Pacific the Upper Missouri country had changed radically. Fur trade expansion, establishment of forts and posts, migration of indigenous peoples, devastation visited by disease—all these and more altered the physical and cultural landscape.

The journals of Maximilian of Wied offer a remarkably detailed account of that landscape based on his journey up the Missouri to Fort McKenzie (below today’s Great Falls, Montana) and back in 1833–1834. These recorded observations are among the most important firsthand sources documenting the early-nineteenth-century American West.

Additionally, Maximilian’s travels between Boston and St. Louis offer a firsthand glimpse of Jacksonian America in rich detail, including visits to New York, Philadelphia, Pittsburgh, New Harmony, and travel through the Ohio Valley and along the Great Lakes.

This volume contains a new, concise edition of Maximilian’s journals. Originally published in three magnificent large-format volumes between 2008 and 2012, the complete text included extensive notes (by both Maximilian and contemporary editors) as well as numerous sketches and asides. The roughly 700,000 words in those volumes are here reduced to a little more than 200,000, highlighting the expedition’s most significant encounters and dramatic events in one easy to hold and read book.

As noted in the “Editorial Procedures,” Maximilian wrote a journal entry for almost every day of his two-year sojourn. A very few have been entirely deleted, a few combined, and most condensed. However, the heart of his descriptions—geographical, biological, linguistic, and ethnographic—have been retained.

Embellished with a 32-page color section reproducing many of Karl Bodmer’s watercolors, and including editorial notes and an index, this new rendering of Maximilian’s journals offers a more accessible gathering of his remarkable writings. The prince experienced the American frontier just before its transformation by settlers, miners, and industry. As a supplement to the three-volume complete journals, or a stand-alone volume, it belongs on the shelf of all students of the early American West.

Robert Clark is editor of We Proceeded On, and editor-in-chief of Washington State University Press.
The Louisiana Purchase Historic State Park

By Jerry Wilson, Ohio River Chapter
Photos by Janice Wilson

On a recent adventure through the Mississippi (and Arkansas) Delta, Janice and I made a side trip to an “off the trail” Lewis and Clark site. Actually, the Louisiana Purchase Historic State Park doesn’t proclaim association with either the Lewis and Clark expedition or trail, but in my opinion, it is a location where anyone who travels to that area can relate to the Lewis and Clark story.

Louisiana Purchase Historic State Park commemorates the initial point from which land surveys of the United States territory acquired through the 1803 Louisiana Purchase were begun. In 1815 President James Monroe ordered the territory surveyed to permit the orderly award of land in the territory to veterans of the War of 1812. Two teams of surveyors were commissioned to identify a starting point for the survey work in what is now eastern Arkansas. One team started north from the mouth of the Arkansas River, while another team started west from the St. Francis River. The Fifth Principal Meridian was established where the two survey lines crossed. Two trees were blazed to mark the meeting point of the two survey lines.

Louisiana Purchase Historic State Park is located at the end of Arkansas Highway 362 off of U.S. Highway 49 in the Brinkley, Arkansas, area. Highway 362 is approximately two miles long and built specifically as an access to the park, situated in a headwater swamp with many large water tupelo and bald cypress trees. Once you have reached the road’s terminus a parking lot is available. An elevated boardwalk then takes you over swampland to the site.

The Louisiana Purchase Survey Marker is six feet in height and typically stands in about one foot of swamp water. When Janice and I were there in fall 2016 it was obviously the dry season, as there was no water in the swamp. The land itself was wet and there were water marks on the monument and the nearby trees. The inscription on the monument reads, “This stone marks the base established November 18, 1815, from which the lands of the Louisiana Purchase were surveyed by United States engineers. The first survey from this point was made to satisfy the claims of soldiers of the War of 1812 land bounties.”

The park is far off the official Lewis and Clark trail, yet I believe it has important connections to the expedition. When the subject of famous surveyors is discussed, the names of Meriwether Lewis and William Clark are normally mentioned as well known and well respected surveyors. One of the many purposes of the Lewis and Clark Corps of Discovery Expedition was to make it possible to open up the Louisiana Territory for settlement, which in turn demanded the establishment of survey lines.

Thank you to Lorna Hainesworth for alerting me to this Off the Trail site, and I believe it was Della Bauer and Mary Langhorst who alerted her to its location. These people are proud to pass on their knowledge. Thank you all.