Volume 29: Issue 1
January, 2018

LINES & POINTS

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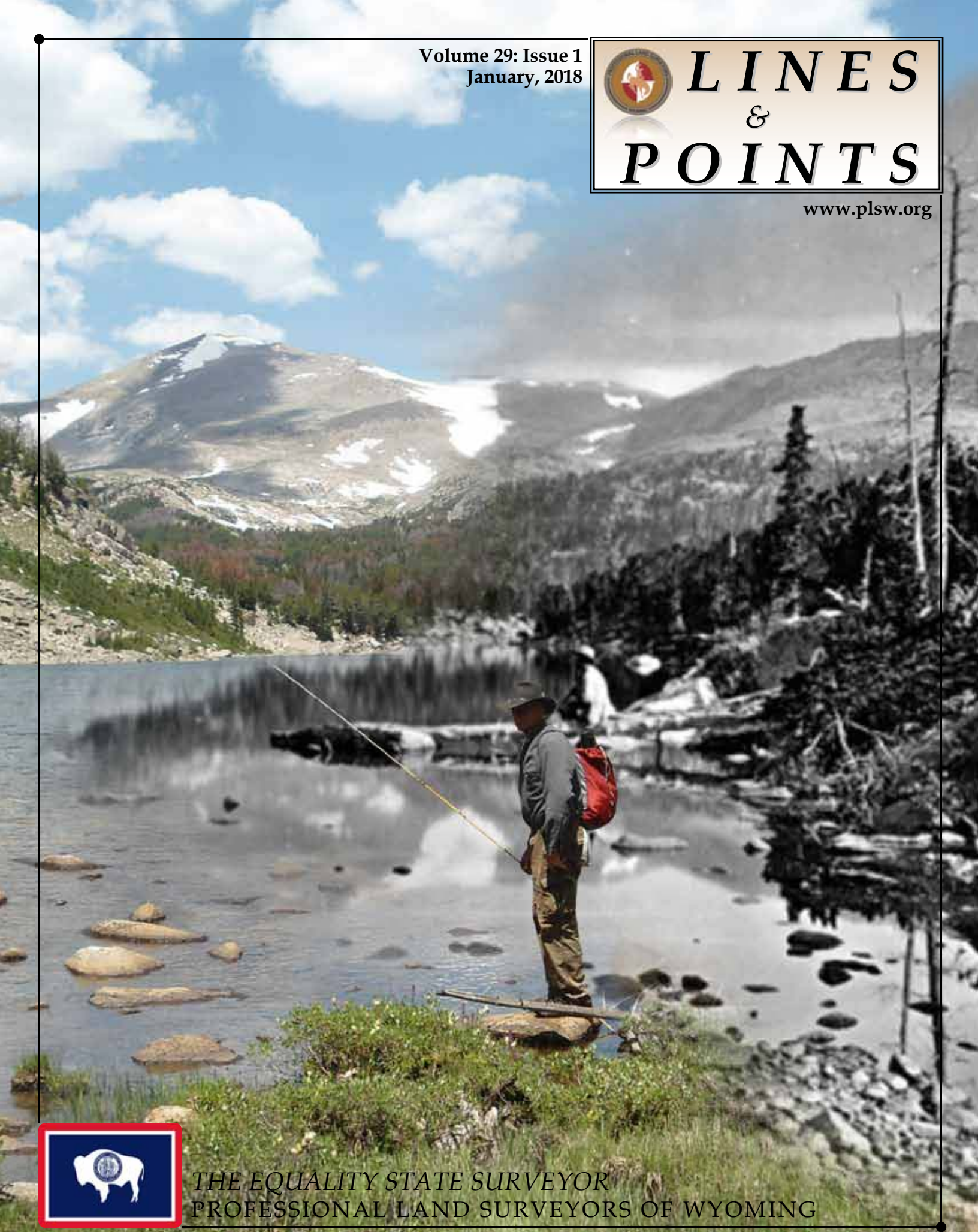
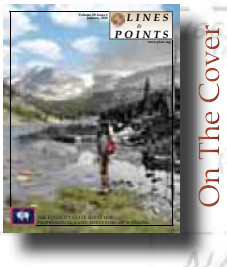


THE EQUALITY STATE SURVEYOR

PROFESSIONAL LAND SURVEYORS OF WYOMING



On The Cover

Blended photos of 1878 Hayden Expedition and the 2013 Chupka Expedition. (Photos from USGS Archive and Bill Chupka respectively)

CONTENTS

2017 PLSW SUSTAINING MEMBERS

- Jenn Heinrich - Frontier Precision Inc.
- John Baffert - Surv-KAP, LLC
- Chris Farnsworth - RDO Integrated Controls
- Kelly Goff - Underground Consulting Solutions
- Susan Hall - Trimble
- Tim Klaben - Berntsen International Inc.
- Troy Langston - Monsen Engineering

PLSW (Professional Land Surveyors of Wyoming; PO Box 8, Cheyenne, WY 82003) is a statewide organization of Land Surveyors registered to practice in the Equality State of Wyoming. PLSW is dedicated to improving the technical, legal, and business aspects of surveying in the State of Wyoming. PLSW is affiliated with the National Society of Professional Surveyors (NSPS) and the Western Federation of Professional Land Surveyors (WestFed).

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PRESIDENT'S MESSAGE

Not too many years ago, I was a Scoutmaster to a group of older boys – 14-18 years old, and we had spent a year planning a week long canoe trek down the Green River. These particular young men had very little water experience, including basic swimming skills. Many weekends were spent during the fall and winter of the year prior to the trip making a pilgrimage to the Teton County Rec Center to work on being comfortable in the water and learning basic water rescue techniques.

About a month before the trip, the ice having finally receded from the Palisades Reservoir and there being enough water, we spent a day working on canoe rescues, leaving and entering a boat, learning to steer, canoe strokes, and so on.

My wife, who has a bachelor degree in psychology and keeps an especial interest in brain development and behavior, consistently reminds me that the brains of teenagers literally go through a rewiring of circuits. Which is why, when you ask your teenager "Why did you do that?" and they reply "I don't know", there is a good chance that the reply is not just a copout, it could by that they really don't know. This lesson was made manifest during this outing as at one point, while I was working with a group of the younger boys, four of the older youth decided it would be a good idea to try to lasso a pelican.

Please keep in mind that I am a proponent of wildlife, and that my usual MO is to step in immediately and stop any activity before an animal is injured or captured, I noticed that this particular group of boys, two per canoe, had tied their canoes together at the gunwales, because they thought it would help them to be more efficient, not wholly unlike an outrigger on an islander boat. They had great speed, but only on a straight line. Turning was another matter entirely. Being farm boys and not cowboys, their "lasso" was a six-foot strand of ½" nylon cord, the painter from one of the canoes. The lasso was already wet from multiple swamping's prior to the pelican roundup, and as such, the loop did not open. I think you get the picture. No immediate danger to pelican.

I will leave out the details of the Game Warden stopping and giving the boys a lecture on migratory game birds and harassment of wildlife, much more effective than anything I could have ever done. And while there are many lessons I have gleaned from this particular adventure over the years, and many I'm sure each of you can come up with on your own, the particular short lesson for this article is that of tools of the trade, and making sure we are keeping up with the tools needed to do our job. This includes the current technology as well as digging into the records and piecing together the puzzle.

It has been a pleasure to serve you this past year and I look forward to continued involvement with you all in the years to come.

Karl Scherbel, P.L.S.
President, Professional Land Surveyors of Wyoming

ANNOUNCEMENTS

CONGRATULATIONS!

The members of the Professional Land Surveyors of Wyoming would like to recognize the achievement of the following new Wyoming registrants:

Gary Ollie	Douglas, WY	SI	174
Benjamin Weaver	Sheridan, WY	SI	175
James Gampetro	Buffalo, WY	LS	16286
Clint Andersen	Billings, MT	PELS	13349
Michael Jackson	Pinedale, WY	PELS	13594

Lines and Points Article Rotation Submission Schedule By Chapter

Responsible Chapter	First Call Date	Last Call Date	Publication Date
Central Chapter	Thank You!!	(see "A Glance At Some Wyoming History" in this issue)	
South Central Chapter	March 1	March 15	April 1, 2018
Southeast Chapter	June 1	June 15	July 1, 2018
Laramie Valley Chapter	September 1	September 15	October 1, 2018
Upper Platte Chapter	December 1	December 15, 2018	January 1, 2019
Southwest Chapter	March 1	March 15	April 1, 2019
Northeast Chapter	June 1	June 15	July 1, 2019
Northwest Chapter	September 1	September 15	October 1, 2019

ANNOUNCEMENTS

PLSW Scholorship Fund Drive Activity Results - During 2017 Fall Technical Sessions

Silent Auction Results

Donated by	Description of Item (Final Bid Price)	Winning Bidder
Rick Hudson	Original artwork of antelope by artist Ray Blaha ($70.00)	Dave Fehringer
Engineering & Assoc.	Reprint of 1902 Manual of Surveying Instructions ($221.50)	Jack Studley
Berntsen	Lasting Impressions, written by Rhonda L. Rushing ($45.00)	Anthony Banette
Mrs. Tom Johnson	Bed quilt especially made for PLSW ($80.00)	Lyle Cashiatto
Upper Platte Chapter	Kayak ($90.00)	Jim Campetro
Doug Boyd	Hand made bottle opener & six-pack of long necks ($6.00)	Dave Fehringer
SubSurface Instruments	Model ML-3 magnetic locator ($600.00)	Cotton Jones
WLC Surveying	Custom coat rack ($35.00)	Roy Holm

Raffle Ticket Results

Donated By	Description of Item	Raffle Winner
Selby's Essco	Sokia 8 foot collapsible GPS/Prism pole	David Gustafson
Survey Supply Service	Lath bag	Cevin Imas
Inberg-Miller	$25 to Rocky Mtn. Discount Sports	Paul Bloyd
	$25 to Rocky Mtn. Discount Sports	Anthony Bartle
	$25 to Rocky Mtn. Discount Sports	Lyle Cashiatto
	$25 to Rocky Mtn. Discount Sports	David Gustafson
US BLM-Cadastral Office	2009 BLM Manual	Ken Magrath
	River and Lake Boundaries, by Jim Simpson	Thomas D. Tucker
Bill Chupka	3 historical prints from Hayden Survey in the Wind River Mountains	Pete Hutchinson
Frontier Precision	Leopold Rangefinder	Pat Factor
Dave Fehringer	$50 to Home Depot	Kent Felderman
Berntsen	Baseball cap	David Gustafson
	Stocking cap	Pat Factor
Jack Studley	NSPS (Surveyor's Creed & Canons)	Lyle Cashiatto
	NSPS (Surveyor's Creed & Canons)	Kent Felderman
	Route Surveying	Dan Kricken
	Elements of Surveying	Nicholas Hammel
	Surveying, by Breel	Doug Elain
	Elementary Surveying	Cotton Jones

The PLSW Scholarship Fund Drive Committee has become a group effort by the Central Chapter; please give a special thanks to the Central Chapter and a special thanks to Randy Stelzner, Gary Hatle, Tom Johnson, Dave Spurlock and especially Doug Boyd. Also, thank you for the support from venders and companies who continue to donate items for the raffle. A special thank you to ALL who donated and/or contributed to this fund drive!

Sincerely,
Chris Hamilton
Co-Chairman, Scholarship Fund Drive Committee

JOIN THE UNIVERSITY OF WYOMING'S

EXPLORE ENGINEERING PROGRAM TO CELEBRATE LAND SURVEYORS WEEK

MARCH 18-24, 2018

We'll bring land surveying to life by matching professional land surveyors to middle school classrooms to introduce the surveying profession and lead a hands-on activity focused around GPS/geocaching.

Want to volunteer?

PROFESSIONAL LAND SURVEYORS PLEASE EMAIL TROY.NIESEN@WYO.GOV
MIDDLE SCHOOL TEACHERS PLEASE EMAIL TEDDI HOFMANN AT THOFMANN@UWYO.EDU

Wyoming Board of Professional Engineers and Land Surveyors | WYOMING ENGINEERING SOCIETY | WYOMING DEPARTMENT OF EDUCATION

University of Wyoming | uwyo.edu **GO FOR GOLD**

Wyoming Engineering Society

98th Annual Engineering/Surveying Conference!

Dates: 02/08/2018 & 02/09/2018

Marian H Rochelle Gateway Center

University of Wyoming

Laramie, Wyoming

The 98th Annual Wyoming Engineering Society Conference will be held this year at the Marian H Rochelle Gateway Center in Laramie, Wyoming. ASCE classes will be held on Thursday morning, organizational meetings Thursday afternoon, opening session will be Friday morning and classes will run all day Friday with the awards banquet on Friday night.

The Convention Hotel will be the Hilton Inn located across the street from the Gateway Center. The Hilton will offer special rates for those attending the Conference if you mention you are attending the WES Conference. The Hilton Inn phone number is 307-745-5500.

Hilton Inn – 2229 Grand Avenue
Laramie, Wyoming 82070

Registration is open on the WEB site!
http://www.uwyo.edu/wes/

WES 2017 Land Surveying Sessions

Session 1a – 9:00 a.m. to 10:00 a.m.

Moderator: Brian Schmalz
Speaker: Andrew Munson, Frontier Precision
Topic - Scanning for Today's Surveyors

Session 1b – 9:00 a.m. to 10:00 a.m.

Moderator: Mark Rehwaldt
Speaker: RDO Integrated Controls
Topic – Machine Control for Surveyors: Implementing Engineering Designs in a Machine Control Environment.

Session 2 – 10:30 a.m. to 11:30 a.m.

Moderator: Mark Rehwaldt
Panel Discussion: Shannon Stanfill, Jessica Frint, Scott Scherbel, Dennis Dawson
Topic – Policing our Profession; An overview of complaint process, the complaint from a legal perspective, how to handle the complaint, what constitutes the practice of Land Surveying

Session 3 – 1:15 p.m. to 2:15 p.m.

Moderator: Dan Kricken
Speaker: Pam Fromhertz, Rocky Mountain Regional Advisor, National Geodetic Survey/NOAA Preparing for the Modernization of the National Spatial Reference System. The current datums will be replaced in 2022 with significant changes anticipated in both the horizontal (4 ft) and vertical (2.5 ft) components. Discussion will focus on the latest developments of the new reference systems, the associated tools and what Wyoming can do to be prepared.

Session 4 – 2:45 p.m. to 3:45 p.m.

Moderator: Brian Schmalz
Speaker: Mike Londe
Topic – Journeyman Geodesy: An update on CORS and RTN in Wyoming and what effect will the new datums have at the user level

"Journeys: One Individual's Excursions into the Surveying and Mapping Professions: Volume I"

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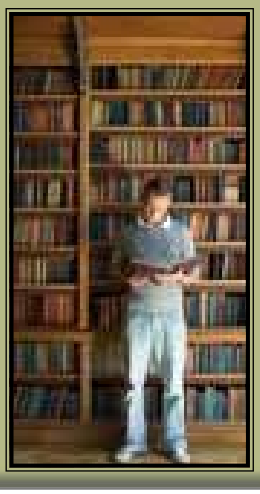
If you are attending college with the intent of pursuing a career in Land Surveying in Wyoming, we want to give you money!

A Scholarship Application is available on our website http://www.plsw.org



Wyoming Engineering Society
98th CONVENTION
February 8 & 9, 2018 – Marian Rochelle Gateway Center

REGISTRATION FORM

See General Instructions and Refund Policy on reverse side.
If you will be unable to attend the convention, you may use this form to pay your dues for 2018.

Name _____ **First name for badge** _____
Mailing Address _____
City/State/Zip _____
Firm/Organization _____
Home Phone _____ **Business Phone** _____
Email address _____

MEMBERSHIP DUES	**Amount**
W.E.S. 2018 Dues: (see General Instructions, Item #4, for amounts)	_____
Scholarship Fund -- Donation	_____

CONVENTION REGISTRATION	**Amount**
Member Pre-Registration: $195 (If received by **January 20, 2018** includes lunches and banquet)	_____
Member Registration: $210 (If received after **January 20, 2018** includes lunches and banquet)	_____
Non-Member Registration: $270 (includes lunches and banquet)	_____
Spouse Registration: $70 (includes banquet Friday night)	_____

Additional EVENT TICKETS	**Number**	**Price**	**Amount**
Thursday – Lunch: *UW College of Engineering Program*	_____	$25.00	_____
Friday - Lunch: *Presidential Project Awards*	_____	$25.00	_____
Friday - Awards Banquet	_____	$30.00	_____
Order of the Engineer (OoE) *(Must have Eng. degree)*	_____	$10.00	_____
	Grand Total	$	

SPOUSE/GUEST NAME BADGES
Name_____ **First name for badge** _____

Return registration form and check to:
Wyoming Engineering Society, 5908 Yellowstone Road, Cheyenne, WY 82009
DO NOT MAIL FORM AFTER January 30 – BRING FORM TO CONVENTION AND REGISTER ON-SITE

Please do not write below this line

Date received: _____ / _____ / 2018 – Database updated: _____	Amount Received: $_____
Notes: _____	Balance due: $_____
_____	
_____	Balance paid: ____ / ____ / 2018
	Received by: _____

General Instructions and Refund Policy

1. **Please note that we are doing something different this year! The registration fee includes your lunch for both days and for the awards banquet on Friday night. If you would like to have additional tickets for other members of your family use the "Additional Event Tickets" boxes found below the Registration Box.**

2. The convention registration desk will open at 8:00 am on Thursday, February 8, 2018, to obtain pre-registration packets, register for the convention, purchase additional event tickets, and obtain information.

3. The ASCE Continuing Education Program on Thursday morning, February 8, is not covered under the WES registration. A separate registration is required.

4. Annual membership dues for 2018:

   Members - $60.00
   Student Members - $10.00
   Honorary Members – none

5. If the registration form is received after January 20th without the late fee included, the $15 late fee will be collected at the registration desk.

6. Individuals must have an official registration badge for admission to convention events and the exhibit area.

7. Spouses accompanying convention registrants are required to register for the convention. The $70 will cover a lunch at Altitude (hopefully getting their small gathering room), menu to be decided, in addition it will cover a tour of the Ivinson Mansion, and a goody bag which will include the Wyoming book (thank you from me as Distinguished Young Women of Wyoming state chair for your donation of $10 per book for that to be part of the goody bag – Maryalice Gulino), banquet Friday night, and other items.

The luncheon will be the only official "spouse" function. However spouses are invited to spend time on their own exploring some very fun options that Laramie has to offer. Here are ideas that I have ..... Explore UW campus, explore UW Art Museum, explore other UW museums , have a massage, spa treatment, or manicure or pedicure at one of various places in Laramie (list of places to be included in welcome packet), explore the great outdoors (options to be included in welcome packet), go skiing at Snowy Range ski area, enjoy exercise or relaxing swimming at the Laramie Rec Center, or go on a self guided tour of downtown Laramie.

8. **Registration fee** will be refunded if cancellation is submitted to the WES Executive Director prior to 5:00 pm on Friday, January 26, 2018. Registration fees will not be refunded after that time.

9. **Payments for meals and events** will be refunded if cancellation is submitted to the WES Executive Director prior to 5:00 pm on Tuesday, January 23, 2018.

10. **Annual dues payments** will not be refunded.

11. **The Order of the Engineer** has been added. The Order of the Engineer was initiated in the United States to foster a spirit of pride and responsibility in the engineering profession, to bridge the gap between training and experience, and to present to the public a visible symbol identifying the engineer.

    The first ceremony was held on June 4, 1970 at Cleveland State University. Since then, similar ceremonies have been held across the United States at which graduate and registered engineers are invited to accept the Obligation of the Engineer and a stainless steel ring. The ceremonies are conducted by Links (local sections) of the Order.

    The Order is not a membership organization; there are never any meetings to attend or dues to pay. Instead, the Order fosters a unity of purpose and the honoring of one's pledge lifelong.

    The Obligation is a creed similar to the oath attributed to Hippocrates (460-377 B.C.) that is generally taken by medical graduates and which sets forth an ethical code. The Obligation likewise, contains parts of the Canon of Ethics of major engineering societies. Initiates, as they accept it voluntarily, pledge to uphold the standards and dignity of the engineering profession and to serve humanity by making the best use of Earth's precious wealth. **Therefore, you must be in attendance at the lunch on Thursday to receive the Order of the Engineer.**

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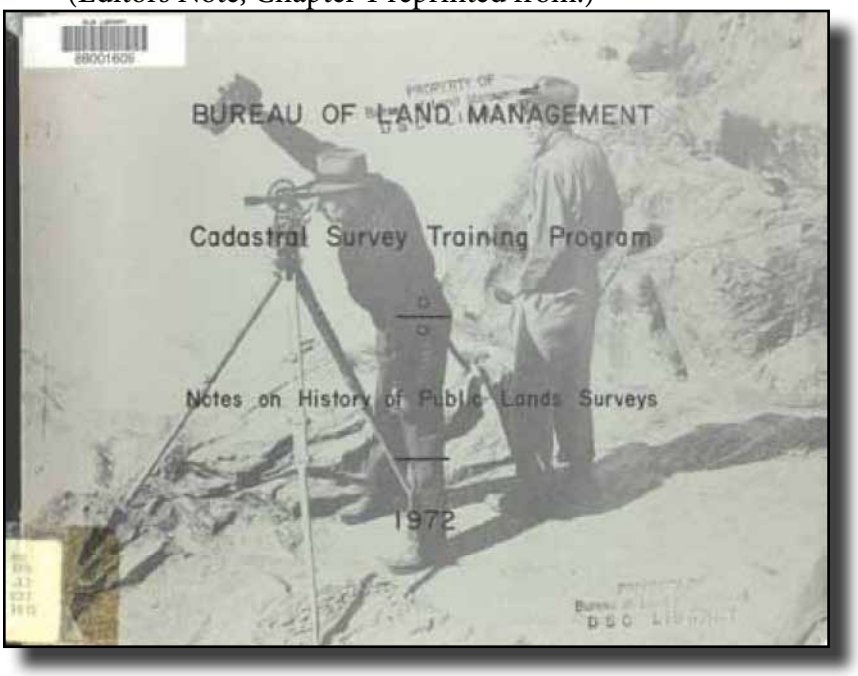
(Editors Note, Chapter 1 reprinted from:)



Ancient Surveys

"When he prepared the heavens, I was there: when he set a compass upon the face of the depth:"
Proverbs 8:27

When an individual first felt the desire to possess land the need for the work of a cadastral survey became inevitable. This occurrence is lost in antiquity, as is the moment when man first found he could strike flint and make fire his servant, or the first time man perceived the principle of the wheel.

Before recorded history, cave men claimed their homes and hunting grounds by right of occupancy and a large club. Disputes over boundaries have always, along with God, politics, and taxes, awakened men's hidden passions. To the surveyor must go the credit for the lessening of disagreements over property lines.

Surveying itself has no "point of beginning". We know that a very ancient clay tablet exists. It is Assyrian in origin, and was found at Nuzi, near Kirkuk. It dates from the dynasty of Sargon of Akkad, well over 5,000 years ago. Scratched into its surface is a map, showing a surveyed part of what is now called Iraq (northern Mesopotamia). (34)

The Egyptians, under the Pharaohs, devised extremely precise methods of measurement. The Great Pyramid of Gizeh (Khufu) is the most famous example. Its base is oriented in the cardinal directions. The four sides (9,068.8 inches) have an average error of just six-tenths of an inch in length and twelve seconds in angle from a perfect square. it was constructed about 4700 B.C. (90) No record exists today of the methods the Egyptians used, or of their equipment. We do know that they were concerned with the survey of land lines for the purposes of taxation. The land in the Nile Valley had to be surveyed over and over because of the yearly flooding of the Nile.

Three or four thousand years ago the Babylonians took their surveying seriously. There are in existence today a few of the boundary stones set during that period. One of them has much carving upon it, most of which has been translated into English. It refers to the size of the land, five gur of corn land, measured by the great cubit. It gives the district, the province, and the location. The name of the surveyor is also given, along with the fact that it was an official survey and established the land as the property of Gula-Eresh. The translation also gives, at great length, the numerous curses to be called down upon the head of anyone so foolish as to move the stone. (94)

A surveying instrument was found in the ruins of Popeii. It was a groma, of the type used by the Romans in dividing land to be distributed to veterans. The groma had four arms, set at 90 degrees to one another, with which the corners of rectangular plots were established. The Roman system of land subdivision was called agro centuriato, land divided into hundreds.(34) Julius Caesar ruled Rome when agro centuriato was introduced. He died 44 years before the birth of Christ, but the subdivision pattern created by different land uses under this survey system is still visible from the air.(36)

(Continued no Page 17)

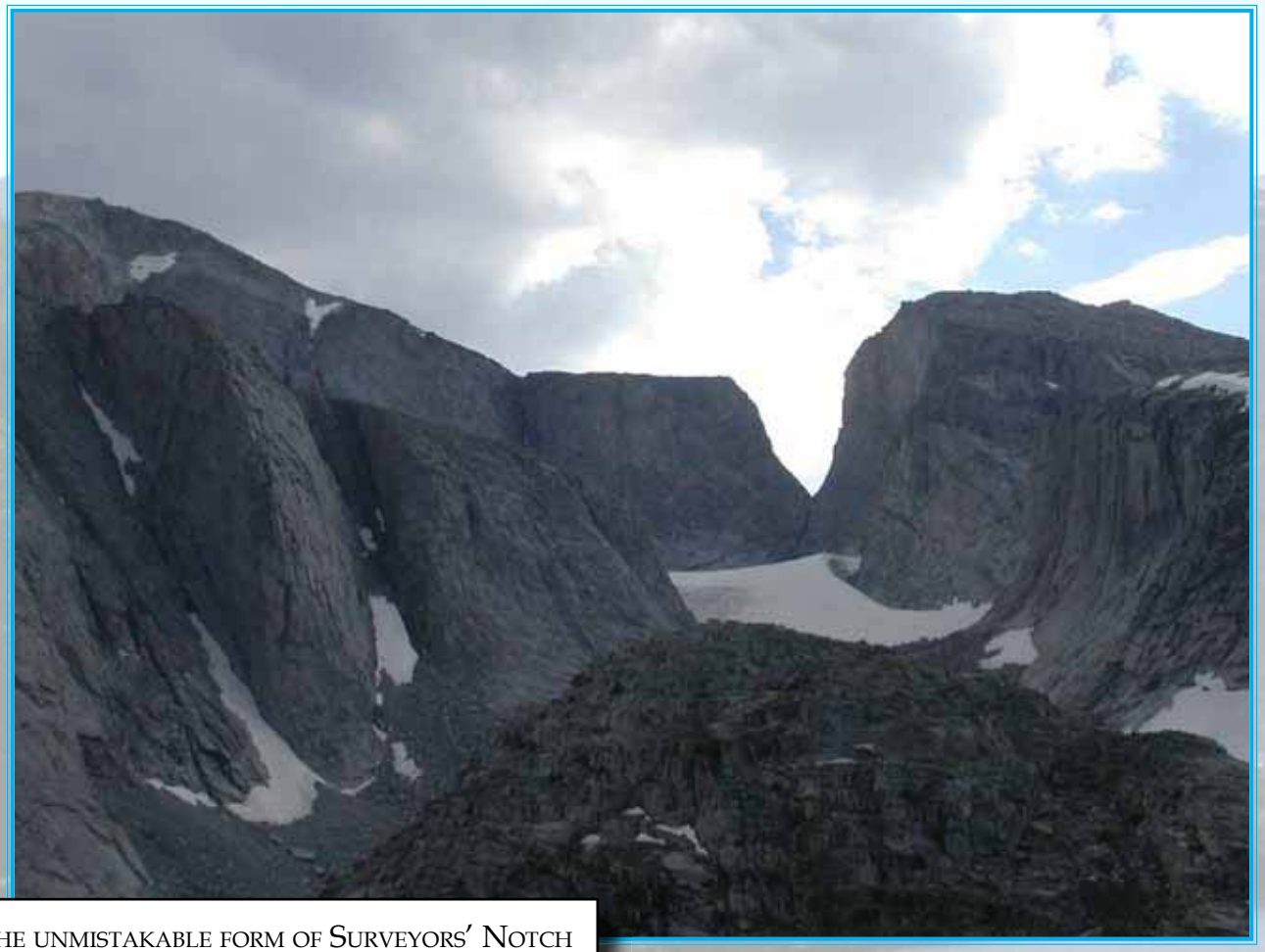
A GLANCE AT SOME WYOMING HISTORY

by: Bill Chupka

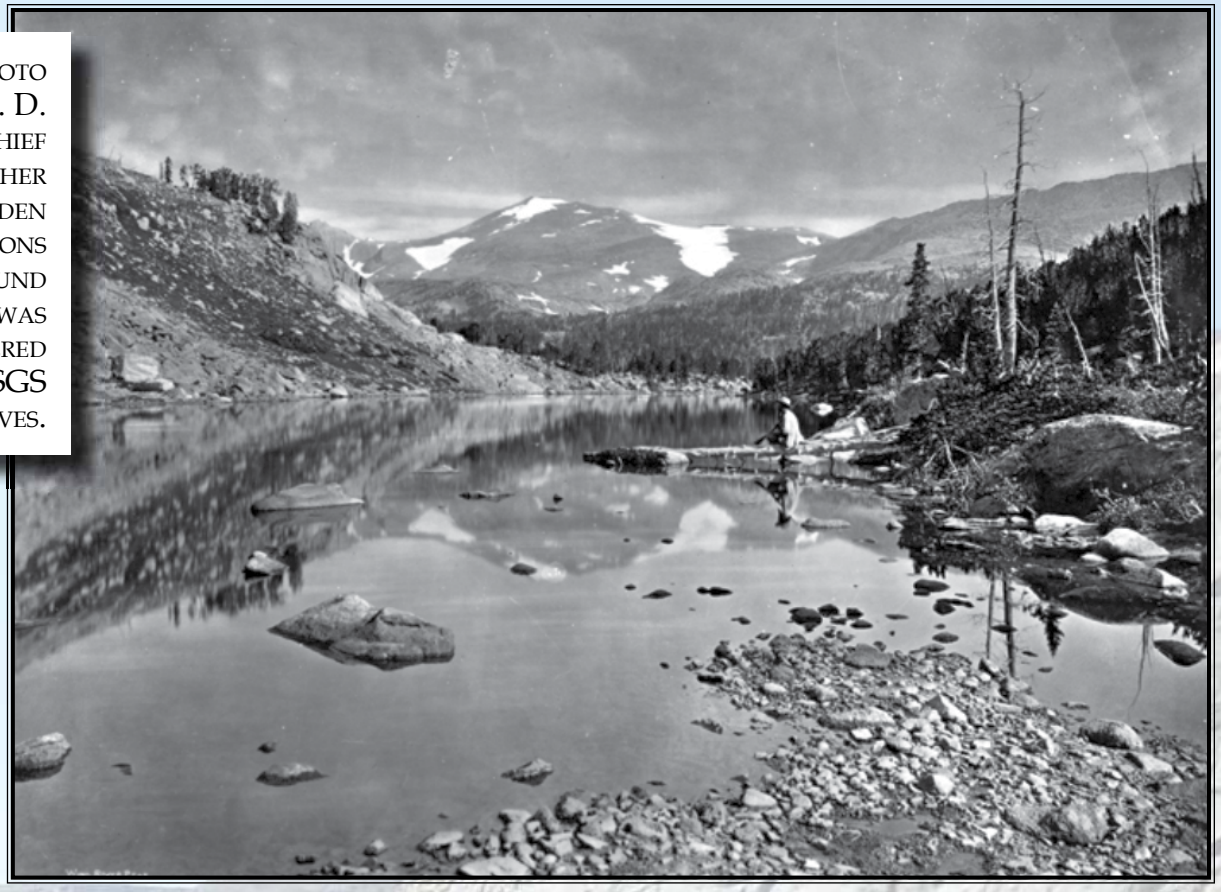
It's not surprising that a surveyor would become fascinated with local history. After all, we're always studying those old notes and plats when performing resurveys in the Public Land Survey System. In our area of the U.S., it's even easier to become interested due to the spectacular backdrop of tall peaks and glacial features that make up the public lands in our own back yard.

So it is that I became interested in the history of the Hayden Expeditions of the 1870's in the Wind River Mountains in central Wyoming. In connection with this, I've been inspired to revisit sites that have been preserved in sketches and early photographs of the Wind Rivers.

Here are some examples of my visits to the past.



THE UNMISTAKABLE FORM OF SURVEYORS' NOTCH IS THE SPECTACLE THAT GOT THE BALL ROLLING FOR ME TO REVISIT SOME OF THE SITES VISITED DURING THE EARLY EXPEDITIONS TO THIS AREA.



This photo of A. D. Wilson Chief Topographer on the Hayden Expeditions taken around 1878 was recovered from the USGS archives.

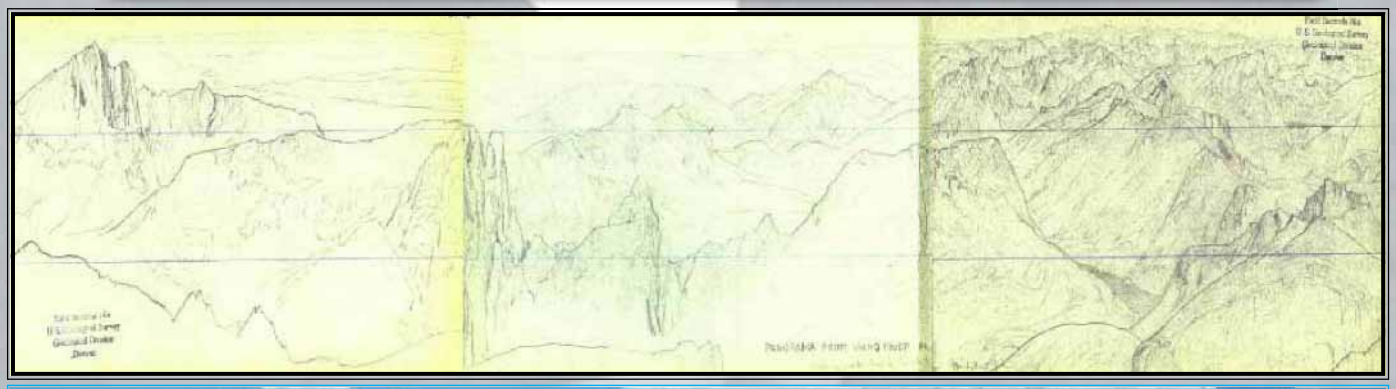
This 2013 photo of me depicts the snowfields on the Wind River Peak some 135 years later from near the same location.

This photo of Mountain Sheep Lake from the USGS Archives is labeled "Source of the Popo Agie River"

This 2013 photo shows the same background as the 1878 photo above, though from a somewhat different angle.

For more information about some of the history of this area you can find my articles in American Surveyor magazine archives or do your own research in the USGS archives. You may find interesting material I omitted. My interest is focused on the Wind Rivers, but there's plenty of information out there about other places in Wyoming (like Yellowstone).

SKETCHES FROM USGS ARCHIVES FROM ATOP WIND RIVER PEAK IN THE SOUTHERN WIND RIVERS IN CENTRAL WYOMING 1877.



PHOTOS TAKEN 2008 REVEAL ATTENTION TO DETAIL IN THE ABOVE SKETCHES.

(Continued from Page 12)

Long before the reign of Caesar, the first five books of the Old Testament were written. The Graf-Wellhausen theory says that these five books, the Pentateuch, at one time consisted of four major documents which were combined into a single literary unit about 400 B.C.[33] Many times within the Pentateuch, and in the rest of the Bible, reference is made to the survey of land.

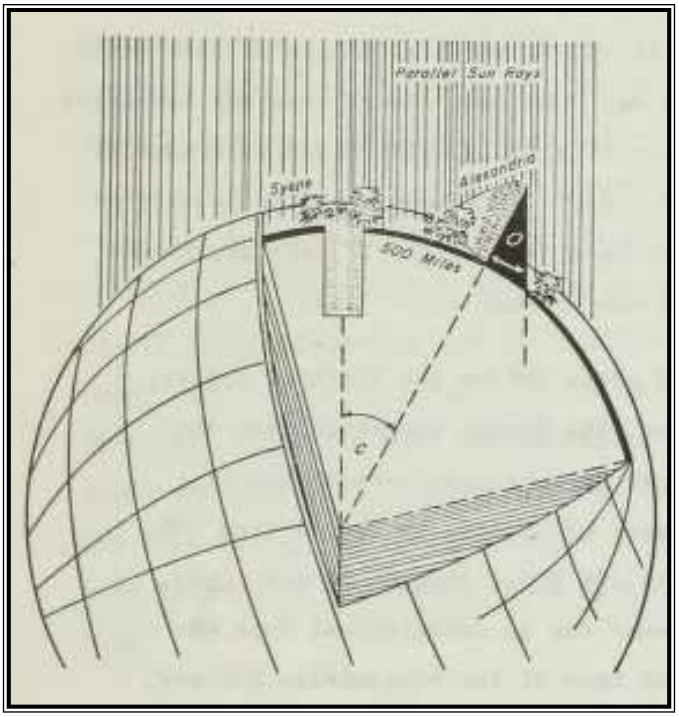
Biblical units of measure were simple and none too exact. For the most part they consisted of approximates arrived at by the use of ones body. The cubit was the length of a man's arm from his elbow to his extended finger tip, about 18 inches. A span was the reach of a man's outstretched hand, from finger tip to finger tip, or about 9 inches. A palm was all four fingers, or about 3 inches. A finger was about three-fourths of an inch. Two spans equalled 1 cubit.

In Ezekiel 40:5 and 43:13 a long cubit is mentioned. It is compared to a cubit and a hand breadth. the Acts 27:28 mentions fathoms. This was the length of a man's outstretched arms, or about 6 feet.

The reed was an instrument used in measuring, and according to Ezekiel 40:5, it was 6 cubits long. The measurement of land was related in 1 Samual 14:14, to the area a team of oxen could plow in 1 day. In Mesopotamia the meaning of "acres" as used in Isaiah 5:10, was about two-fifths of our present acre.[33]

About 500 years before the birth of Christ, Pythagoras, the Greek, suggested that the earth might be spherical rather than flat. Eratosthenes of Cyrene, who lived from 276 B.C. until 196 B.C., thought he was right. Eratosthenes was an intellectual type who became the head of the Alexandrian Library. His intellectual curiosity paid off when he learned that, at the peak of the summer solstice, the sun illuminated a deep vertical well in Syene. At noon, on the longest day of the year, he measured the Angle of the shadow cast by a vertical wall in Alexandria. It was equal to one-fiftieth of a circle. He thought that Alexandria and Syene were on a direct north-south line, and he knew the accepted distance between the two cities. His theory, based upon his observations, was that the distance between the cities was equal to one-fiftieth of the circumference of the earth.

He came very close. He used units of length called stadia and, because of compensating errors, came up with a distance of 24,662 miles. Since the earth is not a perfect sphere, and Syene and



Eratosthenes application of basic geometry in determining the circumference of the earth.

Alexandria are not exactly the distance apart that he used, and are not on a perfect north-south line, he was a little off. The real figure is 24,899 miles.(34)

This was the first attempt to find the size of the earth by measuring the arc of a meridian. It was quite a feat in the advancement of surveying. The only thing wrong about it was that people couldn't believe the earth was that big. Geographers, until the close of the 15th century, did not accept the findings of Eratosthenes. They used the calculations of Poseidonius (130 B.C. - 51 B.C.) and came up with a circumference of 18,000 miles.(34)

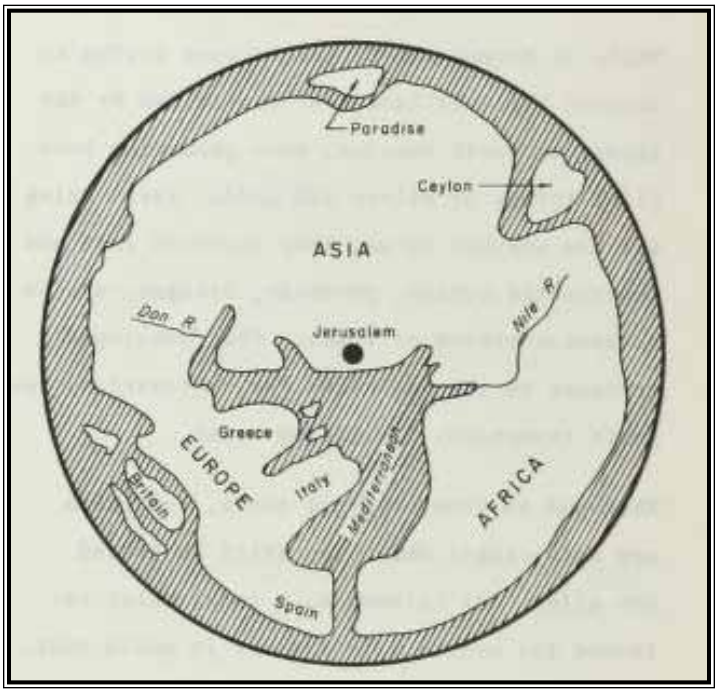
This useful figure helped the Church to convince people, during the middle ages, that Jerusalem was the center of the world. The maps of that period are narrow in concept, and are often called T in 0 maps due to their stylized depiction of what people wanted the world to look like.(29)

When William the Conquerer invaded England in 1066, he changed the manorial land tenure system to the feudalism of France.(95) Under this system, the lords of the manors paid a fixed sum to the king. About 20 years later, William ordered a survey of the lands of England. It was done, and is called the Domesday Book. It is a description of the land, with the names of the owners, and the nature, extent and value of their holdings.(12) It was made so that there might be a more accurate assessment of the sum to be paid to the king. The lords really did not fare too badly. They often met their payments by lending their serfs to the king as soldiers.(12) This was considered a good way to raise an army during the wars, undertaken by European Christains between the 11th and 14th centuries, to free Jerusalem.

While in Europe the Crusaders were trying to recover the Holy Land, the people led by the Incas, in South America, were producing beautiful things of silver and gold.(25) Using methods unknown to us, they surveyed land and constructed cities, pyramids, bridges, and an extensive system of roads. They developed terraces on the hillsides for cultivation, and built tremendous irrigation works.

They had no iron or steel tools, yet there are Inca canals which can still be traced for miles. At Cajamarca, a canal which extended for over a mile was cut in solid rock. At one place they cut the canal in a zig zag patter. Apparently this was one of their methods of controlling the flow of water. At Huandoval, two canals meet and cross, one above the other. There was once a third canal below the other two.(25)

The ancient Inca fortress city of Macchu Pichu set near the top of a mountain, was built of huge blocks of stone. No cement was used in its construction, but the stones were so carefully fitted that some of the walls and stairs are still intact and plainly visible in aerial photographs.(19)



Facsimile of a T in 0 map showing the usual depiction of the world in the middle ages. Jerusalem was shown at the center of the world, and the Asian location of Paradise gave us the phrase "to orient a map."

(Continued no Page 25)

Geodetic Surveying: Part XIII

Alexander Dallas Bache and the Coast Survey: Part 2

Herbert W. Stoughton, PhD, PELS, CP

The Mexican-American War, 1846 - 1847, and the Oregon Treaty (1846) determined the seaward coast of the contemporaneous United States. Texas (Gulf of Mexico), and California and Oregon Territory (Oregon and Washington) (Pacific Ocean) greatly expanded the assignment and responsibility of the Coast Survey. Bache, with his close political ties, undoubtedly had insight into the internal and foreign activities of the United States. In his request for appropriations for 1847-1848 and 1848-1849, he addressed his efforts to obtaining additional instruments and vessels to address the new territorial acquisitions.

Zachary Taylor won the presidential election of 1848. 1849 witnessed the departure of an uncle (Vice-President of the United States) and a brother-in-law (Secretary of the Treasury) from the administration. Senator Thomas Hart Benton (Missouri) (14 March 1782 - 10 April 1858) spearheaded an attempt to repeat the debacle of 1818. However, the roots of the controversy dated to late 1846 or early 1847. In 1846, upon the recommendation of Bache, Sears C. Walker went to work at the Naval Observatory under Mathew Fontaine Maury (14 January 1806 - 1 February 1873). Maury was head of the Navy's Department of Charts (1842) and Instrument and Superintendent of the Naval Observatory (1844).

Walker's first assignment at the Naval Observatory related to an in depth study of the newly discovered planet Neptune. Also, Walker was assigned to assist the Coast Survey in developing telegraphic determination of longitude. Walker's work with historical astronomic observations by the French astronomer Lalande (1795) demonstrated that Neptune was considered a fixed star. From the historical information and the current observations, Walker computed a detailed ephemeris. Walker wrote an article about his researches. Joseph Henry read the report and negotiated publication thereof in Astronomische Nachrichten, a leading international journal on astronomy. Maury was livid. Maury accused Henry (and Bache by association) on what amounted to one Government agency taking a discovery from another which caused the Naval Observatory great harm. It was well known that Maury had rigid rules concerning office working procedures. Apparently, Walker had a diametrically opposite philosophy. Walker preferred to not work at the Observatory and work on his complex calculations and least square adjustments in his own environment. Maury terminated Walker, and Walker immediately rejoined the Coast Survey, and there he continued to develop the telegraphic longitude program.

About the same time, James Ferguson, who had been terminated by the Coast Survey for unsatisfactory work (discussed earlier) joined the Naval Observatory as an observer. Prior to Ferguson's dismissal from the Coast Survey, he was a close friend of F.R. Hassler and a strong supporter of the Coast Survey. In the North American Review (April 1842; pp. 446 - 457) there appeared, according to one biographer of Hassler, "Perhaps the most thorough and influential article bearing on the scientific value of the Coast Survey . . .". Then, after his termination and joining the Naval Observatory, Ferguson authored a scathing attack (one author called it a "scathing broadside") on the Coast Survey, which was published in Hunt's Merchants' Magazine (February 1849).

The actions of Maury and Ferguson undoubtedly came to the attention of Senator Benton. Benton's infatuation was deeply seated dating from the Congressional attack by Representative Aycripp in 1842. Benton publically stated three major faults: (1). The Coast Survey was too expensive (more than $145,000 per annum); (2). The Navy did all the work (hydrographic surveys and oceanographic investigations). He further stated that the Navy was currently under-employed. It would be appropriate to absorb the Survey; (3). The astronomic observations supporting geodetic operations were illegal. The astronomic duties and responsibilities should be under the management of the Naval Observatory. Historians who investigated and studied the Coast Survey have also submitted other reasons. John Charles Fremont (21 January 1813 - 13 July 1890) was the son-in-law of Senator Benton. Fremont's western exploratory expeditions (1842, 1843, 1845, and

1848) placed him in the forefront of young men actively associated with western expansion and Manifest Destiny. It has been suggested that if the Coast Survey was disbanded and partitioned to the Navy, the Army, and the Naval Observatory, the field survey component would be placed under Army control.

Benton specifically moved to strike the $186,000 appropriation for the Coast Survey for the fiscal year ending 30 June 1850, and replace it with a $30,000 appropriation for surveys to be conducted by the Navy. The superintendent and the assistants of the Coast Survey would be terminated.

Bache, like his predecessor, Hassler, did not wait for the inevitable. Bache had the overwhelming support of the American academic and mercantile communities. Senators Jefferson Davis (Mississippi) and J.A. Pearce (Maryland) opposed Benton in the Senate, and delivered very strong positions supporting The Coast Survey. Lt. Charles A. Davis, U.S. Navy, assistant at the Coast Survey responded to the article in Hunt's Merchants' Magazine and authored a pamphlet published by Harvard University. Also, statements supporting the Coast Survey were received from learned societies, chambers of commerce, academic institutions, insurance companies, and private industry.

The Maury - Bache and Henry rivalry was not a conflict between two organizations. Although Maury was a Naval officer, his duties and assignment were well outside the main stream of naval careers. Numerous naval officers had completed assignments and tours of duty at both the Coast Survey and the Naval Observatory. There is no evidence in their careers and writings that there existed conflicts, and were life long supporters of the Coast Survey. At least one author has suggested that the Bache - Henry conflicts with Maury were the collision of giant egos seeking honors, recognition, and support from the American physical science and academic communities. When the measure came to the floor, the measure to strike down the Coast Survey appropriation and turn over the functions to the Navy, received only two votes!

Bache came out the clear winner, but he and Maury would confront each other numerous times on other activities coming on line with the advancement of science and technology.

Each individual had strong supporters who were not reticent to express their likes and dislikes.

Bache and Maury had two very different philosophical positions about collecting scientific data and drawing inferences therefrom. Maury collected small data sets or large data sets without significant quality controlled observations to identify anomalies and short falls. At times the published results produced highly imaginative conclusions. In one instance, his widely separated data sets led to the publication of wind and current charts which shortened by weeks long oceanic voyages. However, his theories of an "open polar sea" and "Atlantic Telegraphic Plateau" were utterly erroneous. Maury's popularity was the result of his passionate beliefs and ability to express them in glowing terms, which were quite popular with the American public.

Bache was the complete opposite. He insisted on being detached, objective, and analytical when making measurements/observations. He took precautions to carefully define and establish controls in order to bound (assign limits to) the study. Accuracy, precision, repeated measurement, and verification were the elements guiding and supporting the conclusions published. Furthermore, Bache strongly believed that the scientific community should monitor and support each other in order to preclude misleading the American public. Ultimately, Bache's philosophy would be instrumental in establishing the National Academy of Sciences during the American Civil War.

During the early years of Bache's tenure as superintendent of the Coast Survey, Bache made significant changes from Hassler's organizational operations. Hassler had initiated the Coast Survey operations in New York - New Jersey and Long Island, and systematically progressing northward and southward. At the time of Hassler's death the major triangulation had sufficiently proceeded to warrant verification base lines. At that time the location of verification base lines was an informal perception of the geodesist and not based upon statistical criteria. It would be only in the twentieth century when a statistical criteria (strength of figure) would monitor the anticipated degradation of the computed lengths through the network to a predetermine marginal criteria. Bache sent triangulation, plane table, and hydrography parties to scattered locations at which baselines were constructed and measured, triangulation observed, topography mapped, and soundings collected. This meant that at each of these isolated locations a local geodetic datum was created and defined. The latitude and longitude of the datum's origin was derived from astronomic observations. When two of the regional (local) datums met, geodetic ties were instituted. Finally, the geodetic positions in one system were recomputed into the other system. This approach had merit. Although the goal was to chart the entire coast line on a single datum, there were numerous harbors and shipping routes requiring immediate attention to mitigate navigation hazards and impediments. Bache decided to send personnel, equipment, and instrumentation to these sites, and subsequently absorb the recomputing expenditure, which he considered minimal.

After soundly defeating Senator Thomas Hart Benton's attack to dismember the Coast Survey, Bache immediately reorganized the administration and organization of the Coast Survey. The Atlantic and Gulf coasts were divided into nine sections. After conclusion of the Mexican - American War, two additional sections were added for the Pacific coast. All the sections were created between 1843 and 1852. The basic operations of the various field elements followed the historic routine.

Bache issued elaborate instructions to the chiefs of the field parties, required monthly reports, and sent interim communications by telegraph. In the 1850's, only George B. Davidson (9 May 1825 - 2 December 1911), who was assigned to the Pacific coast wrote, "My instructions were in elaborate detail, through thirty or forty pages, with the last saving sentence that if none of the proposed schemes could be carried out, I was to do the best that my judgment suggested."

In 1853, Bache reported that triangulation extended 1,450 miles (Cape Small, Maine, to Old Topsail Inlet, North Carolina). A truly remarkable feat for the era.

Bache's greatest attribute was his ability to attract men, and later women, of potential to come to the Coast Survey. Prior to the American Civil War, no more than 50 Army officers were assigned to the Coast Survey during Bache's tenure. This meant approximately ten to twelve

officers per year. Twenty-five of these men would be promoted to the rank of Brigadier General, or higher general rank, during the American Civil War, or immediately thereafter. During most of this era, Army officers served as Assistants in Charge of the office and/or Bache's executive officer when Bache was on sick leave or on travel.

Naval officers assigned to the Coast Survey usually were assigned to hydrographic ships. These assignments provided invaluable command positions at an earlier time in their careers, than would be achieved in the regular Navy assignments. Also, many young naval officers had assignments, and gained invaluable experience, on the newly acquired steam ships.

In 1851, the Senate passed a resolution to the Secretary of the Navy to report "what advantages to the public service would be derived from transferring the survey of the coast from the Treasury to the Navy Department . . .". This resolution was initiated based on a request of the Secretary of the Navy, William A. Graham, who recommended this course of action in his annual report to the President's annual message to Congress. Again, Bache "gathered the troops", and beat back the enemy.

From the arrival of Bache, the Coast Survey appropriations were $ 100 K, $ 80 K, $ 100 K, $ 111 K, $ 146 K, $ 165 K, $ 251 K, and $ 406 K. Between 1851 and 1860, the lowest appropriation was $ 310 K to a high appropriation of $ 546 K (1857 - 1858). These later appropriations were between 0.5 and 1 percent of the total Federal budget!

On 2 March 1855, Congress enacted "An Act to Promote the Efficiency of the Navy". A board of Navy officers were directed to review, evaluate, and report all officers in the Navy who were found inefficient or incapable of performing their duty. In modern parlance "it was a witch hunt". When the dust settled, John Moffitt, Bache's most competent hydrographer, William D. Whiting, the first hydrographic inspector, and Washington Bartlett, who performed work on both the Coast Survey and the Lighthouse Board, were placed on the furlough list. Eight-one naval officers were placed on the furlough list. Subsequently, Moffitt was exonerated. It is interesting to note that Moffitt proved his abilities, for during the

American Civil War, he had an illustrious in the Confederate Navy, and became known as "The Prince of Privateers".

When Franklin Buchanan assumed the office of President, coupled with the financial panic of 1857, he initiated a request to account for moneys expended annually by the Coast Survey and the Office of Weights and Measures. Bache, apparently anticipated this request. In August 1857, the American Association for the Advancement of Science resolved to appoint a committee to "inquire and report on the Coast Survey of the United States." The committee consisted of a Who's Who in American science, and was called the "Committee of Twenty". The report was completed on 2 November 1858, and the end result was to reduce the number of copies printed from 10,000 copies to 5,000 copies. Proposition 10 of the Committee recommended that the Coast Survey carry its triangulation efforts into the interior of the United States. Proposition 12 validated the administrative and operational structure of the Coast Survey. This proposition dulled the attacks to have the Coast Survey under the Navy. It also put on notice to the Coast Survey political opponents that the American scientific community would not tolerate manipulation of the civilian - Navy - Army personnel system under civilian superintendence.

Approximately two weeks after publication of the report of the Committee of Twenty, another virulent attack in the form of two letters were published in the New York Times (17 and 18 November 1858). The attacks were both directed to the Coast Survey and Bache. The documents revealed a deep-seated animosity. The anonymous author has not been identified. The resulting confrontation was shrill, but was beaten back with little opposition.

The Annual Report for 1858 witnessed a subtle change in the role and goals of the organization. From 1807 the legislated objective was to produce a set of reliable nautical charts of the entire coast of the United States. In 1807, the U.S. coast was from Maine to Georgia (at Florida), and from Florida (at Alabama) to Louisiana - Spain (Texas). As the sixth decade of the nineteenth century drew to a close, the length of the U.S. coast line had nearly doubled with the annexations of California, Oregon - Washington (Oregon Territory), and Texas. It was believed by Congress and political administrators that once the charting had been completed (first time), the need and the mission for the Coast Survey would cease to exist. The numerous confrontations Hassler and Bache had encountered would probably have discouraged lesser men. While Hassler addressed the initial formation of the Coast Survey, the search for instrumentation and personnel needed to produce the nautical charts, Bache inherited an operational entity which his stewardship was producing maturations and competence. During the period 1844 - 1858, both Europe and America witnessed the transition of natural science and engineering from a gentlemen's hobby or cottage industry to systematic programs residing in governmental agencies and post secondary academic institutions. While the older system worked, the new order focused the energy of the participants to become a strong lobby seeking support for scientific and engineering progress.

In 1858, Bache acknowledged that the Coast Survey was not a caretaker, soon to be deactivated with its assets dispersed, because the coasts had been charted. He, Bache, and his scientific associates now understood that the hydrography and hydraulics of the maritime environment were dynamic, even having a cataclysmic nature, which affected the published nautical charts. Bache and his associates recognized the need for resurveys of significant areas caused by human activities and natural changes. It became apparent that in the future the Coast Survey would not only be a collector and producer of original information but a redactor addressing the inventory of previously published nautical charts.

In March 1861, the 1861 - 1862 Congressional budget debate took place. Bache's request was $ 502,800, including funds for a new steamer ($ 45,000) to replace the Steamer Wallace (lost at sea). The debate was noisy, but Bache had mustered the forces. In the final conference, the steamer appropriation was stricken; funds for work on the Atlantic and Pacific costs were each reduced by $ 20,000; and the survey of the Florida reef was reduced $ 15,000. The negotiated appropriation passed both Houses of Congress on the eve that Abraham Lincoln assumed the presidency.

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A FEW THINGS YOU SHOULD KNOW ABOUT WRITING PROPERTY DESCRIPTIONS

By: Mark E. Chastain, P.L.S.

About once per month, I get a phone call or email from an attorney or surveyor. There has inevitably been a disagreement on how to properly word a "legal" description, and I am summoned to moderate and referee. This is totally avoidable, and only requires that surveyors read and apply board rules as professionally as they would read and apply the proper weight to (ironically enough) a property description.

The whole issue revolves around Board Rule 180-7-.02(2) which sets forth instructions for writing descriptions. This rule was amended in 2008 to add some content that was to be required, such as adjoining property owners' names. That is the real issue at hand. Before going further, one must step back and understand what this rule actually applies to.

In times mostly of the distant past, and in some areas of the state, surveyors were once (and may still be) asked to prepare a description instead of, or in, conjunction with a survey. The description would be used *carte blanche* in subsequent transactions, court decisions, recorded conveyances, etcetera. This is a very rare practice in the current era. To my recollection, I've only prepared such a description twice, and neither time was within Georgia. All of us have tried to retrace descriptions which had the fingerprints of a surveyor on them, but just didn't make sense. Maybe the description looked just like the raw product produced by our software, maybe it had bearings to the second and distance to the hundredth in places, and then "northerly to a certain stump" interjected oddly. In 2008, the intention of the board was to bring up the quality of surveyor prepared descriptions. Ideally we would all agree, without a survey in hand, the description should be the next best thing and not part of the problem.

Many surveyors are diligent, professional, and meticulous in all aspects of their practice - including the preparation of descriptions. In the current era, we seldom prepare a *carte blanche* property description. If we do, then indeed Board Rule 180-7-.02(2) fully applies. One must note also that the last line of that rule states: "All descriptions, being a form of a report, shall bear the land surveyor's name, address, seal, and signature. " So, please, don't confuse this work product with the two most common uses of "legal description" in our current time.

The most common is when we send a description to an attorney or broker, usually in the form of a word processor document. This has become a very common practice in recent years due to the ability of our software to generate a document that contains all of the bearings, distances, arcs, and radii from the survey file itself. This eliminates the possibility of a typo being made by a paralegal typing each character one at a time from the face of a plat. Depending on point codes, description tables, and software settings, there is always some "tweaking" to take place such as to better describe a corner, call out a right of way or land lot line, etcetera. Sometimes the surveyor does some, or all, of the tweaking, sometimes the law office does. It is very important to realize and understand at this point that attorneys have been preparing legal descriptions for generations and are fully authorized and (usually) competent to do so. In this role, we are not preparing a *carte blanche* description; just providing them with the raw data to finish theirs with. This is a similar professional exercise to sending an engineer a CAD file with some line work and contours from a limited topo for one of their projects.

The second most common instance of a surveyor preparing a description is when it is required to be placed on the face of the plat. This may be a special requirement of the clients, or part of an ALTA survey. In any event, the description becomes part of a plat. A description is not a requirement to be placed on a plat in Georgia, it is just additional information provided at the client's request or other requirement. It becomes part of the plat, not a separate document, though. All of the required data for the description is on the survey, so all rules should be complied with.

The conflict is when a surveyor inserts adjoiner names into the description that is forwarded to the attorney for their use, Anyone who interprets descriptions (including surveyors) should understand that a call worded such as "thence along the property line of Jones North 89 degrees East 400.00 feet to an axle" creates a level of "bounded by" description hierarchy. The quick and easy interpretation is to use the dimensions to measure to the axle and keep moving. But, it creates a potential ambiguity or conflict in that "thence along the line of Jones" becomes a controlling call, arguably over the monuments, and certainly over the dimensions. If Jones' description is different, does it control? It is now called for. What if the Jones property later has a new description recorded, and that new description overlaps your survey by 5 feet? Rather than argue what the outcome is or who prevails in court, let's stop right there and recognize that such calls create a situation that is bad for a title insurer who is expected to insure every square inch of your survey and that their job is to avoid that court battle. If an adjoiner could have a valid claim to 5 feet of your surveyed property, it is not insurable. Converting a "metes and bounds" description to a "bounded by" description is going backwards. So, please try to be understanding when an attorney objects to your adjoiner calls in a description, especially if such is on the face of your survey, and is therefore going to be incorporated.

Mark E. Chastain, P.L.S., is the Board Chairman and Cognizant Land Surveyor member of the Georgia Board of Registration for Professional Engineers and Land Surveyors. He is he owner and President of Chastain & Associates, P.c.. Contact: (www.chastainassociates.com) Questions and comments can be sent to: mec@chastainassociates.com.

(Continued from Page 18)

The real beginning of European exploration took place in the 15th century during the time of Prince Henry, the Navigator (1394-1460). Through Prince Henry's farsighted effort, Portugal, at least 50 years before the rest of Europe, started exploring the seas.

One of the major factors in Portugal's expansion of travel to the unknown was the descovery of the Azores, and the growth of the Portugese settlement there. A man named Christopher Columbus lived there with his wife's family where his father-in-law taught him to use navigational and surveying instruments. Undoubtedly, it was in the Azores that Columbus first dreamed of sailing farther than man had sailed before.[34]

Perhaps it is just s well that geographers had accepted the theory that the earth was 18,000 miles around. Maybe Columbus would have delayed his voyage if he had known how big it really is!

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