Volume 24: Issue 2
April, 2013

LINES & POINTS

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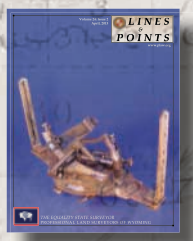
THE EQUALITY STATE SURVEYOR
PROFESSIONAL LAND SURVEYORS OF WYOMING



On The Cover

U.S. Deputy Surveyor William Octavius Owen's *W. & L. E. Gurley* Solar Compass
(Photo by Michael Beale)

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2012 PLSW SUSTAINING MEMBERS

- John Baffert - Surv-KAP, LLC
- Troy Langston - Monsen Engineering
- Richard Monsen - Monsen Engineering
- Bryan Baker - Frontier Precision Inc.
- Chris Farnsworth - RDO Integrated Controls

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For more information please contact Pete Hutchison or Jack Studley.

PRESIDENT'S MESSAGE

Dear PLSW Members,

The grass will be green across our great state before we know it. Spring is just around the corner. Hopefully you are each busy with plenty of work to be completed. First, I wish to thank the membership for the vote of confidence in electing me as your president for the 2013-2014 term. I promise you I will do what it takes to represent PLSW with integrity and continue to promote the values we have come accustomed to as a membership.

Shortly after receiving the gavel from Cotton, he informed me of additional duties requiring my involvement. First obligation was to sit on the University of Wyoming's Land Surveying Advisory Board. It truly was an eye opening experience to learn of all the obstacles the advisory board jumps through to keep the existing classes and ultimately assist the University in the potential of offering a four year degree in the future. These board members are determined and very driven.

I officially took oath on February 7th; on February 8th I received an invitation to attend the Montana Association of Registered Land Surveyors (MARLS) Conference. Shortly after returning home from WES I made the decision to make a fast trip to Missoula, Montana. I encourage each of you to attend a MARLS conference; they do an outstanding job of creating a conference with a large variety of topics that are attended by an array of people (250ish), besides surveyors the rooms were filled with attorneys and county recorders. It was truly an honor to represent PLSW.

Becoming a 100% membership in NSPS was a mile stone for PLSW. Once we are able to finish all the necessary paperwork and actually take full advantage of the membership, our voices will become louder.

In closing, I want to thank the membership for their involvement; PLSW would not exist if it was not for all the volunteers that promote our profession, and I urge you all to keep it up. A special thanks to Marlowe for the work he puts into this organization, and how chaotic things would be without him.

Respectfully,

Cevin C. Imus, P.L.S., President
Professional Land Surveyors of Wyoming

ANNOUNCEMENTS

The Wyoming Engineering Society conference in February 2013 at the Parkway Plaza & Convention Center in Casper was a success and very well attended. The Professional Land Surveyors of Wyoming (PLSW) scheduled their Annual Business Meeting as a part of the conference. Meeting highlights included the announcement of the passage of the resolution to increase dues to participate in 100% joint NSPS membership, and new officers were elected and installed.

In addition, there were four well presented and attended training sessions:

AUTOMATED MACHINE CONTROL by Curtis Clabaugh, PE, LSIT, WYDOT;

GCDB UPDATE by Suzie Sparks, PLS, BLM, and Dennis Dawson, PLS, Cornerstone Surveying;

CASPER CORS STATION by Jim Jones, PLS, CEPI, and Mike Londe, LSIT, BLM; and

GIS AND SURVEY WORKFLOW by Steven Cowley, WLC.

The City of Cheyenne and S.E. Chapter of PLSW received the WES Presidents Project of the Year Award for Surveying for the RECORD OF SURVEY - ORIGINAL CITY OF CHEYENNE project.

Joe Lord presents the 2013 WES President's Project Award to Jack Studley and Herb Stoughton

Early registration is $250 (save $75) available through June 30

Lines and Points Article Rotation Submission Schedule By Chapter

Responsible Chapter	First Call Date	Last Call Date	Publication Date
West Chapter	Thank You!! (see *Stones and "Bones"* in this issue)		
Central Chapter	June 1	June 15	July 1
South Central Chapter	September 1	September 15	October 1
Southeast Chapter	December 1	December 15, 2013	January 1, 2014
Laramie Valley Chapter	March 1	March 15	April 1
Upper Platte Chapter	June 1	June 15	July 1
Southwest Chapter	September 1	September 15	October 1
Northeast Chapter	December 1	December 15, 2014	January 1, 2015
Northwest Chapter	March 1	March 15	April 1

As the Board of Directors discussed, any four page article (with pictures) may be from within the particular chapter membership (survey stories, or technical experiences) or after acquiring permission to use an article from another professional society publication or which provides information of interest to the PLSW members. The Board also approved assigning the responsibility for the article development and submission to each chapter's vice president. If a Chapter does not provide an article that same Chapter shall be obligated to provide an article for the next publish date.

William "Rad" Radlinski

A World War II veteran and Former Associate Director of the U.S. Geological Survey died February 15, 2013, at Loudoun Hospital in Leesburg VA at the age of 91 after a brief illness. He was born on August 13, 1921, in Salamanca, New York. He served in the Army Corps of Engineers as a Topographic Engineer officer in the European Theater of Operations during WWII where he was in three Campaigns, including the Battle of the Bulge. After the war, he graduated from Hofstra College and attended Georgetown University Graduate School. He remained in the US Army Reserves retiring in 1981 at the rank of Lt. Colonel.

A Registered Professional Engineer and Certified Photogrammetrist, Radlinski had a 30-year career with the U.S. Geological Survey where he was the Associate Director for ten years, nearly two of which he was Acting Director. Radlinski was president of the American Society of Photogrammetry in 1968, President of the International Federation of Surveyors for three years in the mid 1970s, and was an Honorary Member of Great Britain's Royal Institution of Chartered Surveyors and of the Federation International des Geometres. He traveled extensively including trips to the Soviet Union and was co-chairman of a joint US-USSR committee on environmental protection in the oil and gas industry. Mt. Radlinski, a 9,020-foot mountain in Antarctica, was named after him in 1963. Radlinski received the US Department of Interior's Distinguished Service Award and was a member of the Cosmos Club since 1970. After retiring from the Government in 1979 Radlinski served as Executive Director of the American Congress on Surveying and Mapping for five Years.

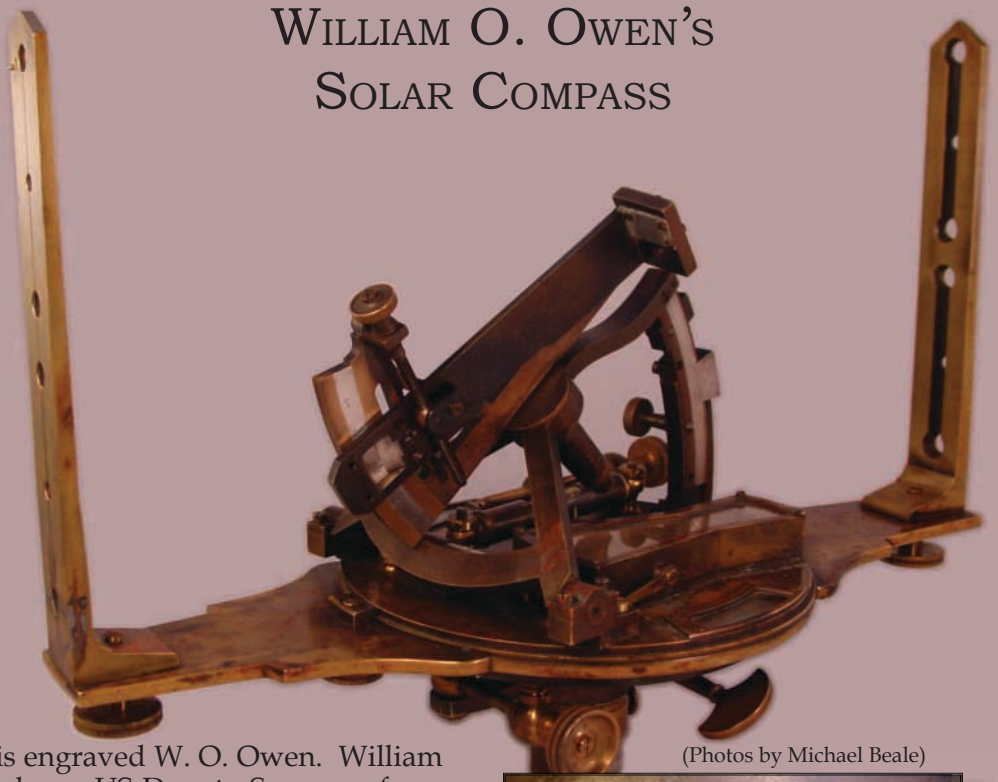
For over 15 years William Radlinski resided at Falcons Landing, a continuing care retirement community in Potomac Falls, VA where he served as president of the Residents' Council and the chairman of the newsletter Editorial Board. He was an avid writer and unrelenting editor, a genealogist, a photographer, woodworker and he played tennis well up into his eighties.

He is predeceased by his beloved wife, Theresa (Harmuth); brothers Leonard, James, Fred, and Donald; and a sister Anne Marie Skrobacz. He is survived by sons Richard of Queenstown, MD and Robert of Bethesda, MD, and a sister Julie Fusiara of Olean, NY. He has three grandchildren and seven great grandchildren.

William O. Owen's Solar Compass

Have you ever wondered where the surveying instruments used by the original surveyors of Wyoming ended up? Well in this case we now know.

Michael Beale, U.S. Forest Service Land Surveyor, recently purchased a solar compass owned by William O. Owen, U.S. Deputy Surveyor. Mike purchased the instrument from an antique dealer in Belle Fourche, South Dakota, in October, 2012. The antique dealer had purchased the instrument from some fellow that had walked in off the street, who had bought it at a local estate sale.



(Photos by Michael Beale)

The instrument is a Burt's (pattern) solar compass made by W. & L. E. Gurley about 1880. Included with the instrument was the original box. As you can see in one of the photos, the instrument is engraved W. O. Owen. William Octavius Owen (1859-1947) worked as a US Deputy Surveyor from 1881 to 1894 and was one of the most productive original surveyors in the state of Wyoming during the contract era. He was also a county surveyor for Albany County and US Examiner of Surveys for the Department of the Interior until his retirement in 1914.

Geodetic Surveying: Part II *The Origins of Control Surveying*

Herbert W. Stoughton, PhD, PELS, CP
Geodetic Engineer

In the first part of this series the mathematical foundations were introduced. In 1533, Gemma Frisius (9 December 1508 - 25 May 1555) was born Jemme Reinerszoon. Dr. Frisius taught Gerardus Mercator the mathematical principles that Mercator used to develop the map projection bearing his name. Frisius proposed using triangulation to accurately position widely spaced points on land. Although triangulation was known from the time of Thales, it was not used by the Romans. The procedure was used in China c. 250 A.D. Arabic treatises introduced the concepts in the first one-half of the eleventh century.

The modern discussion about triangulation is solely the work of Frisius in his pamphlet Libellus de Locorum describendorum ratione (Booklet concerning the ways of describing places), 1533. Subsequently, the pamphlet was appended to a new edition of Cosmographica by Peter Apian, which was considered the foremost work on the subject in the middle of the sixteenth century.

Triangulation networks were adopted in Germany, Austria, and the Netherlands. By 1559, the subject appeared in the English literature on surveying, mapping, and navigation [William Cunningham (1559); Valentine Leigh (1562); William Bourne (1571); Thomas Digges (1571); and John Norden (1607)]. Tycho Brahe, Danish astronomer (1546 - 1601), prepared an estate plan of the island of Hven employing triangulation (1579). Brahe completed the mapping of the lands around his observatory in 1584. Brahe's network included eleven survey stations; one baseline (1,287.9 m.); and over fifty-five angles. The observations have survived, but records of a subsequent computation and adjustment have not survive. In 1968, N.D. Haasbroek (Netherlands Geodetic Commission) published an analysis of the triangulations of Gemma Frisius; Tycho Brahe; and Snellius. Haasbroek estimated the standard error of the angles Brahe's triangulation to be ± 5.9 arc minutes.

Although triangulation was employed throughout the last one-half of the sixteenth century, and used as an application to determine the radius of a spherical earth, it would be the work of the Dutch mathematician Willebrod van Roijen Snellius (1580 - 30 October 1626) which proved its acceptability. Snellius laid off a north-south arc of triangulation encompassing approximately one degree difference in latitude (between Alkmaar and Bergen op Zoom). His approach differed from earlier triangulation in that instead of measuring directly the lengths of the triangles, he measured one or more short lines (baselines) and computed the lengths of the longer sides of the triangles. The work was completed in 1615, and published in Erastothenes Batavus de Terrae ambitus vera quantitate (Leiden, 1617). The network contained twenty-seven survey stations (fifteen main stations and twelve subordinate

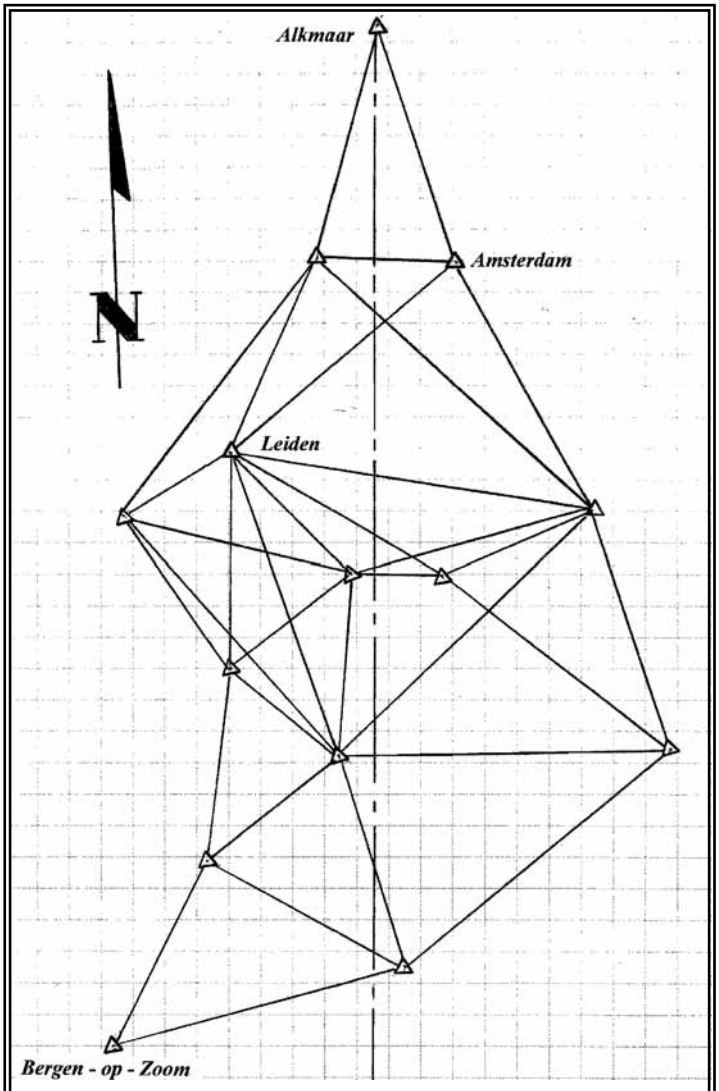


FIGURE 1. SNELLIUS TRIANGULATION

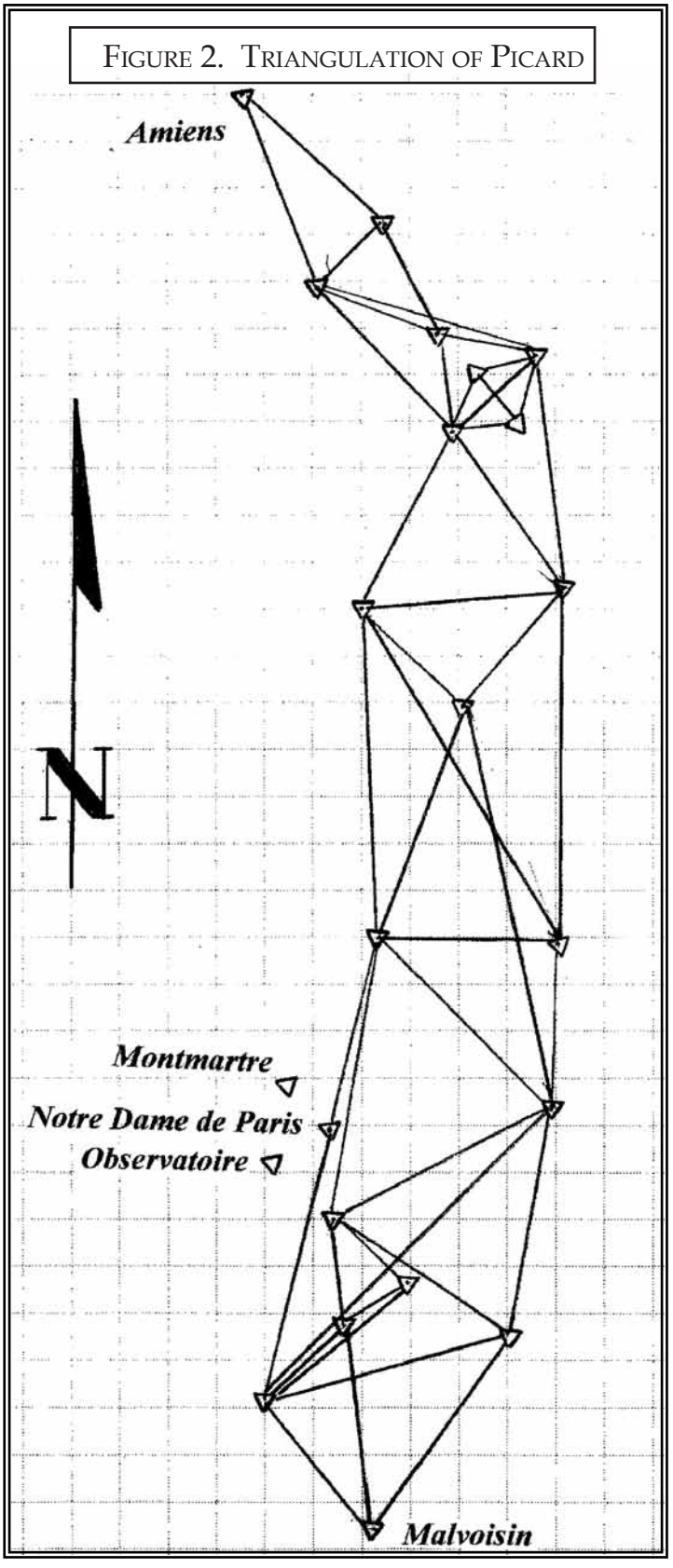
stations). Snellius employed a quadrant having a radius of about 0.65 m. and a semi-circle having a radius of about 0.50 m. The latitudes and azimuths were determined using a 1.70 m. radius iron quadrant having an estimated 0.5 mm graduation equating to one arc minute. Besides developing triangulation networks, Snellius developed the method of resection - determination of the horizontal position of a survey station by observed directions or angles from the station to points of known position. Snellius considered all triangles to be plane figures. Figure 1 is a sketch of Snellius' triangulation.

In the fall of 1660, England's King Charles II approved the idea of forming the Royal Society of London. In 1666, France's King Louis XIV authorized the formation of L'Académie Royale des Sciences. These two organizations would take leading roles in forthcoming work of determining the length of the earth's meridional degree.

Shortly after the founding of L'Académie, L'Abbé Jean Picard (12 July 1620 - 12 October 1682), a founding member, was directed to improve the value of the length of the meridian arc. Picard was Prior of Rille, later professor of astronomy in Paris, and one of the first astronomers at the Paris Observatory. While associated with the Observatory, Picard made many refinements to telescopes, including introduction of the telescope's reticle (cross-hairs) and development of the micrometer. Using the theory of triangulation developed by Snellius, Picard laid out a triangulation network from Amiens to Malvoisin. The network contained seventeen triangles with baselines at the northerly and southerly extent. The southern baseline was 5,663 toise (36,243 feet) and the northerly baseline was 3,902 toise (24,973 feet). The toise is approximately 6.4 feet. Picard used a 38 inch quadrant for his angular measurements supported by an iron stand. The smallest scale dimension was one arc minute.

A few years later, it was proposed to extend Picard's arc northward and southward through the length of France. Jean Dominique (Giovanni Domenico) Cassini (8 June 1625 - 14 September 1712) was assigned the arc south of Malovisin. Philipp de la Hire (18 March 1640 - 21 April 1718) was assigned the arc north of Amiens. Picard's arc of 1° 21′ would be extended to 8° 30′. Shortly after the work was initiated, work ceased due to political controversies and war. The work on the southward extension resumed in August 1700 and on the northward extension in 1718. Jean Cassini was joined by his son Jacques Cassini (18 February

FIGURE 2. TRIANGULATION OF PICARD



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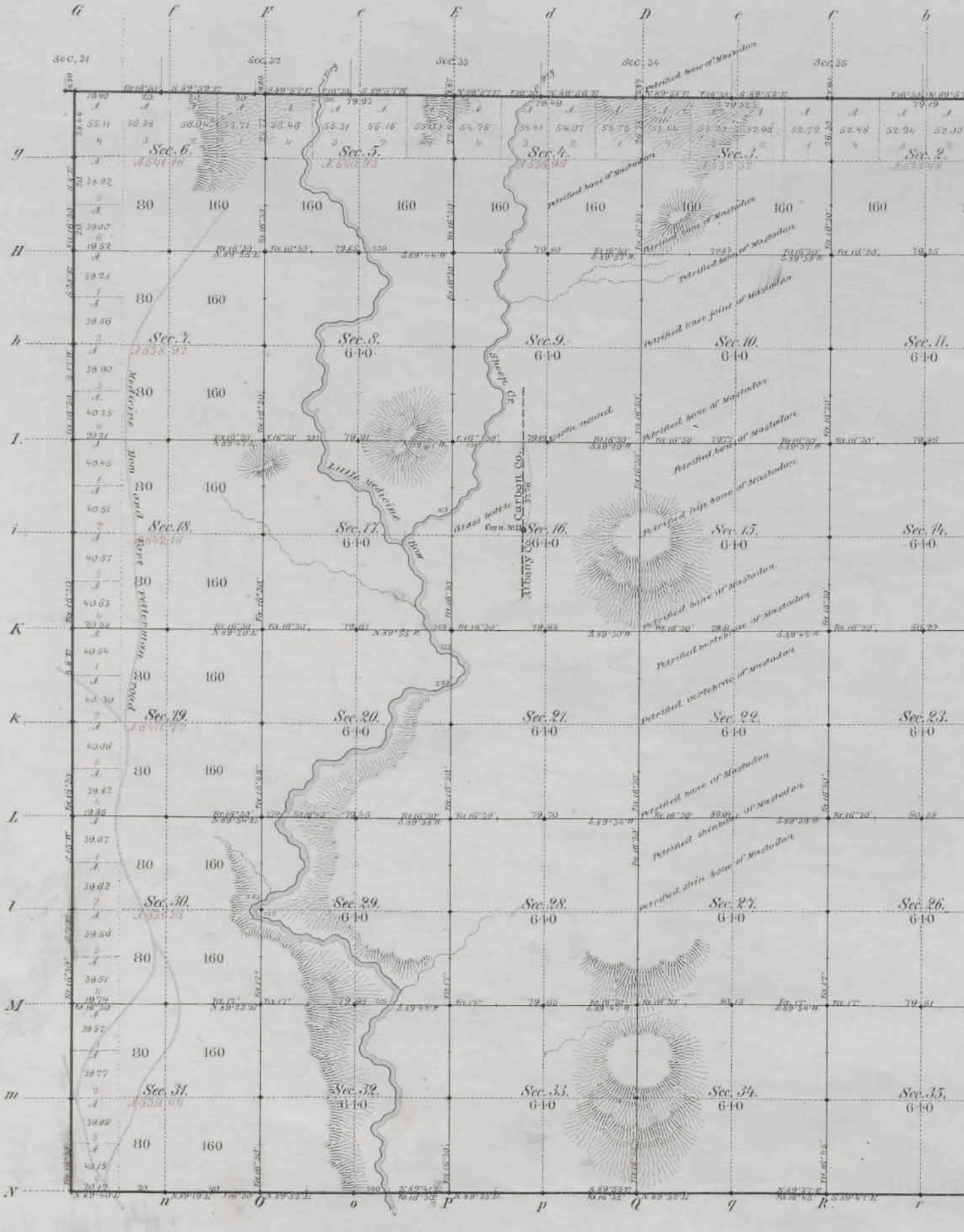
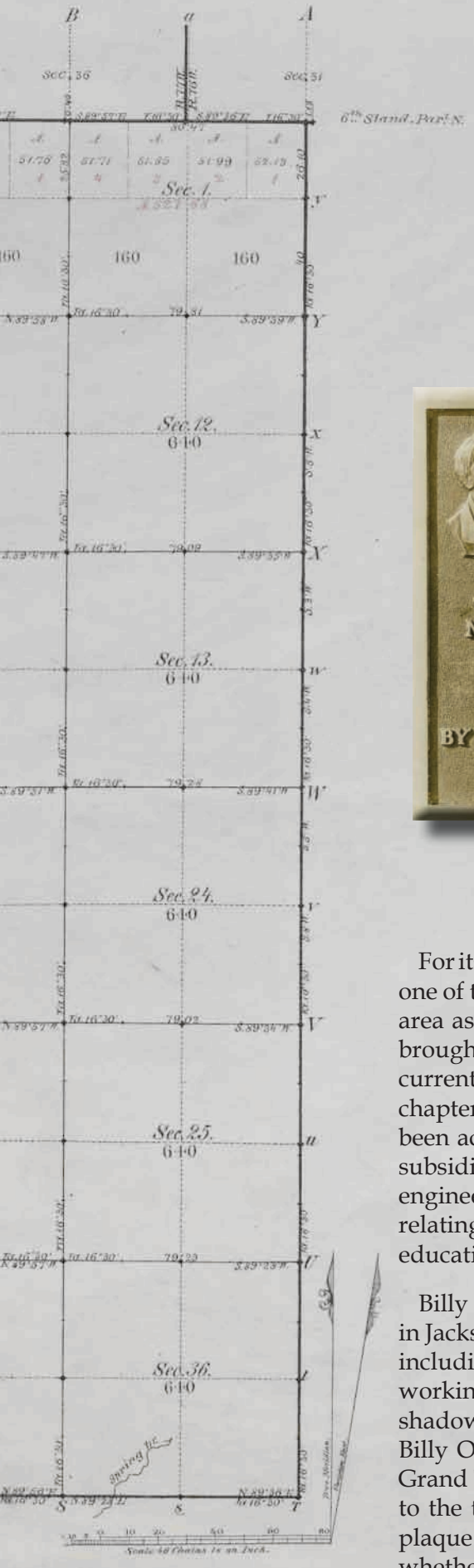
TOWNSHIP Nº24 NORTH. RANGE Nº77 WEST of the 6TH Pri



Total number of Acres 22,107.12

Surveys Designated	By Whom Surveyed	Date of Contract	Amount of Surveys M. Ch. Lks.	When Surveyed	Magnetic Declination
S.W. Township lines	Alfred M. Rogers	July 5, 1871	11 68 56	Septemb 1871	16°32' East
Subdivisions	Moore & Owen	Febr. 7, 1881	69 6 62	March & April 1881	16°35 "
Connections			12 78		

The above Map of Township No. 24 Sixth Principal Meridian Wyoming of the survey thereof on file in this Office

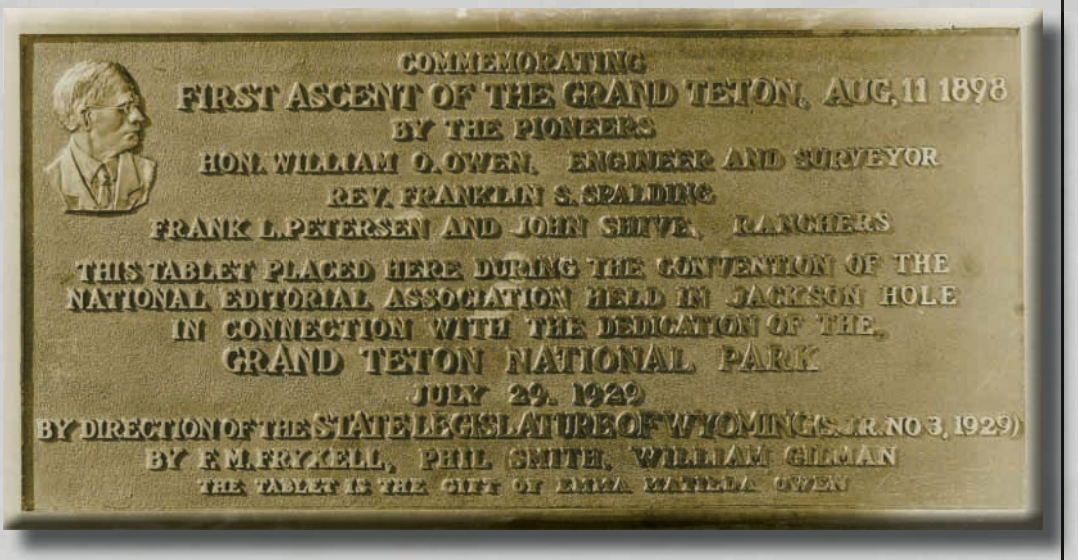


Stones and "Bones"

Set by William (Billy) Octavius Owen:

A Brief Historical Account of Living and Surveying in Wyoming

by J.D. "Sam" Drucker



Introduction by
Scott Scherbel & Matt Gotham

For its Lines and Points contribution, the PLSW West Chapter decided to highlight one of the GLO surveyors, William O. Owens, who was active in the West Chapter area as well as other areas of the state. His surveying and other endeavors were brought to our chapter's attention by J.D. "Sam" Drucker, a BLM archeologist currently working out of the Pinedale BLM office. He was invited to one of our chapter meetings to present an historical view of the surveying profession. He has been active in retracing the Lander Trail, which was one of the first government subsidized roads in the West and was the only portion of the Oregon Trail to be engineered, surveyed and constructed. He also presented the following article relating to William "Billy" O. Owen which we felt would be of both historical and educational interest to the general membership of PLSW.

Billy spent time in many different parts of the state but routinely spent summers in Jackson Hole. He performed a large portion of the original surveys in the valley including the meandering of the Snake and Gros Ventre Rivers. When he wasn't working, Billy spent his time hiking, adventuring, and riding his bicycle in the shadows of the Tetons and in Yellowstone. In Sam's article, it is mentioned that Billy Owen is recognized by many as being part of the first group to climb the Grand Teton. Figure 1 is a photograph of a bronze plaque that used to be attached to the top of the Grand Teton commemorating Billy's climb. Unfortunately, the plaque has since disappeared-probably due to the controversy surrounding whether or not Billy's group were actually the first successful group to the top.

Beginning Interests in W.O. Owen

In November 2000, while helping to create the Bureau of Land Management's (BLM) Geographic Information System (GIS) base layer—the Geographic Coordinate Data Base (GCDB)—I stumbled upon a Government Land Office (GLO) survey plat that has enlightened my views of surveying and Wyoming history. This plat (see pages 7 & 8) was drawn from work conducted by William (Billy) O. Owen during March and April of 1881 in Township 24 North, Range 77 West.

Noted in the center of the plat is a line of section corner monuments labeled as "Mastodon Bones." The idea of relocating and collecting some of these "bone" section corners was intriguing, and I found myself researching the methods needed to accomplish this task. While discussing with John Lee (cadastral chief, Wyoming State Office [WYSO] BLM) my intent to locate and recover the "bone corners," I realized that others within the Bureau were equally eager to recover them.

Search for Mastodon Section Corners

First brought to the attention of paleontologist Laurie Bryant in 1999, the corners were not recovered at that time because it was believed that they were on private land. My background and training in anthropology, archaeology, history, and surveying fostered my excitement for the project, which in turn rekindled the fire of discovery in the cadastral group at the Wyoming State Office of BLM.

Research at the Albany County Courthouse revealed that some of the fossil corners monumented the location of federal lands, allowing for ingress and egress into the township by federal surveyors. Permission was then received to make contacts at the University of Wyoming for information concerning the history and the types of fossils that have been discovered in Township 24 North, Range 77 West. Dr. Danny Walker, the Assistant State of Wyoming Archaeologist, was contacted. He expressed interest not only in locating the fossils but also in the history surrounding them and suggested that Dr. Brent Breithaupt of the University's Geology Museum be contacted. Through a great deal of correspondence with Dr. Breithaupt, the concept of finding not mastodon, but dinosaur fossils, began to materialize and soon the excitement for the project could hardly be contained.[1]

Beth Southwell, Dr. Breithaupt's assistant, began preliminary research in the American Heritage Center located on the University of Wyoming campus and discovered an incomplete autobiography written by William O. Owen (Owen 1930).[2] Among his reminiscences she found references to the surveying of Township 24 North, Range 77 West, which Owen considered to be a very special surveying case. Owen described the events taking place early in the month of April 1881 (date based on GLO field notes) thus:

> We had our team and wagon with us, and it was our custom, when possible, to load in the necessary number of stones at any favorable place and haul them along with us against the frequent happening that no corner material could be found when we have to have it. There was no sign of a stone near our corner point so I ran on north half a mile hoping to find a supply near the quarter-section corner. But in this we were disappointed. Not a stone could be found. As corners are set every half-mile in surveys of the public lands, we could go no farther till this quarter-section corner was established. Something had to be done. Tom Hale, my old side-partner, was my cornerman and in our extremity he pointed to the east where, about half a mile distant, lay two hillocks where, in his opinion, might repose the material we needed. "It's worth a trial," said Tom, "and if you say so we'll drive over and see what we can find there." "Go ahead, Tom, and if you find anything for corners load up and get back as soon as possible." Two of the boys jumped into the wagon and off they set for the hillocks. We watched them anxiously and when they reached their objective we saw the team stop and the men get out. They walked around and by their behavior we inferred they had found what we needed. After some time they started back and as they drew near I could tell they had considerable load. I ran toward the wagon asking if they had found anything for corners. "We've got something," said Tom, "'but God knows what it is—I don't. It's harder then h... and every piece weighs a ton!" Now, what do you suppose those boys had in that wagon? Fossil bones of a dinosaur! There were vertebrae, shinbones, femur bones and what-have-you, and fully as hard and heavy as Tom had said.

Upon reading this excerpt from the Owen autobiography, members of the cadastral group started planning for the recovery and replacement of some of these fossil corners. The anticipation of discovery buzzed in the office, and, after contacting Dr. Breithaupt and Ms. Southwell, a date was set; our long-awaited exploration was coming to fruition.

We acquired GCDB coordinates for selected corner locations and input them into a 12XL handheld GPS (Garmin model) before setting out for a day of investigation on May 31, 2001. John Lee, Mike Whitmore and myself from the Cadastral staff, Dale Hanson (BLM paleontologist), and Marty Griffith from the Resource Management staff (WYSO) were in our party. In Laramie, Dr. Breithaupt and Beth Southwell (UW Geology Museum) joined us, and we continued our trek to Township 24 North, Range 77 West to investigate and locate some of these fossilized bone corners.

Dr. Breithaupt and Ms. Southwell filled us with valuable information concerning the history of area paleontological discoveries and narrated stories about colorful local personalities.

Having members of the UW Geology staff to confer with was and is invaluable. Our first sight of the area was well explained by Dr. Breithaupt from a promontory overlooking the outstanding panorama of the surrounding geology. Next we visited the site of the Bone Cabin Quarry (Breithaupt, 1997), a dinosaur fossil bed that is still being excavated by a private firm. Here we were able to view the type of material that Owen's crew probably collected for corner material, giving us a much clearer idea of what we would be searching for. It should be noted that this township is gently elevating toward the Laramie Mountains to the east, void of timber except along the Medicine Bow River and a few streams and lacks stone materials used for monumenting corners during Owen's historic era.

Our search began at the position for the closing corner on the north boundary of the township. As we closed on the location, history was very close at hand, and we could all feel it. Mike Whitmore was the first to see the corner, which was marked with a section of Sauropod (Breithaupt, personal communication) fossil long bone. Engrossed by this first discovery, we photographed the section corner and anxiously discussed the find. Sauropods were part of the Brontosaurus (now called Apatosaurus) family—a family of very large, vegetarian dinosaurs.

We continued our search one and a half miles south of this corner and found the 1/4 section corner of sections three and four. This position was monumented with a portion of a large fossilized dinosaur vertebra bones and, to our amazement, was plainly marked with 1/4 (Figure 2) on the upper right corner of the fossil. Owen wrote in his autobiography that these stones were too hard to "scribe" (Owen 1930). Finding one that was marked adds to the historical significance of the survey. Recall these stones were set in 1881; and, it is quite possible that we were the first people to see this particular monument in 120 years. The 1/4 corner was collected and replaced with a BLM brass cap. Presently, it is awaiting identification at the UW Geology Museum.

Continuing our investigation another half-mile south, we suffered some disappointment as we were not able to find any trace of the section corner monument. After lunch, however, we focused our search half-a-mile east of the lost position and were more successful. We found a portion of a fossilized dinosaur ulna where a 1/4 corner should have been between sections three and ten; there was no inscription visible on the fossil. The bone was large, most probably belonging to a mega-

Figure 2: Quarter corner 3 | 4 Fossilized dinosaur vertebrae; note ¼ scribe on upper right side. (photo by Mike Whitmore).

vegetarian (Breithaupt, personal communication).

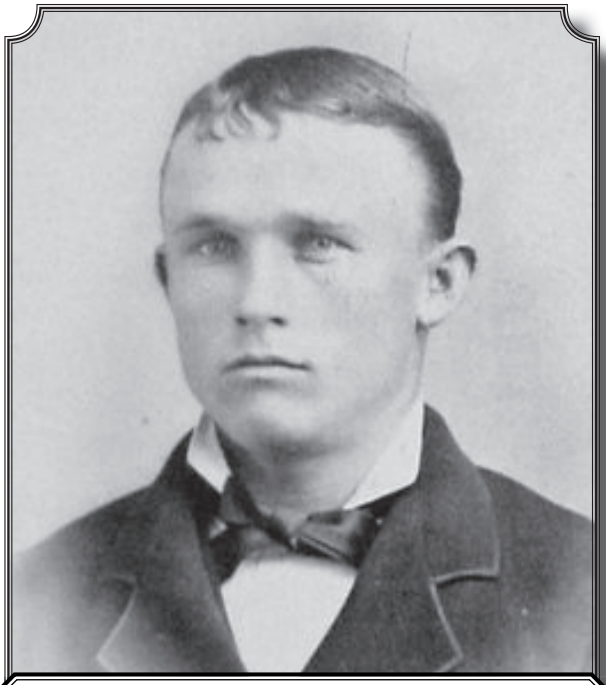
The use of GCDB latitude/longitude in developing the search area was put to excellent use during this project. Township 24 North, Range 77 West is controlled by 29 digitized corner locations from a 1:24,000, 7 1/2-quadrangle map, allowing for a search area of 40 feet. By utilizing the lat/long values from the GCDB geo file, we were able to navigate close enough to spot the fossil corners in the field (Table 1).

There are several more of these "Mastodon bone section corners" documented on Owen's plat that are yet to be located. They are on private or a combination of private and state lands, requiring landowners' cooperation before these historical corners can be positioned and recorded. Our initial field trip was described in a short article co-authored by Mr. Whitmore and myself and later presented by Mr. Al Pierson, State Director of Wyoming's Bureau of Land Management. An article outlining our work was published in the Wyoming BLM biannual journal Horizon (Whitmore and Drucker 2001).

"Billy" Owen, the Surveyor

Research has continued into the life and times of Mr. Owen. As more information is gathered it seems fitting to call Mr. Owen "Billy"—a long lost friend and comrade, a surveyor from the past with whom we all feel akin in the cadastral branch of the Wyoming BLM. Owen's autobiography contains many accounts of surveying the high plains, deserts, and mountains of Wyoming, which impart the enthusiasm he must have had for life, his work, and adventure. It is our hope that in the future, with the help of the Wyoming Historical Society, we can publish Owen's autobiography in order to share these remarkable accounts with other audiences.

The American Heritage Center on the UW campus houses a large collection of Owen's personal letters, calculations, photos, and newspaper articles. Based on this information, numerous other directions of research could be followed. For instance, one could study other dinosaur fossil discoveries made by Billy Owen, his adventures in mountaineering, and family ties to the well known Downey family of Laramie. Another significant repository of information and, consequently, source of research ideas is the Government Land Office record preserved on microfiche at the Wyoming State Office of BLM.[3]



Young Billy Owen
(Reproduced with permission from the American Heritage Center, William Owen Collection, University of Wyoming).

This record contains original plats and field notes with observations pertaining to important historical, geological, and natural resources in Wyoming. Locations recorded by early surveyors in their field notes or on plats have proved to be of particular value in research into historic trails.

Billy Owen was the most prolific surveyor in the early days of the State of Wyoming. He received

POINTId.	GCDB, GEO FILE		GPS'd FIELD LOCATIONS	
	LATITUDE	LONGITUDE	LATITUDE	LONGITUDE
400700	42° 5′ 12.17220″	106° 3′ 14.35195″	42° 05′ 13.0″	106° 03′ 14.7″
400640	42° 4′ 54.71241″	106° 3′ 14.27052″	42° 04′ 55.0″	106° 03′ 13.5″
400600	42° 4′ 28.63073″	106° 3′ 14.09038″	NOT FOUND	NOT FOUND
440600	NOT CALCULATED	NOT CALCULATED	42° 04′ 29.0″	106° 02′ 38.3″

Table 1: Latitude and longitude comparing office calculations and field locations.

20 contracts from the Government Land Office: his first contract was issued in 1881, his last in 1894. This does not include time spent working for other surveyors such as William O. Downey, Mortimer Grant (a relative of Ulysses S. Grant), and Thomas Medary. Owen was appointed to the position of U.S. Examiner of Surveys in the Interior Department in 1899, retiring in 1914.[4]

A letter to the U.S. Survey General dated August 17, 1930, archived in the William O. Owen file at the American Heritage Center confirms that Billy surveyed a number of forts in Wyoming, including Fort Laramie (April 1896), Fort Sanders (May 1886), Fort Fred Steele (July 1887), and Fort Fetterman (June 1887). In his survey notes for the area surrounding Fort Laramie he makes mention of the original fur trapper's fort—Fort William or Platte (original field notes, WYSO BLM microfilm)—and documents its location. In 1999, field work was done at Fort Laramie by the Office of the Wyoming State Archaeologist (OWSA) to find Fort William. These efforts were focused at Fort Laramie proper, not at the Owen locality, and the fort location was not substantiated. Further investigation at the Owen location could reveal the fort's true location.

Billy Owen also conducted numerous mineral surveys throughout Wyoming (original field notes, WYSO BLM microfiche). Some of these mineral surveys (such as the surveys around Hartville) were done prior to the completion of the Public Land Survey System in the state. Last but not the least, Mr. Owen was an adventurer—a mountaineer and a Wyoming pioneer. Billy served on the posse' trying to capture the "Sundance Kid" during the heyday of train robbery in the state. In 1898, he and a small group of men were the first white men to climb the Grand Teton (still somewhat controversial). He was also the first person to tour the Yellowstone area on a high-wheeled bicycle (Annals of Wyoming 1997). While on the subject of bicycles, there was a race with a stagecoach from Laramie to Cheyenne that was won by Billy and a compatriot. According to the tale, the bicycle team pushed and walked as much as rode to Cheyenne through the thick mud of the trail.

2001 marked the 100th anniversary of the Carnegie Museum's discovery of an intact fossil *Apatosaurus* (Figure 3) at the Sheep Creek Quarry. Billy Owen

Figure 3: Apatosaurus skeleton
(From the Carnegie Museum's website)

was involved in surveying the location of several fossil beds, as can be deducted from telegraph messages between his employer (Stephen Downey) and the Carnegie Museum. Owen may even have led the expedition to the site.

The cadastral branch of the Wyoming State Office of BLM participated in this celebration by adding our research into Billy Owen's surveying and other work. Many of the discoveries he made came twenty years before the Carnegie find.

Footnotes

1 In fact, upon Ms. Bryant's leaving the Wyoming State Office of the Bureau of Land Management, she received a framed copy of the plat.

2 The autobiography, Reminiscences of William O. Owen, was discovered in the Bancroft Library at the University California, Berkeley, among the papers of Sheridan Downey, Billy's nephew and former state senator of California. A roll of microfilm containing the "Reminiscences" was ordered and received early in June 2001. Although incomplete, the stories Billy relays in his autobiography are historically invaluable giving the reader insights into the early days of Laramie City and Wyoming. Some of the stories imparted by Billy appear to be closing on tall tales, but his writing style is so enthralling that one laughs through some of the more unbelievable yarns.

3 Very few of the GLO plats fail to mention a historic detail, be it trails to battle sites, mining camps, or forts. In some cases, the original GLO information is all that exists for township, range and section descriptions; and locations; this information is the basis of information for BLM's GCDB and other GIS databases.

4 A typewritten list of Owen's career accomplishments can be found in the William O. Owen file at the American Heritage Center.

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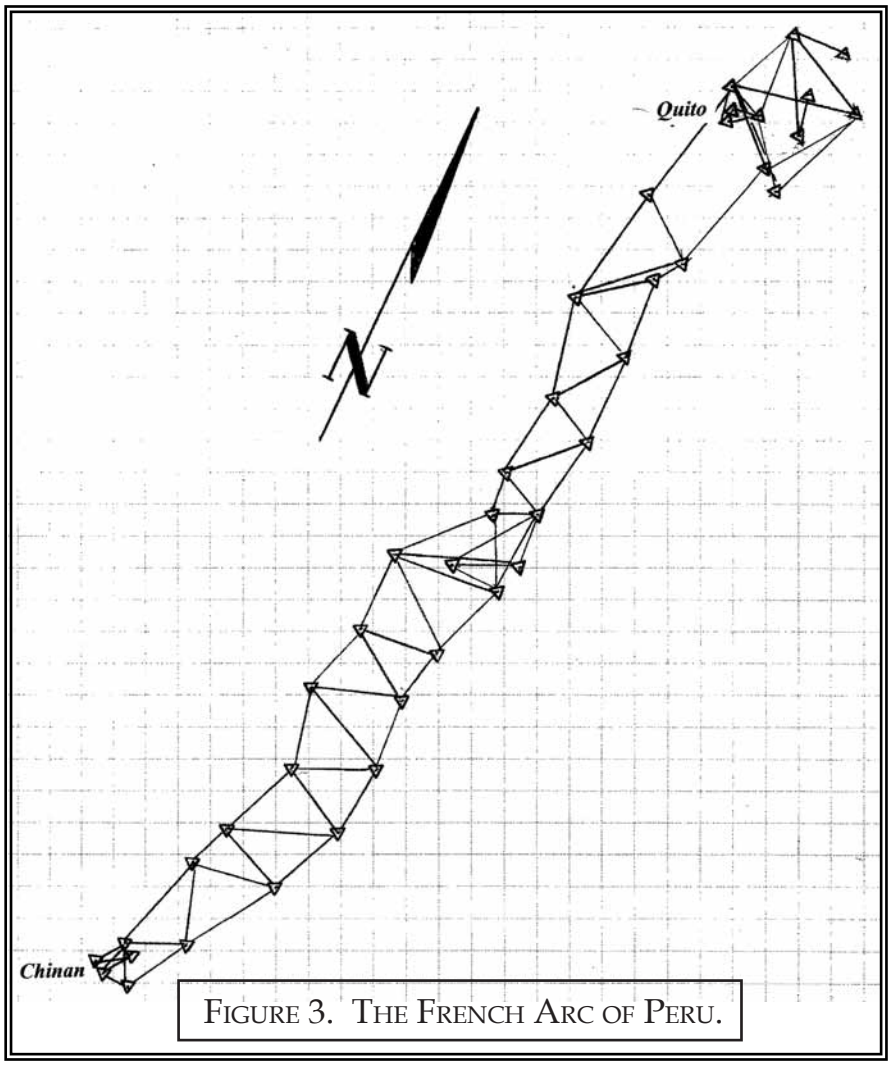

FIGURE 3. THE FRENCH ARC OF PERU.

1677 - 15 April 1756). Due to failing health, Jean Cassini was succeeded by Jacque Cassini. The latter Cassini extended the northerly portion to Dunkirk.

When the southern portion was reobserved and computed, the lengths of a meridional degree for several portions of the meridian of Picard's work and the southern arc strongly suggested the arc lengthened towards the equator (prolate ellipsoid). The Cassinis were strongly convinced of the accuracy of their work and supported the theory of a prolate ellipsoid. A measurement of a degree of longitude was observed in 1633 - 34, which supported the prolate ellipsoid theory. The arc length of 1° of longitude at St. Malol Strasbourg; Brest; and Nantes raised concerns. It was finally decided that the source of the problem was the reliability of determining longitude. All determinations were based on eclipses of Jupiter's satellites. The reobservations from 1733 to the early 1740's discovered a number of errors in Picard's original work. By 1744, the French agreed on the theory of the oblate ellipsoid proposed by Newton, but not the magnitude.

Sir Isaac Newton (25 December 1642 - 20 March 1727) employed 60 miles as the meridional arc length of one degree. In June 1682, the Royal Society saw the announcement of Picard which changed the earth's radius by ten percent. By relating the theory of centrifugal forces to the properties fluids, Newton developed his theory presented in Principia (1687). To validate his theory, Newton studied the pendulum experiments of Jean Richer (1630 - 1696). Richer noted that his pendulum lost more than two minutes in Cayenne, French Guiana, when compared to the observations at Paris. The seconds pendulum in Paris was 3 feet 8.6 lines, and in Cayenne was 3 feet 7.35 lines (a loss of 2 minutes 28 seconds) per day for ten months). Varin and Des Hayes substantiated Richer's work with their work in Africa and America.

In 1738, Pierre Louis Moreau de Maupertuis (28 September 1698 - 27 July 1759) wrote a summary of the results of the surveys of Jean Cassini and Jacques Cassini. The work of the Cassinis (1701, 1713, 1718, 1733, and 1734) strongly indicated the theory of the prolate ellipsoid. The conclusions deduced were based on accidently erroneous observations. In 1733, Charles-Marie de La Condamine (28 January 1701 - 4 February 1774) suggested that an expedition be sent to measure the arc of meridian near the equator. Louis Godin (28 February 1704 - 11 September 1760) submitted Condamine;s proposal to the L'Académie. The expedition, which lasted nearly a decade, included Louis Godin; Pierre Bouguer (16 February 1698 - 15 August 1758); Charles Marie de La Condamine; Jorge Juan y Santacila (5 January 1713 - 21 July 1773); Antonio de Ulloa y de la Terre Giral (12 January 1716 - 5 July 1795); and Joseph de Jussieu (3 September 1704 - 11 April 1779). The triangulation network (Figure 3) contained forty-eight survey

stations; thirty-three triangles; and two baselines (6,274.05 toise, 40,153.9 feet and 5,258.95 toise, 33,657.3 feet). The arc of triangulation extended from the equator southward to nearly three degrees south latitude. Twenty solar azimuths served as checks for accumulated errors in the angulation. The triangulation arc was oriented approximately 14° west of the meridian. Bouguer assumed the meridians through various survey stations to be parallel (because of the nearest to the equator). La Condamine, however, made allowance for convergence of the meridians. The barometer was employed to determine numerous stations' heights above sea level. Subsequently, Godin and Juan added several triangles and a baseline to the northern end of the network. Since this was a pioneering work, there were numerous sources of error. Subsequent analysis of the elevations indicate errors of several tens of meters. The quadrants probably produced angular errors of thirty arc seconds.

The Lapland expedition departed Paris on 20 April 1736. Pierre Louis Moreau de Maupertius headed the expedition. He was accompanied by Alexis-Claude Clairaut (7 May 1713 - 17 May 1765); Anders Celsius (27 November 1701 - 25 April 1744); Réginald Outhier (16 August 1694 - 12 April 1774); Pierre-Charles Le Monnier (20 November 1715 - 3 April 1799); Charles-Etienne-Louis Camus (25 August 1699 - 4 May 1768); and Ander Hellant (1717 - 1789). The southerly end of the Lapland arc (Figure 4) was the town of Torneå (approximate latitude 65° 50′). The northerly terminus was near Kittisvaara (approximate latitude 66° 50′). During the summer of 1736 all the angles were observed. The observers spent from three to eight days at each station. The only baseline is located midway between Torneå and Kittisvaara. In approximately two feet of snow on the frozen river (Torneå River) the baseline was measured. The mean of the two baseline measurements was 7,406.86 toise (47,403.9 feet). Eight fir rods, each five toise long were employed. The astronomic work was completed between 30 October 1736 and 11 April 1737. After reduction of the Lapland survey, Maupertius reported the length of a degree of latitude in Lapland was approximately 377 toise longer than a degree of latitude in France.

For his work, Pierre Maupertius became known as the "man who flattened the earth." Isaac Newton died 20 March 1727 in London, and would never learn that his theory of the figure of the earth had been vindicated.

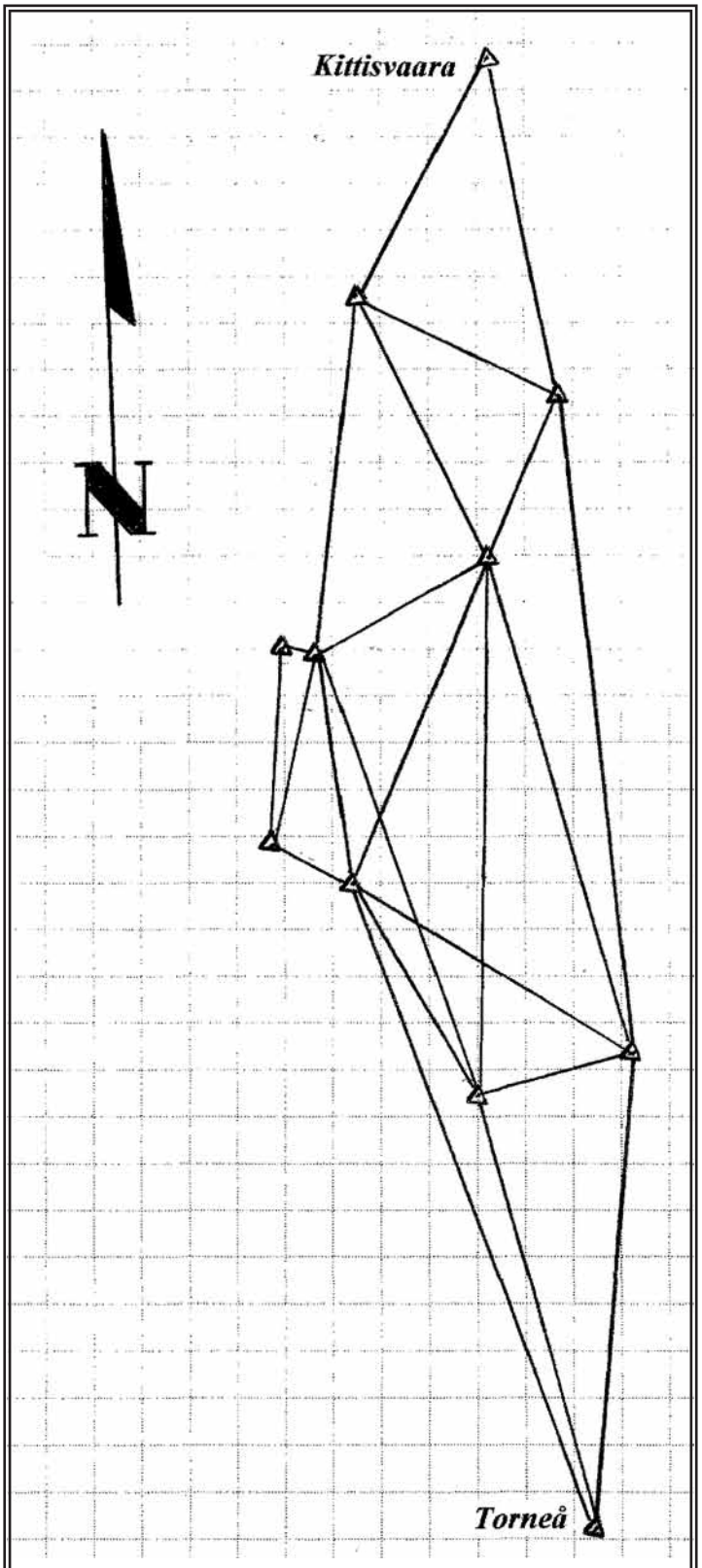

FIGURE 4. FRENCH ARC OF LAPLAND.

CONGRATULATIONS!

The members of the Professional Land Surveyors of Wyoming would like to recognize the achievement of the following new registrants and encourage you to join our society.

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Gary E. Paul	Durham. OR	LS 13893
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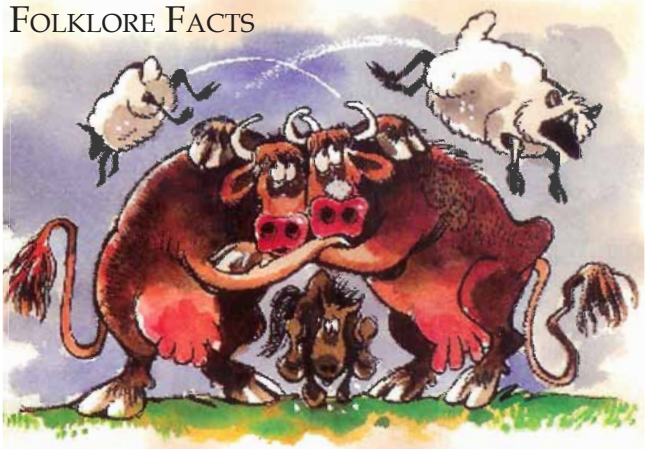
Nathan K. Stroud	Laramie, WY	LSIT 150
Chance V. Wagner	Gillette, WY	LSIT 151

Folklore Facts



"Before a rain, sheep are frisky and box each other. When horses are restless and paw with their hoof, you'll soon hear the patter of rain on your roof. If cows huddle, it's going to rain."

« When barometric pressure falls, as it does before an imminent storm carrying rain, it directly affects the entire body's chemistry. Most farm animals -and many people for that matter- often become discontent, irritable, and nervous when atmospheric pressure falls.

(Adapted from *Weather Proverbs*, by George D. Freier)

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