Missouri Surveyor

A Quarterly Publication of the
Missouri Society of Professional Surveyors

Jefferson City, Missouri

September 2007

MISSOURI SURVEYOR

CALENDAR OF EVENTS

2006-2009

October 4-6, 2007
50th Annual Meeting and Convention
Tan-Tar-A Resort,
Golf Club and Marine
Osage Beach, MO

October 6, 2007
Certified Survey Technician Testing
Tan-Tar-A Resort
Osage Beach, MO

December 1, 2007
Board Meeting, MSPS Office
Jefferson City, MO

December 1, 2007
Certified Survey Technician Testing
Florrisant Valley
Community College

February 13, 2008
Capitol Visitation and Board Meeting

March 4-8, 2008
ACSM/LSAW Conference
Spokane Convention Center
Spokane, WA

May 8-10, 2008
Spring Workshop
Lodge of Four Seasons
Lake Ozark, MO

July 11-12, 2008
Board Meeting and Minimum Standards Workshop
Lodge of Four Seasons
Lake Ozark, MO

October 16-18, 2008
51st Annual Meeting and Convention
Joint Conference with Kansas City Society of Land Surveyors
University Plaza Hotel
Springfield, MO

December 6, 2008
Board Meeting, MSPS Office
Jefferson City, MO

May 7-9, 2009
Spring Workshop
Lodge of Four Seasons
Lake Ozark, MO

John Alan Holleck, Editor

Notes from the Editor's Desk

by John Alan Holleck

It is the 1st of August and I am still trying to figure out what happened to this year. I guess my dad was right when he told me a couple of years before he died that time seems to speed along when you get older. When we are young, it always seems that time is standing still as we wait to become eighteen or twenty-one, in my case, to be legal. Besides admitting that my father was right, getting older is not exactly fulfilling my youthful expectations. However, life seldom does, so on to the September issue.

As it turn out, this is another of my eclectic issues that does not have purposeful theme but contains articles I hope will interest the readership none-the-less. Pages two and three maintain the usual pattern, "Notes from the Editor's Desk" followed by the "President's Message." Following the President's message is David J. Langhoff's "Original Rectangular Surveys in Alaska." This was to appear originally in the March issue but somehow failed inclusion. Next-up is an article by my favorite Pennsylvania surveyor, Wilhelm Schmidt, entitled "Land Surveying," written specifically for Surveyor's Week 2007. Remember the Taum Sauk levee break of a couple years ago, Herbert Stoughton adds some perceptive comments concerning the Teton Dam across the Snake River in Idaho from thirty years ago in "Dam Dilemma: Poor Monitoring May Bring Death and Destruction." His article begs the question, Are we ignoring other potential problems? Dave Berg, an Evergreen State surveyor's short but perceptive article asks two questions, "Adjust a Boundary? Are You Sure?" He shares the page with Dick Elgin's latest accolade, Trustee to the National Surveying Museum. Rounding the first half of this issue, Gary John Bockman, Springfield surveyor and Instructor at Missouri State University, gives us his thoughts "Survey Plats and Original Monuments" and well worth your attention.

Candidate and Board member biographies, for the upcoming annual election, occupy the center section of the journal. A familiar name to Missouri surveyor events, Gary R. Kent provides some court case citations for "Understanding and Applying 'Written Intentions of the Parties' in Boundary Resolution." Next, is a thought provoking article, "*You* Own Your License (Not Your Employer)" concerning who accrues liability, you or your employer? by Dave Dediluke, a surveyor from British Columbia. Written over one hundred years ago, "What Constitutes a Survey and Map" by William G. Raymond is as fresh today as the day it was written, which describes one of the benefits of our profession—solid foundations yield a solid product. The State Chair of the Utah Council of Land Surveyors, Will Bagley offers a historical perspective on the early Mormon surveys versus the GLO surveys. The article is entitled "Pioneers Didn't Take Kindly To Pesky Federal Surveyors." The final article, "My Total Station Battery Has Alzheimer's...And That is a Good Thing!" by Arthur Dias describes his experience2 in the battery servicing business. Finally, I would like to leave you with a quote from Albert Einstein concerning education, which is applicable to our profession.

"The aim must be the training of independently acting and thinking individuals who, however, can see in the service to the community, their highest life achievement."

THE MISSOURI SURVEYOR

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President's Message

by F. Shane Terhune

Greetings fellow Surveyors;

Summer is quickly passing and although we are still experiencing 90 to 100 degree temperatures, I see signs of the eminent fall season rapidly approaching. Early mornings bring late season crickets chirping and the eternal sounds of our local High School band practicing along with distant echoes of the football and softball teams working out and signaling the start of a brand new school year. The fall is my favorite time of year. After surviving another hot and humid summer, it makes me yearn for another below zero Surveyors Rendezvous. At least I would not be covered from head to toe with chigger and tick bites as I am now. I suppose I am lucky I do not get poison ivy.

The annual Missouri Minimum Standards was held in July at the Lake with a large turnout of our members seeking to refresh their knowledge of standards of practice. I saw a lot of new faces attending, and that is encouraging to me as a sign of more surveyors participating and contributing to their profession.

Two important pieces of legislation that affect Land Surveyors were passed this year in the Missouri Capitol. The Civil Penalties bill that MSPS lobbied for was signed into law. The Board of Registration has always had the ability to penalize professional license holders by probation or suspension. This law enables the Board of Registration to assess civil fines against persons practicing without a license instead of just sending them a nasty cease and desist letter.

A bill requiring public entities to adopt quality based selection for professional services showed up and was slipped through the legislature also. This could eliminate the low bid mentality of selection which usually ends up costing the entity more by cutting corners and poor quality work.

Speaking of Legislative issues, MSPS now has a Professional lobbyist firm on retainer for a two year period. A full time lobbyist will provide a constant presence and an ear open at the capitol for our profession. Rich Barr has served as our volunteer lobbyist for several years and has done a great job for us. Rich will continue to assist and advise our lobbyists with his surveying expertise and political contacts. We are a much better organization and profession because of past service by Surveyors such as Rich who have worked to better our profession, and we are deeply indebted to these individuals.

Turning to history we are quickly approaching the 50th anniversary of the birth of MARLS/MSPS. The Annual Meeting committee has a great 50th anniversary program planned for October. The surviving founding members of our organization and past presidents have all been invited with an elaborate banquet and entertainment planned for this occasion. Many of the programs revolve around surveying history with the "Old Surveyor" Norman Brown speaking at lunch on Friday. Dick Elgin will show off part of his large collection of antique surveying instruments, and bring your own old equipment along as he will also conduct a Surveying Instrument Road Show and evaluate that old and unusual surveying equipment you have hidden in your basement. Bob Myers will hold a CST certification test for our prospective surveyors of tomorrow so bring your techs and rodmen along and give them the opportunity to take the test and see where they stand on the path of knowledge. This promises to be a memorable event and encourage everyone to attend. The annual meeting approaching means my term serving as your president is drawing to a close. I will turn the reins over to a much more refined and intellectual President in Don Martin. Don is an eloquent speaker and writer and he will be much more interesting than my bathroom humor. Writing comes much easier to me than speaking, although my wife says I don't make either one very interesting. It is time to wrap up my ramblings and thank you for allowing me to serve as your president this past year. I have met many different Land Surveyors this year around the state and have a better appreciation for the diversity of our membership and the surveying issues that effect them. I am looking forward to a slower pace next year, but would not have traded this experience and opportunity for anything. That's all for now and I will catch you all on down the line.

Cover photo: Taken at the 25th anniversary celebration for the county surveyors' association for the dedication in Ste. Genevieve for the Bench given to the cemetery in the name of P.K. Robbins, GLO Deputy Surveyor for the 5th PM. Pictured are Dan Lashley, Norman Brown and Jerry Bader. Photo taken by J. Michael Flowers.

Original Rectangular Surveys in Alaska

by David J. Langhoff

It had been thirteen years since I last worked in Alaska. The call from Mike Wilson, my old boss and now the Field Section Chief, caught me a little off guard — Would I be interested in working for the Bureau of Land Management on a limited term basis at the end of the 2005 field season? What part of the state, I wondered? What kind of project? Could I wrap up the jobs I was working on in time? Would my wife let me go? I knew I had to make it happen.

The Alaska Airlines flight was a non-stop from Chicago to Anchorage. Six hours after departing O'Hare I was met at the Anchorage airport by Roger Blouch. Roger and I had worked together in the early 90's performing Native Allotment surveys in central Alaska. Roger is now the Contract Section Survey Chief for the state of Alaska. Aside from the gray hair, he looked the same.

I spent the night at Roger's home and it was great to catch up after all those years. His daughter, who I remembered as a toddler, was now in high school. Where had all the years gone? The next morning I departed the Anchorage district office in a U.S. government Ford F-350 with about 450 miles to cover.

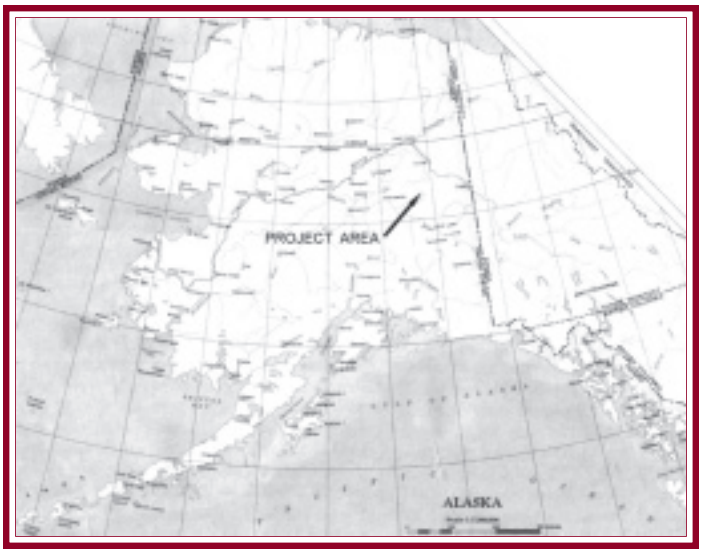
I was assigned to Camp 21 which, at the time, was based out of Chena Hot Springs, approximately 50 miles northeast of Fairbanks. The work being conducted by this camp involved the original survey of protracted township boundaries for more than 100 townships. Perspective was obtained through the realization that all of Waukesha County, where I live, is a mere sixteen townships. The survey instructions require that the township boundaries be monumental at two-mile intervals.

The project area is situated in remote mountainous terrain with an abundant array of wildlife. It is home to a number of wolf packs, grizzly and black bears, moose, caribou, and Dall sheep. I later learned that it has the highest nesting density of peregrine falcons in North America. Some of the richest gold deposits found in Alaska are in this area.

The project included the delineation of a portion of the boundaries of the Yukon-Charley Rivers National Preserve and the Steese National Conservation Area, both of which are designated as units of national wilderness preservation.

My home would be an 8' x 8' "Arctic Oven" tent. Big enough to stand up in, these tents are too heavy for backpacking. But if you're going to be spending a couple of months or more living out of a tent, they're awesome. Outfitted with a stove, cot, sleeping pad, and even a piece of carpeting, it provided more than just shelter — the peace of mind that comes from knowing you would spend each night in comfort and the knowledge that every morning would mean bone dry clothes and boots.

The geographic position (latitude, longitude) of every township and section corner in the state of Alaska has been calculated mathematically. This protracted grid of geographic positions has been published on "protraction diagrams" and has served as the basis for all cadastral surveys in Alaska since statehood.



Over the years, the Bureau of Land Management has employed many technologies to survey the huge tracts of public land that would be transferred eventually to the State of Alaska, native corporations and individuals. These methods have included trilateration, triangulation, traverse, and helicopter-mounted inertial navigation systems. Obviously, GPS is currently the tool of choice.

Camp 21 consisted of one Camp Chief, two additional permanent BLM surveyors, about ten temporary surveyors or co-op students, two helicopter pilots and one mechanic. The Camp Chief oversees the entire operation and all work assignments. Two Hughes 500 helicopters were contracted for transportation and support of field crews.

Two-man field crews are primarily engaged in the monumentation of section and township corners whose positions have been uploaded to handheld and survey-grade GPS units. Survey crews utilize small handheld units inside the helicopter to navigate to the corner location. Once there, the pilot must find a suitable landing area that is sufficiently flat and free of obstacles to permit a safe landing.

Working around helicopters is potentially dangerous. Land surveyors must be constantly vigilant to prevent personal injury or damage to the aircraft. Upon exiting a helicopter, uphill movement is obviously strongly discouraged. The vertical separation beneath the plane of the main rotor blades can disappear fairly quickly. Tools like shovels or digging bars must be carried low to the ground, never over the shoulder. All ingress/egress bars should commence or terminate from the front of the ship where surveyors have visual contact with the pilot. The noise from the jet engine makes conversation almost impossible, limiting communication to hand signals. The tail rotor is nearly invisible.

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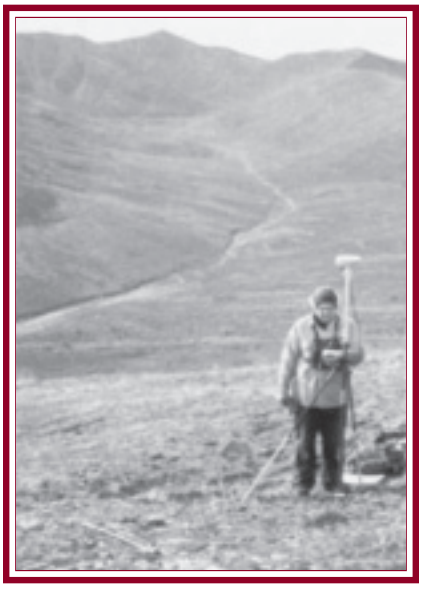
Original Rectangular Surveys in Alaska (continued)

Most helicopter safety seems like common sense, but with all the noise and activity, brain-lock is a potential affliction. Periodically, "tailgate" safety meetings are held to remind surveyors of the dangers and to avoid complacency.

Occasionally, landing zones are not ideal and pilots will perform "toe-in" landings. This is where the forward end of the skids is the only part in contact with the ground. During this type of maneuver, the pilot is still holding main rotor pitch and is effectively hovering while the surveyors exit and unload gear. Needless to say, the weight of a person must be removed from the ship in as smooth a motion as possible to allow the pilot some time to make the necessary flight control corrections. Toe-in landings require special safety training and are avoided if possible. They are usually only done when dropping a crew into a corner location, since a suitable LZ for pick-up can likely be constructed once the crew is on the ground.

The hike into the corner locations can be as little as 1/10 mile or up to a mile. This is often the most physically demanding aspect of the job considering that the survey crew's equipment consists of post hole digger, digging bar, GPS rover and bipod, spare batteries, two-way radio, staff compass, corner monument, stamping kit, bearing tree tags, chainsaw with spare gas and oil, chainsaw chaps, logger's tape, reference nails, raingear, water, and some food.

The hike into the corner is largely a matter of navigating with the aid of the handheld GPS receiver. Once the "Garmin" indicates that you've reached the approximate corner position, the survey-grade GPS receiver is set up immediately. After radio link with the base station is verified, and initialization is achieved, the exact position of the corner is determined. The point is referenced and the process of setting the monument begins. This consists of digging a hole using a post hole digger and digging bar, flaring the ends of the steel post and stamping the cap of the monument, placing a magnet at the base of the hole, setting the monument in the hole, backfilling and tamping while periodically checking reference nails. Sometimes a rock collar is constructed around the brass cap.



Camp chief Kurt Huhta performing a static observation on a newly established section corner.

The Bureau of Land Management takes great pride in their monumentation procedures and a properly placed Berntsen monument (manufactured right here in Madison, Wisconsin) is something that will perpetuate the corner location for a very long time. Section 4-84 of the Manual of Surveying Instructions states: "The surveyor cannot perform any more important service than that of establishing permanent and accurate evidence of the location of the corners in his survey."

Once the monument is set, a static GPS observation is performed on the brass cap while surveyors take accessories to the monument.

Accessories are established to evidence the position of the corner monument. If the monument is destroyed or removed, its position may be identified by any remaining evidence of the accessories. Bearing trees, when available, are taken. Field notes will indicate the bearing and distance from the corner to the center of the tree, the diameter of the tree at breast height, the species, and the exact marks scribed. Trees of sufficient diameter are fully scribed to indicate the township, range, and section in which the tree is located. Other accessories might include chiseled crosses or steel bolts set in rock outcroppings, or mounds of stone.

The remains of a Cessna 180. This accident was the result of pilot error.

Occasionally, while working in areas above treeline, we would come across pieces of twisted metal, almost white in color that looked like aluminum. From the helicopter they stood out visually against the dark colored rock. They were generally smaller than a clipboard, about º inch in thickness, and often found in clusters. Later, research revealed that part of the area being surveyed was designated as the "Yukon Command Training Site". Most likely it is utilized by nearby Eilson Air Force Base or the U.S. Army's Fort Wainwright. I learned that the area was used as an impact site for conventional ordnance including hellfire missiles, multiple launched rockets, and 2000-lb bombs. I hoped they knew we were there.

The Alaskan backcountry is accessed to a large extent with a variety of fixed-wing aircraft and helicopters. It is not uncommon to come across the remnants of downed aircraft. This past fall, when the remains of a single-engine aircraft was spotted by our crew, the pilot immediately relayed, by radio, the location of the aircraft wreckage to flight service. Flight service responded that this accident was one with

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Original Rectangular Surveys in Alaska (continued)

which they were aware. Admirable, I thought, was the fact that our helicopter pilot, likely following some airman's code, treated the discovery as if the accident might have occurred recently.

I hiked up to the crash site and inspected the Cessna 180. It had come to rest nose-high on a fairly steep hillside covered with black spruce. Months later, I looked up the NTSB aviation accident report. I was pleased but surprised, having inspected the wreckage up close, to learn the injuries to the pilot were only minor. The report indicated that the pilot had decided to skip a fly-by inspection of an unfamiliar airport. On approach, the pilot realized that he was high on the glide path and attempted a go-around. He indicated that the terrain was "visually deceiving" and "the airplane was unable to out-climb the terrain". It was interesting to note that the pilot involved in this accident had more than ten thousand hours of flying time in a variety of aircraft types. So, a lack of experience was not a factor in this incident.

Weather can drastically affect the production of the camp. When bad weather moves in, helicopters don't fly, and no corners get set. There are only so many tasks that can be accomplished in camp like catching up on paperwork, sharpening tools, organizing gear, or performing chainsaw maintenance. In the fall of the year, after months of very long hours and hard work, everyone is anxious to wrap it up. Co-op students have resumed class and permanent employees are interested in getting home to their families and the luxuries of normal life. Every effort is made to get those last corners set.

Unfortunately, the weather around the autumnal equinox is often unsettled and daylight is quickly waning. In late September, at these latitudes, daylight is decreasing by almost an hour each week.

The "get 'er done" attitude is alive and well. Surveyors hope for any break in the sky that will permit continued work. In some cases, after departing camp, marginal conditions will turn the helicopter around. Occasionally, surveyors will get dropped off to set a corner and weather conditions will worsen with ceilings dropping rapidly. If a quick pick-up isn't possible, crews may find themselves walking out. This happened to several crews and some had to hike over six miles through mountainous terrain void of trails in dramatically deteriorating weather conditions. Needless to say, warm, dry clothes and some supper are all you could want at the end of such a hike.

One of my last responsibilities, in the process of breaking down camp, was to assist in slingloading equipment from a remote fuel site back to camp. During the helicopter flight of about 30 minutes, the pilot and I spotted a grizzly with two cubs, dozens of caribou, Dall sheep, and one moose. It drove home to me the fact that we were working in one of the last bastions of true wilderness, as yet virtually unaffected by man's existence.

Once Camp 21 had been dismantled and transported back to the Anchorage District Office, I was assigned to Chris Wiita to work on a variety of smaller jobs. We spent a few days in Homer on the Kenai Peninsula retracing survey lines and investigating a possible encroachment associated with a Native Allotment parcel. We then traveled overland to Haines which necessitated crossing the border into Canada, and worked on a project along the Chilkat River north of Haines. Finally, we traveled 25 hours by ferry to Prince of Wales Island, west of Ketchikan, to perform a survey for the Bureau of Indian Affairs.

The whole experience was wonderful. I am so proud to be able to say that I have assisted in performing original rectangular surveys of the United States Public Lands Survey System. The people with whom I worked are some of the friendliest and most interesting individuals you'll ever meet. And BLM — Alaska is without question "the greatest survey organization in the country and the envy of the world".

I left Alaska at the end of October on a "red-eye" flight. As the Boeing 737, bound for Seattle, climbed steadily out of Anchorage International Airport, it was completely dark. Winter was just around the corner. I was on my way home to Wisconsin, a state with an area one-tenth that of Alaska and ten times the population. Through the window of the plane I could see the northern lights shimmering, a weird, translucent green curtain of light. The "Big Dipper" was noticeably higher in the sky than it is back home. I wondered not if but when I would return.

References:

NTSB Factual Report ID No. ANC99LA077

Cadastral Survey Technology in Alaska from Statehood to Present

Robert W. Arndorfer and Jerry L. Pinkerton

Journal of American Congress of Surveying and Mapping

Volume 51, No. 4, December 1991

U.S. Department of the Interior, 1973. Manual of Instructions for the Survey of the Public Lands of the United States, 1973, Bureau of Land Management Technical Bulletin 6, Washington, D.C.: U.S. Government Printing Office.

Camp 21 — Chena Hot Springs

Land Surveying

by Wilhelm A. Schmidt, PLS

Almost everyone recognizes surveyors when they see them. Almost no one knows exactly what they do and how they do it.

Years ago while doing a survey, my instrument man was set up at a street corner and I was giving him sight some distance away. Two elderly ladies were standing at a bus stop near him. One of them said to the other loudly enough for him to hear: "They never do any work, all they do is measure, measure, measure." When my assistant told what she had said, we looked at each other, tried to keep a straight face . . . and kept on measuring.

Come to think of it, the lady was right. Measuring is what we surveyors do — i.e. measuring land. Even geodetic surveyors measure land, but they take the curvature of the earth into consideration, while land surveyors reduce the earth to a plane.

There are two reasons for measuring land in this manner. One is to establish the boundary of a piece of real estate. The other is to facilitate the development of land by staking out buildings and improvements, both private and public. In the latter capacity, surveyors "work" mostly for developers. In the former, they are hired by the individual land owners wanting to know the extent of their property. Surveyors then mark the corners of their property with iron pins and, if asked to do so, place stakes on line.

> ***"They never do any work, all they do is measure, measure, measure."***

Occasionally, the location of the corners and lines is uncertain. In that case, if the neighbors can come to an agreement on their location, correction deeds must be recorded to formalize the agreement. If not, the surveyors for both sides may have to give expert testimony in court to settle the dispute. Only a judge can ultimately decide the location of the boundary. But in all boundary surveys, surveyors must proceed as if they were sitting on the judge's bench. They must know boundary law and apply it the best they can, with the expectation that the result is acceptable to the land owners.

So, how do surveyors know where the property lines and corners are supposed to be? By reading the description of the property in the deed. The boundary surveyors' first stop is always the courthouse, specifically the office of the recorder of deeds. There they acquire copies of the current deed to the property they have been retained to survey, as well as those of the adjoining properties. They also get any plans that are on record. Back at the office, they plot the descriptions in the deeds to get a sense of the size and shape of the property and how well it is marked. They also keep an eye open for ambiguities and inconsistencies in the deeds that might require further research.

With this information in hand, surveyors go to the site and look for actual corner markers. Generically, the markers are called monuments, but they can be iron pipes, iron pins, railroad spikes, or anything else made of iron. In rural areas, they can be stones or trees. In subdivisions, some of the corners along the streets are marked with concrete monuments. Surveyors check the accuracy of the markers they find, and then proceed to mark the unmarked corners in accordance with the description in the deed.

That's often the end of the survey. In many instances, however, a plan of the property is desired or required. The plan is the record of the survey. Surveyors generally keep their research and field notes on file for future reference. But the property owner has no record of the survey without a plan. The plan usually shows the boundary as well as the major improvements on the property. Such a plan is often required for mortgage commitment or the issuance of title insurance. It is also required as evidence in a boundary dispute. For the plan to be valid, the surveyor's seal must be embossed on it. For certain purposes, a signed certification of accuracy must also appear on it.

One other service surveyors provide is the preparation of a legal description. A new description is necessary for the conveyance of a newly created lot. It is advisable to correct inaccuracies in the current deed, although the description need not be used until the next conveyance of the property. In form, it should be a metes and bounds description — providing the direction and length of each of the lines as well as identifying the corner markers and the adjoining property owners. At the end, the description should state the area of the lot in square feet or acres, depending on its size.

It should by now be apparent that measuring land is more work than the lady at the bus stop was willing to concede. At its core, it may only be measuring. But try doing without it!

The article above was prepared for the Lehigh Valley Chapter and was printed in local newspapers during the 2007 Surveyor's Week.

Reprinted from *"The Pennsylvania Surveyor"* Spring 2007

MO Colleges/Universities Where Land Surveying Coursework is Available

The following list will be updated quarterly as new information becomes available.

Longview Community College - Lee's Summit, Missouri
Contact: Ken Eichman
Longview Community College
Science and Technology Bldg.
500 Longview Road
Lee's Summit, Missouri 64081
816-672-2283

Florissant Community College - St. Louis, Missouri
Contact: Ashok Agrawal
Florissant Community College
3400 Pershall Road
St. Louis, Missouri 63135
314-595-4535

Missouri State University - Springfield, Missouri
Contact: Thomas G. Plymate
Southwest Missouri State University
901 So. National
Springfield, Missouri 65804-0089
417-836-5800

Mineral Area College - Flat River, Missouri
Contact: Jim Hrouda
Mineral Area College
P.O. Box 1000
Park Hills, Missouri 63601
573-431-4593, ext. 309

Missouri Western State University - St. Joseph, Missouri
Contact: Department of Engineering Technology
Missouri Western State University
Wilson Hall 193
4525 Downs Drive
St. Joseph, MO 64507
816-271-5820
www.missouriwestern.edu/EngTech/

St. Louis Community College at Florissant Valley
Contact: Norman R. Brown
St. Louis Community College at Florissant Valley
3400 Pershall Road
St. Louis, Missouri 63135-1499
314-595-4306

Three Rivers Communitiy College - Poplar Bluff, Missouri
Contact: Larry Kimbrow, Associate Dean
Ron Rains, Faculty
Three Rivers Community College
2080 Three Rivers Blvd.
Poplar Bluff, Missouri 63901
573-840-9689 or -9683
877-TRY-TRCC (toll free)

University of Missouri-Rolla - Rolla, Missouri
Contact: Distance & Continuing Education
University of Missouri-Rolla
conted@umr.edu
103 ME Annex
Rolla, Missouri 65409-1560
573-341-4132

University of Missouri-Rolla - Rolla, Missouri
Contact: Surveying Courses in Civil Engineering
Dr. Bill Schonberg, Chairman
University of Missouri-Rolla
Dept. of Civil Eng.
civil@umr.edu
1870 Miner Circle
Rolla, Missouri 65409-0030
573-341-4461

University of Missouri-Columbia, Missouri
Contact: Lois Tolson
University of Missouri-Columbia
W1025 Engineering Bldg. East
Columbia, Missouri 65211
573-882-4377

Missouri Southern State College - Joplin, Missouri
Contact: Dr. Tia Strait
School of Technology
3950 E. Newman Rd.
Joplin, MO 64801-1595
1-800-606-MSSC or 1-417-782-MSSC

The Dam Dilemma: Poor Monitoring May Bring Death and Destruction

by Herbert Stoughton, Ph.D.

Consider the failure of the Teton Dam along the Snake River in Idaho. June 5, 1976 at 11:57 a.m. eleven people were killed, 2,300 treated for injuries; 4,000 homes were lost; 11,000 head of livestock drowned and 90,000 acres of crops were consumed by floodwaters. Over $5 billion in damage was attributed to the dam's failure.

This enormous potential for destruction presents surveyors and engineers with a major task — how to monitor dams, holding reservoirs, canals, or pipelines to protect the public welfare. Up to 10,000 such structures are estimated to exist throughout the United States; many demand state-of-the-art technologies to monitor them properly. But analysis of a monitoring program is complicated by a number of factors that, in combination, literally expand the problem exponentially.

The first consideration is location, which, out of necessity, is usually at a point of weakness in the earth's crust — across a canyon, gorge, wadi, arroyo or valley.

A second factor is hydrology. It is unreasonable to blockade a watercourse having an insufficient recharge — either naturally or by man-made diversions — unless the blockage is to reduce peak storm runoff. Retention dams built to control storm runoff have unique design criteria that are radically different from water conservation projects.

. . . analysis of a monitoring program is complicated by a number of factors that, in combination, literally expand the problem exponentially.

The third potential problem is economics, including factors that range from design and construction financing to the analysis of alternative projects and various fiscal and physical returns. Because economics is not an exact science, it may well be that this is the most disruptive influence of all.

The fourth factor is politics. Since the end of the Korean War public awareness and activism have affected design and construction. The Environmental Protection Act of 1969 is a demonstrable effect of political action.

Finally, there are considerations involving the protection of the public — the fundamental reason for implementing monitoring systems.

While the primary reason for dam monitoring is protection of the public, a secondary reason is to enable engineers to gain a better knowledge of conditions that contribute to failures and disasters.

The classic monitoring systems have been designed and implemented after construction is completed. Essentially, such monitoring systems are an afterthought, and while these systems do provide information, acquiring the requisite data for long-term understanding of the structure's behavior is difficult.

A more detailed and effective monitoring system can be used today. It is incorporated as an integral part of the original design and construction of the dam and the resulting reservoir and calls upon the knowledge gained from previous catastrophes as well as preliminary data about the tentative site itself.

Integrating a monitoring system into design and construction involves a wide variety of considerations. When a dam is built and water is impounded several major engineering, geological and geophysical problems can occur. One is the effect impounded water has upon ground water hydraulics. Does the impound water increase, or decrease, the recharge rate on the confined aquifers? What are the limits (boundaries) of the significant effects on these aquifers? Will the aquifers be contaminated?

Besides the effect upon the aquifers, the loading on the geological formations can be a problem. One effect is fracturing of various formations, which will cause leakage and potential contamination of various aquifers. The changes can seriously affect the integrity of the dam's foundation.

The saturation of the dam's anchor (bedrock) could also reduce its stability, particularly in earthen dams. There have been dam failures in which unforeseen leakage through the dam's anchor contributed to the disaster.

Viable monitoring systems are based on an understanding of the forces and causes of failure. To create that system successfully, the following data should be collected during both the design and construction stages, and after impoundment:

- Color serial photography
- False color serial photography
- Seismic profiles
- Gravity observations
- Optimized horizontal geodetic control survey network

(continued on page 11)

The Dam Dilemma (continued)

- Lateral transverse geodetic vertical survey network

The color and false color aerial photography should be acquired to provide suitable mapping (as large as 1:600) for design and profiles throughout the entire dam and impoundment area. False color aerial photographs may indicate an unknown surface or near-surface condition not readily discernible by other means. Standard procedure is to place a liberal number of geodeticphotogrammetric panels throughout the area to provide geodetic control for the photography.

Seismic profiles can create maps of the underlying geological formations. These data — and the data collected from test borings and well logs — cannot only assist in designing the dam and reservoir, but can be an important monitoring aid.

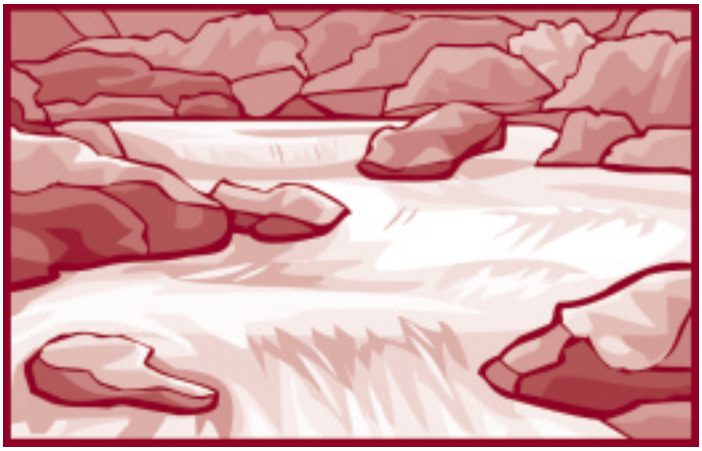
Gravity observations are crucial in geodetic leveling and vertical crustal movements. Elevations are directly related to the theory of potential energy and work. Remember, "the free sill'face of any undisturbed liquid is an equipotential surface." Too often, elementary surveying textbooks fail to address this technical point, resulting in a lack of appreciation by engineers and surveyors as to the need for an accurate knowledge of the earth's gravity field.

Departures from the predicted norm are used in geophysical prospecting. In dam monitoring, such data is required to interpret the subsequent observations correctly. If the elevations have been accurately and "properly" determined prior to impounding the water, the addition of water, and the saturation of the adjacent geological formations, radically alter the local earth's gravity field. When releveling, the change in local mass attraction — thus the profiles of equipotential surfaces — will give false elevation data and will result in the misinterpretation of crustal loading settlement. Although the principle has been understood for over a century, it is rarely applied.

In the past three decades, technology has provided the surveyor an opportunity to predict the optimum accuracy and precision that can be achieved from horizontal control surveys. Statistical theory, observing personnel, survey instrumentation and observational programs can be used to formulate mathematical models that predict the precision and accuracy of the results.

Once the design of the dam is formulated and the topographic maps compiled an "infinite" number of geodetic control networks can be designed and tested.

Vertical geodetic networks are the most misunderstood aspect of monitoring systems because of the repetitive nature of the observational program and the apparent simplicity of the instrumentation. Precise determinations of geodetic elevations, or differences in geodetic elevations, are difficult and costly operations. The problem is complicated by the large number of cumulative, small



systematic errors present from instrumental, mathematical, geophysical and micro-meteorological sources.

Instrumentation and procedures available to monitor dam safety can be divided roughly into three categories: real-time continuous, real-time intermittent and remotely sensed.

In real-time continuous monitoring, data is collected continuously at intervals of a few seconds to a few hours, and deposited in a database. Information is called about strain in the structure, water temperature and height. Also, continuous elevation at selected points — internally and externally – throughout the dam can be continuously monitored by employing hydrostatic leveling. Transverse and longitudinal "level lines" can be incorporated in the structure, the elevations sensed, and the information reported to a single recorder.

Distances and directions can be monitored in a similar manner. For instance, a permanently positioned electronic total station can automatically measure directions and distances to selected targets on the dam. The data can be transmitted to a central data bank, where computers monitor the data and signal an alarm if abnormalities appear.

Two serious concerns are the monitoring of seismic and hydraulic areas. Microseism normally occurs during impound of water or during significant changes in water levels. Monitoring these events can determine if there is weakness in the foundation rock that could affect the dam and reservoir. Although ground water monitoring near the dam has been common practice, regional aquifer monitoring has not been standard.

To monitor hydraulics and determine the reservoir's hydraulic characteristics, portable self-recording water level gauges and wind gauges should be placed at several points around the reservoir. The data can determine the seiche period and predict the nodal points. In conjunction with the wind data and wind setup coefficients, critical problem locations are determined, which are important for control of

(continued on page 12)

The Dam Dilemma (continued)

erosion and embankment stability. All these systems can be automatic, with data collected periodically and transmitted simultaneously to a central database.

The second category — real time intermittent — has been the classic approach to monitoring program, whereby survey crews perform horizontal and vertical control surveys by conventional procedures. The use of one-second, or smaller graduation, optical micrometer theodolites is recommended. Both optical light and infrared electronic distance measuring equipment are used. For horizontal control surveys (triangulation, trilateration and traverse) all the major monitoring stations should be permanent case in place piers with permanent tribrachs attached. When leveling, optical micrometer geodetic levels are precise level rods meeting certified First-Order specifications are used.

These surveys should be executed in conformity with Federal Geodetic Control Committee specifications. Targets on the dam are marked permanently with a non-destructive material so that once a geodetic network has been established; new observations of the network will require minimum field personnel. Field observations are recorded on field data recorders and transmitted to a central computer daily, allowing immediate verification of data.

Great care should be used when evaluating intermittent monitoring programs, repeating the re-observation program at the same time each year or season. There are well-documented incidents where seasonal ground, air and water temperatures, as well as the volume of water impounded, have caused significant valid structural deformations, leading unsuspecting engineers to mistake them for harmful movement.

Although the term "remote sensing" has generally been associated with the photogrammetric community, data collected by remote sensing can be used to monitor the entire dam and reservoir. Remotely sensed data will play an important role in future monitoring program. While the first system is likely to be expensive, once the prototype has been built and tested, costs will be reduced. The scope of this technique is still on the drawing board, but is a viable alternative.

Dam and reservoir monitoring presents a complex set of problems. What might appear on the surface to be a simple surveying problem is, however, a major effort. The technology to create modern, efficient, and effective monitoring programs exists. The task of the surveyor and the engineer is to express the need, design the program and apply the technology. With lives and property at stake, the task is one that the entire surveying and engineering community should not hesitate to address.

Herbert Stoughton, geodetic engineer is a land surveyor, professional engineer and certified photogrammetrist. He has published over 90 book reviews and 50 technical papers. Mr. Stoughton resides in Cheyenne, Wyoming and is president of the Professional Land Surveyors of Wyoming.

Dick Elgin Becomes National Surveying Museum Trustee

Dick Elgin, owner and president of Elgin Surveying & Engineering, Inc. of Rolla, Missouri was recently elected as a trustee of the National Surveying Museum in Springfield, Illinois. The museum is located in the heart of downtown Springfield, across the street from the Old Illinois State Capitol Building and along the walking path of the Lincoln sites in Springfield. The museum houses a collection of about 2000 books, and a like number of surveying instruments and attachments. It is one of the largest public collections of surveying instruments in the country. "I am happy to join the Museum's Board to help preserve the heritage of the surveying profession and to make it available for research and to the public," Dick said.

Dick has spent most of his surveying career collecting early American surveying equipment and also researching the early American makers. He has a large collection of equipment, portions of which he has exhibited at many surveying conventions nationwide. Some of his collection is on permanent loan to various museums. Dick is the President of Elgin Surveying & Engineering, Inc., Rolla, Missouri and is the elected Phelps County Surveyor and serves as the Land Commissioner of Phelps County.

Adjust a Boundary? Are You Sure?

by Dave Berg

How does one go about "un-ringing" a bell? That question parallels "un-adjusting" a boundary line which never needed adjusting in the first place. Consider the following scenario (a true story):

Not long ago two surveyors performed boundary surveys in the northern end of a government lot; the meander line was on the west side of the lot. Both surveyors were using the same control. Both surveyors made the same erroneous assumption regarding a found axle on the beach; they held the axle as marking the north line of the government lot at the meander line.

As they performed their surveys for various clients in the northern reaches of the government lot, they encountered some fences which didn't fit the lines of record. Both surveyors set about recording Boundary Line Adjustments making the record agree with the occupation lines. Over time, the two surveyors performed surveys in the middle regions of the government lot where they found fences to be even more "out of position" to a greater degree. More Boundary Line Adjustments were recorded.

Enter the third surveyor. The third surveyor did not accept the axle as being anything more than a very handy device to moor a buoy or float during the boating season. In addition, the third surveyor found a county field book which indicated the county had found the same axle 30 years previous; the county had not accepted the axle as marking the meander line or the north line of the government lot.

The third surveyor ignored the axle and set about a retracement, the results of which agreed very closely with surveys performed by others several decades ago. It became clear that the fences found by the above two surveyors to not be on the lines of record, were indeed very close. So the third surveyor set about marking some boundaries in the southern areas of the government lot. It as not long before property owners in the middle of the lot began to feel the squeeze.

The third surveyor of course had presented his evidence to the first two very unhappy surveyors. They went into denial. They seemed to favor going to litigation and try to justify their acceptance of the axle. To court it went.

The third surveyor prevailed, leaving the first two surveyors with the nightmare of trying the "un-ring" the bell.

It is not hard to find Boundary Line Adjustments or agreements recorded pursuant to RCW 58.04.007 that should never have been made. It is not a comfortable feeling to try to explain to a client that their Boundary Line Adjustment should never have been made. It speaks poorly of our profession. Invariably, the cost of "un-ringing" those bells is far greater than the amount "saved" by neglecting to research properly.

Save yourself a lot of heartburn. Don't ring the bell until you are sure it needs ringing.

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Item	List Price	Monthly Lease Price
Topcon GTS-236W, 6" Accuracy, Wireless, Laser Plummet	$6,290.00	$135.16
TDS 200NX Recon w/ Standard Software, tripod bracket, & cable	$1,519.00	$31.01
Heavy-Duty Wood/Fibgls tripod	$188.00	$2.59
Single Tilting Prism	$178.00	$2.19
8ft Prism Pole	$155.00	$1.70
Total:	**$8,330.00**	**$172.65**

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Lists at **$7,348**, you pay only **$5,295** for package price or **$152.49** a month!

Item	List Price	Monthly Lease Price
Nikon DTM-332 total station with On-Board Data Collection	$6,495.00	$139.58
Heavy-Duty Wood/Fibgls tripod	$188.00	$2.59
Single prism & prism pole	$366.00	$3.92
Nikon 9 pin download cable	$100.00	$1.89
Nikon Connex Software for download & data manipulation	199.00	$4.51
Total:	**$7,348.00**	**$152.49**

Contractor's Kit

Lists at **$7,517**, you pay only **$5,495** for package price or **$158.25** a month!

Item	List Price	Monthly Lease Price
Sokkia SCT6 Construction total station	$4,999.00	$108.00
TDS Recon w/ Layout Pro, includes cable, & bracket	$2,095.00	$45.93
Heavy-Duty Wood/Fibgls tripod	$109.00	$1.98
Mini Prism package	$159.00	$2.56
8ft Prism Pole	$155.00	$1.70
Total:	**$7,517.00**	**$158.25**

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3rd mo. $1000	3rd mo. $288	$1,424
4th mo. $1000	4th mo. $288	$2,136

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Survey Plats and Original Monuments

by Gary John Bockman, LS2334, Bockman Engineering Services, LLC, Land Surveying Instructor-Missouri State University

It is quite common for land sales to be based upon a recorded subdivision plat, a metes and bounds description or a boundary survey of an irregular parcel, and during subsequent surveys and platting of the irregular parcel, particularly when the two types are adjoiners.

Individual subdivision lot owners, planning department plat reviewers (sometimes not trained in land surveying or legal principles of boundary control) and some surveyors are unsure of the procedure for resolution of differences in the boundary.

United States courts have commonly held that a call for a subdivision plat or a boundary survey in a deed will include the subdivision plat or survey drawing and field notes as though written on the face of the deed. This was established by Ferris v. Coover 10C (1858) and reconfirmed by Cragin v. Powell 128 U.S. 691, 2 S. Ct. 203 (La 1888) and has led many to believe that a recorded subdivision plat or survey drawing controls the boundary of the subdivided parcel.

A further review of available court and congressional guidance, however, will reveal that corners established and monumented by the original surveyor control, even if established in error.

In establishing the United States Public Land Survey System as a rectangular system based upon townships 6 miles square and sections 1 mile square, Congress stated "The boundary lines, actually run and marked in the surveys returned by the surveyor general, shall be established as the proper boundary lines of the sections and subdivisions for which they were intended. (U.S.C.A., title 43, Sec. 472) Congress further stated in its February 11, 1805 act that "The boundaries of the public lands, when approved and accepted, are unchangeable. Given a choice between allowing surveyors perpetual authority to "correct erroneous surveys" versus finding and adhering to the original corners, Congress chose the latter with the intent that we would not have continually moving land boundaries. Subsequent to the work by Congress, various courts have upheld their choice for fixed boundaries.

Given a choice between allowing surveyors perpetual authority to "correct erroneous surveys" versus finding and adhering to the original corners, Congress chose the latter . . .

In an 1888 Louisiana case, the court ruled that not the surveyors nor the courts change alter a section line or corner, and also applied the decision to subdivisions. The court ruled that no subsequent retracing surveyor should be permitted to relocate boundaries based upon more precise methods of surveying and does not have the authority to "correct" any errors that are found. Cragin v. Powell, 128 U.S. 691. In its explanation of its reasoning, the courts said that to change errors would wreak havoc on possession, structures and other improvements within the neighborhood and surmised that neighborhoods that have enjoyed a long history of peace would be thrown into total disorder.

Other courts have stated the survey is composed of the monuments placed on the ground by the creating surveyor and the maps and plats prepared to describe the property. Bearings and distances are "finger pointers" as to where the monuments are located. Riley v. Griffin 16 Ga. 151 (1854) and Gordon V. Booker 97 Cal. 586 (1892)

In clarifying the relation between field survey and plats, a case in Iowa resulted in the court ruling that when it becomes a difference between the round corners on the ground and the course and lines depicted on a plat, the plat is nothing more than a subdivision of land, marked on the earth and represented on paper. McDaniels v. Mance 47 Iowa (1877)

In another Iowa case a surveyor set original monuments, then later set additional monuments based upon the location shown in the field notes, but an original monumenting error caused a loss of 4 feet in one street and a gain of 4 feet in the next, shifting all lots by 4 feet. Early purchasers relied on the original monuments to erect their improvements and the court rules that even original surveyor could not alter the lots after they were sold. Tomlinson v. Golden, 157 Iowa 237 (1912)

In O'Farrell v. Harney, 51 C. 125 (1875), the court ruled that when there is an inconsistency between the map and the facts on the ground, the map must yield to the facts on the ground, and only when the facts cannot be established on the ground will the map rule.

In a more recent Arkansas case, a landowner petitioned the county to lay off a town site completely within the north 40 acres of land that he owned, and through error, the town site extended into the south 40 acres. Although a plat was filed depicting the town to be established in the north 40 acres, the court held that all sale of lots created and their conveyance was to the lots and land as monumented. Pyburn v. Campbell 158 Ark. 321 (1923)

As professional land surveyors, we should all strive to adhere to the directions of the judicial system to accomplish the courts' goal of reaching a consistent application of boundary determination methods thereby reducing the number of boundary disputes. We should also help to educate others that are involved in the creation of new land boundaries about these long-established procedures described by the various courts.

The simplest reminder of this responsibility with which we are charged is that subsequent surveyors should "FOLLOW THE FOOTSTEPS OF THE ORIGINAL SURVEYOR".

Editor's note: This letter was inadvertently misplaced last year and is printed here as a partial apology to Jerry Anderson, its author.

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May 1, 2006

Letters to the editor
Missouri Surveyor
editor@missourisurveyor.org

I was very disappointed at the general tone of the letter from Dallas Peters regarding the omission of John C. Freemont from the article written by Walt Cunningham (Salt Lake Community College).

Particularly disturbing was the wholly inappropriate innuendo that Walt may have omitted reference to Fremont because "he was not a Mormon."

Perhaps Mr. Peters isn't aware that On June 25, 1976, Governor Christopher S. Bond issued an executive order rescinding the Mormon Extermination Order that was issued by Missouri Governor Lilburn W. Boggs on October 27, 1838.

Walt Cunningham worked for me one summer in Alaska. Never have I had the pleasure of working with a man who took surveying more seriously than Walt did. His dedication to excellence in all aspects of the survey, his personal ethics, and his insistence that the job be done properly despite any and all problems encountered was an example for all of us.

I was very sorry to have him leave my firm, but couldn't argue with his desire to continue his education in surveying.

Besides that, Walt is an all-around nice guy, has a great family and is valued as a friend by anyone who has had the opportunity to associate with him for any period of time.

I don't know why Walt didn't include Fremont – perhaps he found other figures in history were of greater interest. Besides, any treatise on surveying or history cannot possibly contain all the information available.

Write an article for the Missouri Surveyor Dallas; let's see how all encompassing YOU can be.

Sincerely,

Jerry Anderson PLS

A Funny Thing Happened On the Way to the Job . . .

"I'll Be Right Behind You, Boys"

by B. Gregory Rieth, PSM

The first 9 1/2 years of my "Surveying Career", I worked in a very small office which was located on Market St. (The "Main Drag") in Corning, NY. Our office was located above a Drug Store, along with three other Attorneys, one of which was the Mayor of the City. Parking was to say the least, an everyday issue, the lot behind the Drug Store was a Metered Public Parking lot, and that was our only choice. We constantly had to run down the back steps to "feed the Meter" its required dimes.

Having painted that picture . . . we were in our office and the boss (who was also the owner) instructed my helper, Tim, and I to gather our equipment. He briefly went over the job, and then told us to head out to the site. He said "I'll be right behind you, boys". When Tim and I went downstairs, sure enough, there was a parking ticket on MY car for an expired meter (yes, we actually worked out of our own cars when needed). So . . . just for the fun of it, I took the ticket from my windshield and put it on my boss' truck, which was parked right next to mine. Tim and I laughed, drove to the job and thought nothing more of it. It seemed like a really long time before the boss finally showed up (he did say, "I'll be right behind you"). Then we heard him race up with his brakes squealing. He flew out of his truck in a rage, told us how he went to his truck, saw the ticket on his windshield, and with time still left on his meter. He went on to say (or actually scream) that he took the ticket and marched into the Mayor's office, read the Mayor the "Riot Act" over getting a ticket with time still left on his meter, the injustice of it all . . . and on and on and on. The boss told us that the Mayor tried to calm him down and told him he would "take care" of the ticket (I'm sure he only wanted this raving maniac out of his office).

Tim and I listened to his story with eyes like a "Deer in your Headlights", and jaws down to our knees. After a few uncomfortable moments of silence, we knew we had to come clean: we doubled over with laughter as we told him what we'd done . . . luckily, the boss had a great sense of humor, too.

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Nominations for 2008 Officers

President
Donald R. Martin, PLS

With almost 30 years of experience in surveying and mapping, Donald Martin has a diverse background in these disciplines that includes work in transportation, technical support, training, photogrammetry, project management and land surveying. He is the leader of surveying operations for the Missouri Department of Conservation where he manages programs for boundary and engineering surveys. Don holds a B.S. in Management and a Master of Business Administration, both from William Woods University in Fulton, Missouri. A former MSPS co-chair for the Highway Liaison and Vision 21/GIS Committees, he was honored in 2006 as the Missouri Surveyor of the Year. Originally from Oklahoma, Don, his wife Margaret and their daughter Selena live in Jefferson City.

President-Elect
Darrell D. Pratte, PLS

Darrell Pratte is a Professional Land Surveyor with the Land Survey Program in Rolla Missouri. He began his surveying career as a chainman with S. H. Smith & Co. of Poplar Bluff, Missouri in 1975 and was licensed as a Professional Land Surveyor in 1985. In 1987 Darrell took the position of Surveyor for the Missouri State Park System, a position he held until 1991. From 1991 until 2004 he was a Project Surveyor with the Land Survey Program's Cadastral Survey Section. In June of 2004 Darrell accepted the position of Geodetic Survey Section Chief and is responsible for the Geodetic Survey Network in the State of Missouri. Darrell is a member of ACSM, NSPS and an Associate Member of the Missouri Association of County Surveyors. His duties with MSPS include serving on the Board of Directors and Chair of the Scholarship Committee. Darrell and his wife Nancy have a few acres outside Rolla where three Labradors and one three-year old grandson run wild.

Call in your reservation for the MSPS Annual Meeting at 573-635-9446.

Vice President
Ralph Riggs, PLS

Ralph Riggs is president of Riggs & Associates, Inc. Ralph entered the land surveying profession in 1978 and in 1987 began the firm that is now Riggs & Associates. He is serving his fifth term as the Howell County Surveyor, is a past president of the Missouri Association of County Surveyors and a past chairman of the Land Survey Advisory Committee. Ralph and his wife Lisa have three children and have lived in West Plains, Missouri all of their life.

Secretary-Treasurer
Mark W. Nolte, PLS

Mark Nolte has owned and operated Nolte Land Surveying for 15 years. He has been the Lafayette County Surveyor for this long as well. Mark performs primarily boundary surveying in the rural areas of Lafayette and Saline Counties. Mark graduated from the University of Missouri-Columbia in 1981 with a Bachelors degree. After graduation, Mark worked as a Project Engineer for Juneau Associates in Illinois and for Turner, Collie and Braden in Texas; and as a Construction Superintendent for O.T Dunlap Construction in Texas and McCarthy Brothers Construction in Florida. In 1990, Mark returned to Missouri and worked for Land Tech, Inc in Higginsville. Mark received his Registration in 1992. Mark is married to Carol and they have a 13 year old daughter, Lily. Mark enjoys backyard BBQ, gardening and flying.

Secretary-Treasurer
Brian D. Viele, PLS, RG

Brian is the owner and manager of Landmark Surveying & Consulting, LLC, a small professional consulting company in Springfield providing land surveying and environmental consulting services in southwest Missouri. Brian earned a B.S. Degree in Geology from Southwest Missouri State University in 1983 and has been employed as a land surveyor and environmental consultant in Springfield since 1984. He currently serves on the MSPS Board of Directors and is a member of the Ozark Chapter of MSPS. Brian is a Missouri Professional Land Surveyor, a Missouri Registered Geologist, and a per-course instructor at Missouri State University for elementary and advanced surveying courses. Brian and his wife Liz have two children (in college) and are native to southwest Missouri, having lived in the Springfield area since 1979.

Nominations for 2008 Board of Directors

(terms expiring 2010)

Norman Ellerbrock

Norman began his career as a land surveyor in 1989 in Dayton Ohio, gaining valuable experience as a surveyor as he performed various types of surveys for design and construction projects. Moving to Quincy, Illinois in 1993, Mr. Ellerbrock was a staff land surveyor and survey crew chief. In 1996, Norman became licensed as an Illinois Professional Land Surveyor. Norman joined MECO Engineering (Hannibal) in August 1999 as the Manager of the Survey Department and became licensed as a Missouri Professional Land Surveyor in 2001. In 2005, Mr. Ellerbrock was elected as Vice President of MECO Engineering, becoming an owner and principal of the firm. In addition to his responsibilities as Survey Manager and Vice President, he provides assistance to the Director of Engineering and is charged with the oversight of the firm's IT Department. Mr. Ellerbrock is a member of various professional organizations, including the Missouri Society of Professional Engineers, Illinois Society of Professional Land Surveyors, American Congress of Surveying and Mapping, and the National Society of Professional Surveyors. Norman is also the County Surveyor for Lewis County, Missouri. Norman is very involved with the Hannibal community as shown by his participation in local public service organizations. He is an active member and Vice-President of the Hannibal Early Bird Kiwanis and sits on the Board of Directors of the Hannibal Area Chamber of Commerce. Norman and his wife Suzanne reside on a farm in Marion County. They have three children, Breeana, Ryan and Emily.

Jerrod Hogan

Jerrod started his surveying career in Indianapolis, Indiana at Hahn Survey Group, Inc., where he worked from an instrument operator, to CAD technician to party chief. He relocated to Joplin, Missouri in the summer of 2000. He completed his Missouri survey coursework at Southwest Missouri State University in 2002. He obtained his Missouri Professional Land Surveyor license in January of 2004. Jerrod is also licensed in Arkansas and Kansas and is a member of the Kansas Society of Professional Surveyors and the Arkansas Society of Professional Surveyors. Jerrod is a Vice President and Project Surveyor at Anderson Engineering, Inc. and manages theSurvey department for Anderson's Joplin office. Jerrod also serves on the Board of Directors at Anderson Engineering. He has been a member of MSPS since 2002. Jerrod was a charter member and founding President of the Southwest Chapter of MSPS. Jerrod Hogan appreciates the nomination for director of MSPS and looks forward to the opportunity to serve the Society.

Kevin Lambeth

Kevin has twenty nine years of diverse land survey experience centering on all aspects of large construction projects, Route surveys, and Cadastral surveys. He is currently the Vice President-Project Surveyor of Anderson Engineering in Springfield Missouri. Previously he was Crew Chief at Southwest Surveys in Springfield and was also a Crew Chief with the US Department of the Interior in Oklahoma City and Reno. He has attended courses on Land Surveying at Southwest Missouri State University and the University of Wisconsin. He achieved a Professional Land Surveyor License in the State of Missouri and in the State of Arkansas. He is the Planning and Zoning Commissioner for the City of Battlefield as well as numerous advisory committees with the city and the Metro Planning Organization. He is a Past President of MSPS, Ozark Chapter and serving currently as director. He has a daughter who is 19 and is a sophomore at the University of Arkansas and coaches Little League baseball.

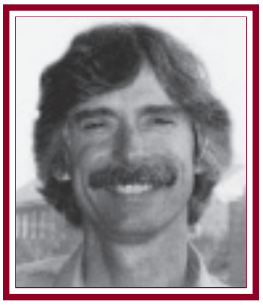
Robert Ubben

Robert is an Associate at Affinis Corp., located in Overland Park. Currently in his 19th year of employment with the company, he is responsible for the survey department services. Licensed in Missouri in 1995 and in Kansas in 1997, Robert works primarily in the Kansas City Metropolitan area. He has an A.S. degree in Land Surveying from Longview Community College, located in Lee's Summit, Missouri. Robert is a member of the Kansas Society of Land Surveyors, the Missouri Society of Professional Land Surveyors and the Kansas City Metro Surveyors Association (KCMSA). He has been a board member of the KCMSA since 1998, serving as President in 2000 and is currently serving as Treasurer. Robert also works as a part time instructor teaching Legal Aspects of Surveying at Longview Community College during fall semesters. Robert and his wife Amanda have two children and live in Raytown, Missouri.

Understanding and Applying the "Written Intentions of the Parties" in Boundary Resolutions

by Gary R. Kent, PS

Most surveyors would not argue with the assertion that one of the most important tasks faced by the professional surveyor is the proper resolution of boundary lines. At the same time, it is interesting to note that it is not unusual for the surveyor to be faced with a set of facts and evidence that does not lend itself to one obvious, singular "correct" boundary resolution.



There are virtually no statutes that dictate rules for resolving boundaries. Nearly all law in this regard comes from "common" or case law and every state has a history of appellate and supreme court rulings that outline the boundary law principles for that state. On most principles, the courts across the states have been consistent, even citing cases from other states when their own state has not developed a lineage of case law regarding a particular issue. In order to resolve boundaries with confidence and integrity, the surveyor must have a strong knowledge of the boundary case law in his or her state.

Some states have compiled their own documentation of relevant judicial decisions related to boundary law using a variety of means. Some state surveying societies have taken on the project themselves. In some states, there are other sources of this information. For example, the Indiana Land Title Association maintains yearly updates to its Indiana Land Title Handbook, which is an excellent resource for surveyors.

Intention

Determining the intentions of the parties to a conveyance is the primary objective in construing the meaning of a description. This is the starting point for the resolution of the associated boundary. The "parties" in this sense are the grantor in particular, but may also include the surveyor, if there was one, and perhaps the grantee.

The courts have consistently stated that "intent" means the intention as expressed in and interpreted from the deed — the "written intentions of the parties" — not what the grantor may have "meant" to say. This position is consistent across the country; the true intention of the parties is what was written in the conveyance.

Only when there is an ambiguity in the document may extrinsic evidence be called upon to explain what the words in a deed mean. Such "extrinsic ambiguities" include the need to explain the meaning of words existing within a written conveyance and the need to explain conditions existing as to the date of the document. Following are a variety of statements drawn from court decisions regarding this issue . . .

"When the boundaries of tract can be determined by reference to the description in a deed . . . parol evidence is not admissible to enlarge the scope of the description."

Canady v. Cliff, 376 S.E.2d 505 (1989)

"[S]tatements and acts of adjoining landowners are not competent evidence of the location of a boundary when the boundary can be located by the calls in a deed."

Canady v. Cliff

"The reputation in a community is inadmissible evidence." [Parol evidence showing that others in community believed that the eastern boundary of the deed holder's land was located to the east of an old road was inadmissible in the boundary dispute inasmuch as the boundaries of the tract could be determined by reference to the description in the deed.]

Canady v. Cliff

"There being no ambiguity in this deed, it follows that what the grantor, or grantees understood by its terms, or in what manner they subsequently treated it, has no bearing upon the construction thereof."

Wilkins, et al v. Young, 144 Ind. 1 (1895)

"Where the description in a deed is not ambiguous, but certain and complete, there is no occasion to resort to extrinsic evidence to ascertain the intent of the parties as to the land intended to be conveyed."

Ault v. Clark, 112 N.E. 843 (1916)

"The grantor's intention controls, and the question for the court is not what the parties meant to say, but what they meant by what they did say."

Pointer v. Lucas, 169 N.E.2nd 196 (1960)

To allow or consider extrinsic evidence in the form of verbal statements of the parties when there are otherwise no ambiguities violates the statute of frauds which calls for conveyances of real property to be in writing.

Mutual Mistake of the Parties

On the other hand, if it can be shown that the parties to a conveyance, in fact, collectively made mistake in describing the real estate to be conveyed, the courts will allow the written conveyance to be 'amended' based on testimony to that effect.

"In an incorrect description was incorporated in the deed from

(continued on page 24)

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Written Intentions (continued)

the defendant to the plaintiff by mutual mistake of the parties, the defendant is entitled to so show and to have the deed reformed so as to conform to the true intent of the parties."

Yopp v. Aman, 193 S.E. 822 (1937)

". . . though parol proof is not, as a rule, admissible to contradict a plain, written description, it is always competent to show by a witness that the parties by a contemporaneous, but not by a subsequent survey, agreed upon a location of lines and corners different from that ascertained by running course and distance."

Clark v. Aldridge, 162 N.C. 326, 78 S.E. 216, 217

While the principles with regard to intent are clear, the problem often faced by the surveyor is how to properly interpret the written intentions when the writings contain patent or latent conflicts.

While the courts have, by virtue of hundreds of years of decisions, developed a weight of authority to be given to the various elements of a description — what Curtis Brown called the "Order of Conflicting Title Elements" in Boundary Control and Legal Principles — the exact application of those rules is highly dependent on the individual set of facts and evidence for the given boundary.

The courts have held that, notwithstanding the weight of authority, the elements of the deed will be applied in a manner that best express the intentions of the parties. Thus, a call for what would normally be a higher ranking element may, in some cases, be overridden by an ostensibly lower ranking element if it can be shown, for example, that the higher ranking element was used in error, or that by holding the higher-rated element, numerous other elements would have to be disregarded. In keeping with this, all of the terms of a description must be considered in light of each other when attempting to resolve what the intent actually was.

Relying on the intent of the parties to resolve boundaries has only one qualification — it cannot adversely affect the pre-existing rights of third parties. The net effect being that intent is subject to unwritten and senior rights.

This article is a follow-up to Mr. Kent's presentation at the 2007 ASPS Spring Conference.

Reprinted from *"Point of Interection"* Arkansas, June 2007

Thoughts for People Who Take Life too Seriously

(from www.a-guide-for-seniors.com via TBM)

- Clones are people two.
- I feel like I'm diagonally parked in a parallel universe.
- Honk if you love peace and quiet.
- I drive way too fast to worry about cholesterol.
- Support bacteria. They're the only culture some people have.
- Monday is an awful way to spend 1/7 of your week.
- A clear conscience is usually the sign of a bad memory.
- Change is inevitable, except from vending machines.
- Get a new car for your spouse. It'll be a great trade.
- Plan to be spontaneous tomorrow.
- Always try to be modest, and be proud of it.
- If you think nobody cares, try missing a couple of payments.
- OK, so what's the speed of dark?
- How do you tell when you're out of invisible ink?
- If everything seems to be going well, you have obviously overlooked something.
- When everything is coming your way, you're in the wrong lane.

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You Own Your License (Not Your Employer)

by Dave Dediluke, BCLS

Recently, I was present during a conversation between an experienced Aircraft Maintenance Engineer and a new graduate who was entering his career. During the discussion about work experience and opportunities, the veteran, of about thirty years in the profession, said: "Always remember that *you* own your license, not your employer. Never sign anything that says you did something under regulations that you did not, despite your employer or co-worker saying that everyone else does [it]."

This sage advice applies to everyone working under statutory regulations, especially those with legislated professional status. Regulations specify the way important tasks should be done and who is qualified to do them. Believing, or advising, that it is "common practice" to circumvent or ignore what is clearly written in a regulation is naive at best. Our legal system interprets the meanings of words and phrases as what would be understood by an ordinary person with an ordinary command of the language. An understanding of a regulation based on some abstract definition of the words composing it, or a rationalization of meanings to circumvent the intent understood by an ordinary person, would be inappropriate. This has been continually reaffirmed in judicial decisions.

Advice from employers, colleagues or clients to ignore a clearly stated regulation, in favor of some nebulous interpretation of it, or incorporating a "common practice" argument, should be rejected. Aside from protecting one's license to practice, reasons for rejecting the "common practice" argument include safety, security of life and property, and integrity of public trust, as well as to maintain and expand a profession. Most circumventions of regulation, usually rationalized by some esoteric arguments, are consciously or unconsciously made for selfish reasons, such as increasing profit and keeping work away from competing firms.

Circumvention of a regulation generally requires less work for those licensed and entrusted to follow it. This will affect the supply and demand equation pertaining to the applicable profession. If certain work is done by someone not licensed, or someone licensed is not doing the work that should be done, demand for the applicable license holders is reduced. This, in turn, will reduce the overall collective remuneration, notwithstanding a potential for those circumventing certain regulations to increase their individual profits at the expense of others. The attractiveness of entering a profession, as well as the attractiveness of purchasing an existing practice from someone abiding by the regulations, will therefore be decreased. In addition to the monetary considerations, when a perception exists that it is "common practice" for members of a profession to circumvent regulations, the resulting loss of respect will reduce the attractiveness of entering a professional or using it when alternatives are available.

The more attractive a profession is, the greater the range of skills and interests that will be held by the people willing to endure the work necessary to become qualified members. The result will be a broadening of collective expertise. This can soften the negative effects of technological change and economic downturns by opening up new and expanded opportunities. The less attractive a profession is, the more likely those with desirable skills and interests will find homes in other organizations that could evolve into parallel and competing professional groups.

Unfortunately, regulatory bodies cannot simply rely on everyone under their jurisdictions to follow ethical behavior, so they are usually given the responsibility of addressing transgressions and promoting ethical behavior through boards and tribunals. Those who stray from the rules and make false statements can be brought into line or barred from further practice. An excuse that such a transgression was made because it is "common practice" clearly cannot be accepted.

If a statement that it is "common practice" for members to circumvent regulations is accurate, it is a manifestation of decay within the regulatory body itself. If this is the case, cynicism will replace pride of membership, the supply and demand equation will be adversely affected, those who circumvent the rules will have economic advantage over those who do not, confidence of the public (including those who are considering entering the profession) will decline, and the profession will atrophy rather than expand. A regulatory body itself is not immune to political or legal assault if it knowingly allows false statements to become "common practice".

This erosion of a profession, caused by acceptance or complacency with regard to circumventing regulations, may be slow and imperceptible but, if allowed to continue, it will eventually change the focus of the organization from the strength of core values to appearance and fluff under the direction of outside consultants and public-relations gurus. These corporate and political fashion consultants, perhaps unaware of the underlying decay, will focus on appearances and trendy cliches. A facade will be presented, but the decay will continue until the professional entity is overtaken by parallel and competing entities or simply fades into oblivion. The facade may be so effective that members will believe everything if fine without recognizing the erosion due to the regulatory body's acquiescence to inappropriate behavior by calling it "common practice".

An employer who encourages, or tacitly expects, an employee to sign a document that is not true, in the common sense of the words, should be challenged. There is probably no better advice for a professional than to always remember that he or who owns the license to practice, and to reject the "everyone else does it" argument. This advice not only protects the practitioner, it protects the profession. The Aircraft Maintenance Engineer gave the new member some very wise advice that all professionals should follow.

Reprinted from *The Link*, the official publication of the Association of British Columbia Land Surveyors, Vol. 29, No. 3, September 2006.

What Constitutes a Survey and Map

by William G. Raymond, Civil Engineer and Professor of Geodesy, Road Engineering & Topographical Drawing, Renesselaer Technical Institute
submitted by Hal Davis, PLS

This article was first published in 1896 in "A Textbook of Plane Surveying". It demonstrates the remarkable foresight of the author — many of his remedies are addressed in modern statutes and discussed in "Guide to the Preparation of Records of Survey and Corner Records", also in this issue. Read on to see how startlingly relevant many of the Professor's observations are today. — Editor

The object of a boundary survey is to provide definite information as to the location of a parcel of land, including reference to adjoining tracts, so that from this information the land may at a future time be found. For a complete survey the corners must be fixed, the boundaries marked on the ground, and all facts necessary to preserve their location delineated on a map.

It is true that a great many surveyors hold a different opinion and purposely return their maps and note in such condition, that, while they may serve the purpose for which they are primarily made, do not tell the whole story. Nor do they make it easy for another surveyor to relocate the tract surveyed. When this is done the person ordering the survey does not receive what he pays for. Something is withheld. No argument is needed to show that this is radically wrong. But there is another reason for condemning this practice. The correct and permanent location of all boundaries, public and private, is a matter of the gravest importance. The entire community is interested in the permanency of land boundaries, and all surveyors should cooperate to preserve, in their correct places, the boundaries within their district. It is too important a matter to be subject to avaricious and jealous rivalry.

To this end, the returns of every surveyor should be thorough and complete. Maps made for filing as public records should be so finished as to enable any surveyor to relocate the land without the least uncertainty as to the correctness of his work. That this is done in very few instances is well known to every surveyor who has had occasion to examine public records. While some states have good laws prescribing what shall appear on a map before it will be received as a public record, this is often not the case. Anything that is made up of lines and figures and labels "this is a map", is considered sufficient, whether it is drawn by hand, photo-lithographed, or simply printed with "rule" and type. Worse than this, these maps are frequently purposely distorted to create a favorable impression of the property to be sold. Wide streets are shown where only narrow ones exist, streets appear opened for the full width where they have been opened for but half their width, subdivision are indicated as rectangles that really may not be even parallelograms, etc. Such maps as these frequently form the only basis for the description and location of the property they are supposed to represent.

Examine one of these maps closely. Often there will be no evidence that a monument has been set in the field, nor an angle recorded. The liens may cross at all sorts of angles, and dimensions are given that do not agree among themselves. There may be no signature except, possibly, that of the surveyor, who thus advertises what we shall charitably call his stupidity. When monuments are set they may be small stakes at block corners, but even the fact that such stakes have been set is not recorded on the plat. Only those surveyors acquainted with standard practice in a given district know where to look for such stakes. If the stakes have been set, and not subsequently pulled out to make room for a fence post or building, they may even succeed in finding them. Some surveyors are accustomed to set stakes a certain distance away from the point the stake is supposed to mark, but no mention of this fact appears on the map. In fact, the map is so drawn that no one but the surveyor who made it can write a description of any one of the parcels of land shown, or correctly locate it on the ground. Furthermore, the surveyor himself finds it impossible, after the lapse of a few years and the destruction of his "private marks", to rerun any one of the lines exactly as originally laid out.

It is easy to see to where this leads — impossible descriptions of property, giving opportunity for differences in judgment as to interpretation of what was intended. Boundary disputes, costly litigation, expensive movement of structures, and the actual shifting of lines back and forth by difference surveyors, or even by the same surveyor, are all but guaranteed. The writer has seen enough trouble of this sort to indicate to him that a radical change is needed in the field work and mapping of cities, town and additions, not to mention farms and other tracts of land that it may be necessary to lay out and describe. So long as fallible man is responsible for the accuracy of surveys, maps and descriptions

From the Collection of Bryant N. Sturgess, PLS, PE

(continued on page 29)

What Constitutes a Survey and Map (continued)

or properties, there will be errors. But this writer is fully persuaded that it is possible to greatly reduce their number by proper regulation.

A map of a city, town or addition, or other trace of land, serving as a basis for the description of property, should furnish all the information necessary for the proper description and location of the entire tract and its various parcels. It should also show the exact location of the tract relative to the lands immediately adjoining. In order for the map to be sufficient, it should include the following:

1. The lengths of all lines shown.
2. The exact angle made by all intersecting lines.
3. The exact position and character of all monuments set, with notes of reference points.
4. The number of each block and lot.
5. The names of all streets, streams or bodies of water, and recognized landmarks.
6. The scale.
7. The direction of the meridian and a note as to whether the true or magnetic meridian is shown. (It should be the true meridian.)
8. The angle of intersection made by the lines of adjoining property with the boundaries of the tract mapped.
9. A simple, complete, and explicit title, including the date and the name of the surveyor.

Our course monuments will not be shown if none have been set, and very frequently none are, either from carelessness on the part of the surveyor, or an unwillingness on the part of the owner to pay their cost. Monuments of a permanent character should be set at each corner, and at least two inter-visible monuments should be on the line of each street. Where monuments are not placed on the centerline of the street, they should be placed at uniform distances from them. Uniformity in practice saves a vast amount of time and checks confusion.

In order that the map may be relied upon, there should appear on it the following:

1. The certificate of the surveyor stating that he has carefully surveyed the land, that the map is a correct representation of the tract, and that he has set monuments (to be described) at the points indicated on the map.
2. The acknowledged signature of all persons possessing title to any of the land shown in the tract, and, if possible, signatures of adjoining owners.
3. If the map is of an “addition”, the acknowledged dedication to public use forever of all areas shown as streets or roads.
4. If a street of full width, whose centerline is a boundary of the tract, is shown, the acknowledged signature of the owner of the adjoining property, unless his half of the street has been previously dedicated.

There should be included in the statutes of every state pertinent laws that explicitly define what shall appear on every map filed for reference.

In some states a map may be filed at the request of any person, and without signature. This practice frequently leads to trouble. The writer knows of cases in which owners of large tracts of land have had those tracts subdivided and have taken land of adjoining non-resident owners for street purposes without the consent or knowledge of those owners. When, at a later date, the owners of the land so taken have objected and attempted to close half of the street, trouble of a serious character has arisen. The same trouble has occurred where streets have been run through narrow gores of land and have subsequently been completely closed, leaving houses built on the mapped property without outlet. Time and again have cases of this sort come to the knowledge of the writer.

Having pointed out certain evils, it remains to suggest a remedy. It lies in the enactment of laws governing these matters. There should be included in the statutes of every state pertinent laws that explicitly define what shall appear on every map filed for reference. To file a map that does not strictly conform to such requirements should be a misdemeanor. In the absence of such laws it is believed that the young surveyor can assist greatly in a much-needed reform by following the principles suggested in this paper as the correct ones, and avoiding the errors here indicated. It is hoped that those graduates of our engineering schools who drift into this line of work will be guided by higher principles than covering up their tracks, at the expense of others, in order to secure a monopoly on business. Certainly, a thorough education should so broaden the young surveyor’s views as to make it impossible for him to be controlled by those meaner instincts which, if indulged, lead only to the perpetual grief of his community.

Pioneers Didn't Take Kindly to Pesky Federal Surveyors

by Will Bagley, State Chair Message, History Matters

Conflicts are nothing new in Utah — and compared with what happened to Territorial Surveyor General David H. Burr in the 1850s, it's a tempest in a teapot.

Within days of arriving in Salt Lake City, the first Mormon pioneers had "surveyed and laid out a city with streets running east and west, north and south, in blocks of 10 acres, divided into eight lots of 1 1/4 acre each," wrote Thomas Bullock, clerk of the Pioneer Camp.

"One thing wonderful," Bullock noted, was that "you have no land to buy nor sell; no lawyers waiting to make out titles, conveyances, stamps, or parchment. We have found a place where the land is acknowledged to belong to the Lord, and the Saints, being His people, are entitled to as much as they can plant, take care of, and will sustain their families with food."

Worthy Mormons received "stewardships;" they could use the land, but the Lord retained ownership — and Brigham Young was his landlord.

Trouble was, the government thought it owned the land, and U.S. land policy directly contradicted the Mormon system. During the 19th century, the feds sold off or gave away about two-thirds of its public domain after "extinguishing" American Indian rights and surveying the land. Using a system created by Thomas Jefferson, government surveyors established a base line and meridian and then divided the land into square-mile townships, sections and quarter-sections that were sold or homesteaded.

When Army Capt. Howard Stansbury of the U.S. Topographical Engineers arrived in Utah in 1849, he learned the Mormons "would never permit any survey of their country to be made" and, it he tried, "my life would scarce be safe." Stansbury managed to win Brigham Young's cooperation, but by 1855 Young had appointed his own county surveyors to assign "inheritances" to loyal Saints. If they decided to leave, noted Jewish artist Solomon Carvalho, "they are obliged to abandon their property, and are precluded from selling it."

Before reaching Utah in 1855, David Burr had been one of America's leading cartographers — he drew the first map showing the discoveries of mountain man Jedediah Smith — and served as topographer of the U.S. Post Office and geographer for Congress. (Why he came to Utah is anybody's guess.)

Burr's job was to survey government lands so they could be sold through the General Land Office — and in 1855, the government and the Indians owned everything in the Utah Territory.

"Not an individual in all Utah now holds a foot of land the title of which is derived from the United States," a national newspaper, The Washington Union, observed in 1857, and LDS Church leaders feared the government would evict them from their hard-won homes. Burr claimed he surveyed nearly 2 million acres only to find settlers had ripped out his stakes and section corners, all while local authorities harassed his men. Payson officials sued one surveyor for "running a line across their field."

A mob stoned Burr's house at Fillmore. "Danites" beat surveyor Joseph Troskolawski almost to death and gave clerk C.G. Landon "a tremendous thrashing", according to the surveyors' official reports. The Mormons claimed Burr's surveys were fraudulent, and in April 1857 Burr and every non-Mormon federal official but one fled for their lives.

> ***Since Salt Lake City's block looked nothing like a 640-acre government section, the conflict produced some odd results.***

Such shenanigans meant Utah would not get a land office until 1869, but it opened in March to, well, land-office business. By the end of June it had sold 51,683 acres for $1.25 an acre and granted 96,764 acres for homesteads.

Since Salt Lake City's blocks looked nothing like a 640-acre government section, the conflict produced some odd results. Eventually, the "Ten Acre A-B Big Survey, Showing ties to Section Lines and Corners" resolved the problem, but to this day deeds between Highland Drive, the Jordan River and down to 45 00 South are a surveyor's nightmare.

David L. Bigler's Forgotten Kingdom describes Utah's land wars.

You all may be wondering why I would preface my message with an article on the history of surveying in Utah. I guess first and foremost, I would like to draw attention to the committees of the Utah Council of Land Surveyors. We have at this time in the organization of UCLS, 10 standing committees. These committees are as follows: Standards and Ethics, Legislative, Testing, Education, Public Relations, Publications, Historical Conference and Workshop and Membership. Each of the committees have a distinct purpose and function in the ongoing goals of our organization.

The above article is something that could possibly be of interest to the Historical Committee. Many of us have access to documents and/or records of past surveyors/surveys that are of historical value and in need of preservation. The Historical Committee is actively engaged in pursuing ways to accomplish this. The Standards and Ethics Committee is being an assist to DOPL and is also compiling standards that will improve and solidify our profession and bring us the

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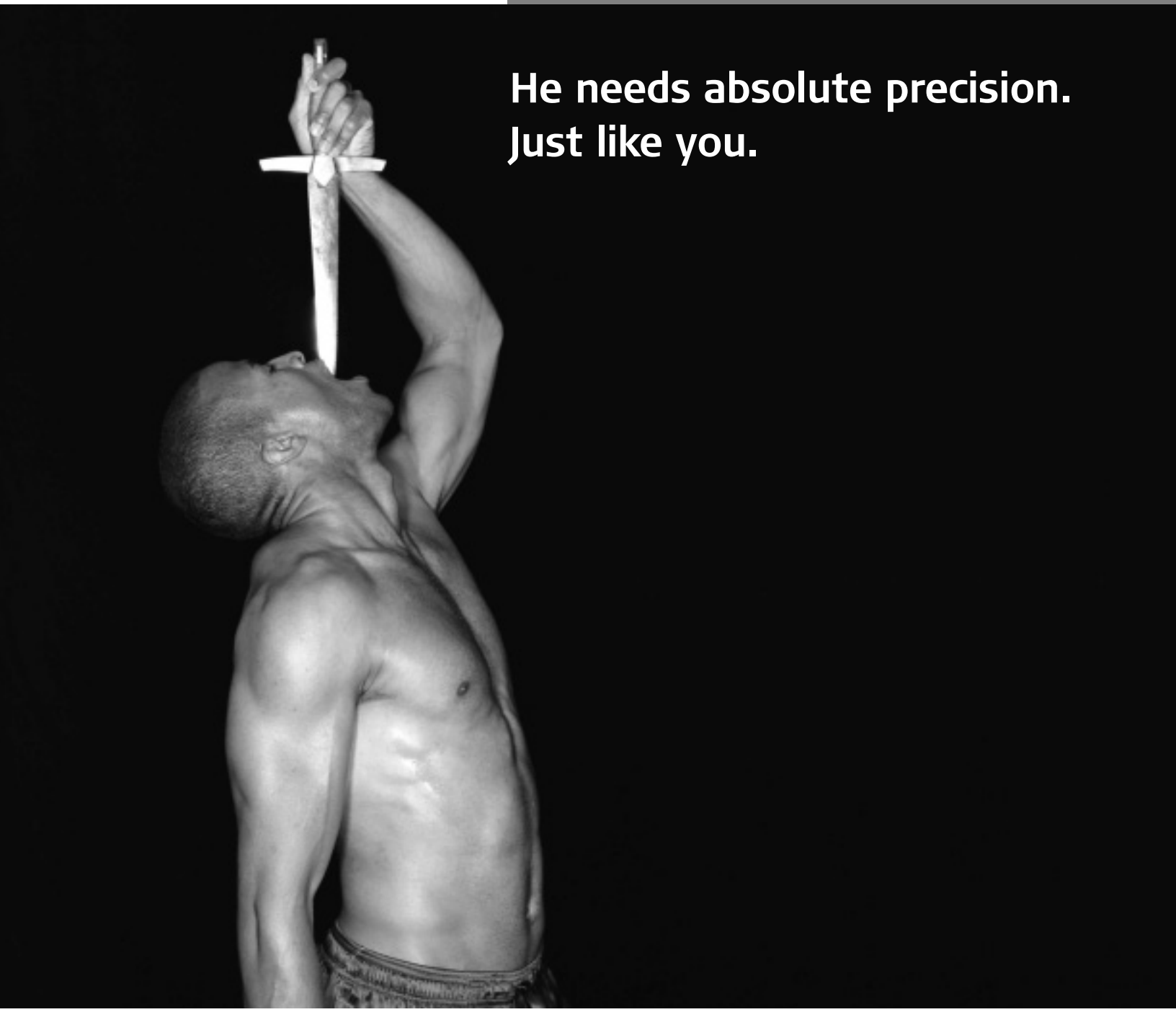

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Pioneers Didn't Take Kindly (continued)

respect of our local citizens and surrounding states. The Testing Committee is earnestly reviewing the testing structure of the state and national exams to be sure that they are applicable to the Land Surveying profession thus guaranteeing that future licensees are qualified to be licensed as a land surveyor and that the tests actually test the persons knowledge of "Land Surveying" instead of unrelated items that do not address the Professional Land Surveying arena. The Education Committee reviews the applications for scholarship monies. These are just a few examples of some of our committees' work. All of the committees need our support and participation. Please evaluate your respective schedules and time commitments and if possible and if you desire, join one of "our" committees. Many of our members expressed a desire through their response to the survey passed out at the conference in February to be on one or more of the committees. We ask that you now step up and fulfill that desire and begin serving on our committees.

I know that this is a busy time of year for all of us. I respectfully ask that we jointly re-assess our time commitments and volunteer to become actively engaged in our official organization.

Lenard Jay Barney
State Chair, UCLS

The Bathtub Test

It doesn't hurt to take a hard look at yourself from time to time, and this should help get you started.

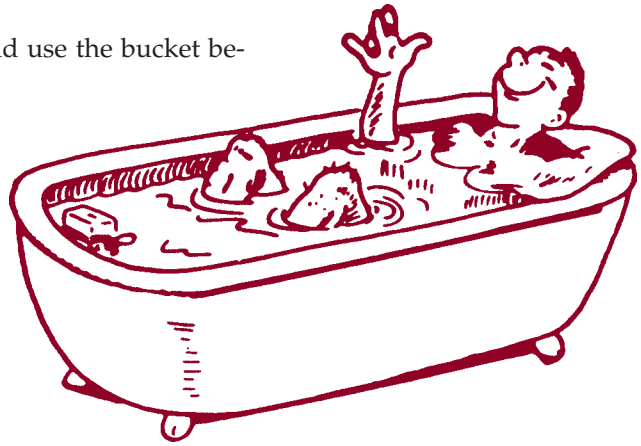
During a visit to the mental asylum, a visitor asked the Director what the criterion was which defined whether or not a patient should be institutionalized.

"Well," said the Director, "we fill a bathtub, then we offer a teaspoon, a teacup and a bucket to the patient and ask him or her to empty the bathtub."

"Oh, I understand, said the visitor. "A normal person would use the bucket because it's bigger than the spoon or the teacup."

"No." said the Director. "A normal person would pull the plug. Do you want a bed near the window?

DID YOU PASS, OR DO YOU WANT THE BED NEXT TO MINE?



INTRODUCING MIDWEST RTK NETWORKS

Seiler Instrument & Manufacturing Company is pleased to announce the establishment of Midwest RTK Networks. These integrated networks of Continuously Operating Reference Stations (CORS) and Trimble Navigation GPSNet and RTKNet software produce models of systematic GPS errors which significantly improves RTK accuracies for rovers working within the network.

Saint Louis RTK Network:
12 stations covering approximately 5,000 square miles and the ten Missouri and Illinois counties comprising the Saint Louis, Missouri metropolitan area.

Indianapolis RTK Network:
12 stations covering approximately 5,000 square miles and the ten counties comprising the Indianapolis, Indiana metropolitan area.

Milwaukee / Southeastern Wisconsin RTK Network:
6 stations covering approximately 4,000 square miles comprising the Milwaukee, Wisconsin metropolitan area and Southeastern Wisconsin.

MIDWEST RTK NETWORKS COSTS AND BENEFITS (CMR+ VRS survey service)

VRS 1month	**600.00 monthly**
VRS 3 months	**1,500.00 quarterly for one quarter service**
VRS 1 yearQtr	**1,200.00 quarterly for one year service**

BENEFITS OF USING THE MWRTK

Increase Productivity
Walk onto any worksite within the MWRTK VRS network and, within minutes, start surveying with centimeter accuracy. By yourself.

The VRS software establishes high quality control throughout the network area so that users can work anywhere within the network without setting up and securing a reference base station and base radio modem.

Reduce Capital Equipment Costs
MWRTK VRS networks eliminate the need of a Base Receiver and radio at the job site. The only equipment a single-person crew needs is a data ready cell phone, a rover, GPS with NTRIP capability for user, and name and password.

High Quality Data
Reference station data is preprocessed to ensure integrity, reject outliers, and correct for cycle slips. The result is consistent, accurate corrections anywhere in the network, regardless of distance to individual reference stations.

Ease of Use
Connecting to the network is easy. All you need is cell phone coverage at the job site and an Internet connection.

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My Total Station Battery Has Alzheimers . . . and That's a Good Thing!!

by Arthur Dias, B.Sc.

How many times have you heard the phrase, "My battery pack is holding memory"? Being in the battery business, this is something we hear all the time. The term is used to explain the tendency of a rechargeable battery to remember the point up to which it was discharged over several cycles, before full discharge was attained. Subsequently, the battery behaves as if this point is the point of full discharge. This is a generally misunderstood phenomenon and a term often misused to explain various battery problems. There are many scientific and theoretical explanations for why rechargeable batteries behave poorly at times. But, in a practical sense, these problems can be analyzed and addressed without having to have a degree in chemical engineering. So, if your battery has "Alzheimers", based on the explanation above; it's a good thing.

"Memory Effect" is essentially caused when a rechargeable battery is recharged to full capacity, and then used in the field to the point where the battery never reaches full discharge before being placed on recharge again. For argument's sake, let's imagine a battery being a container of sugar, where you fill it up and then use what you need before refilling it again. If you constantly use only the top portion of the container and refill it with new sugar, the remaining portion you have not touched in a while begins to get stale. The same is true for a battery. The remaining charge, that you never allow the instrument to use, over time starts to stagnate.

The only way to recover the performance of the battery is to somehow remove the "stale" charge in the battery and restore a fresh new charge.

Initially, the charge in a battery is at a uniform voltage throughout the cells. The voltage begins to drop immediately after removal from the charger. If all the charge in the battery is not consumed before recharging, the portion that is left unused continued to drop in voltage and becomes "stale". Eventually, the voltage in this "stale" portion drops so low that when your instrument is finished gobbling up all the "fresh" charge, it hits this "stale" portion like a brick wall. The instrument is confronted with a sudden drop in voltage, at a level below the "low battery" indicator threshold. The battery cannot power the instrument now without being recharged again.

The only way to recover the performance of the battery is to somehow remove the "stale" charge in the battery and restore a fresh new charge. Unfortunately, some total station manufacturers have designed their instruments and chargers in a way that makes it almost impossible to correct this problem. Chargers with a "discharge" function built in may not work to correct the problem at this point either. The low voltage point of stale charge will also cause the discharge operation to cease prematurely, leaving the stale charge still in the battery. In a case like this, a battery service shop with the proper equipment, can analyze the battery, remove the stale charge and solve the problem.

Trying to live with the problem will only make it worse and can actually ruin the chances of correcting the problem at all. Just like the container of sugar example, eventually this stale part will become so solid and entrenched in the battery that it will permanently ruin that part of the battery and diminish its ability to accept a usable charge again. What also appears to happen is that the portion of the battery that is able to receive fresh charge, now goes through many rapid cycles and in effect "wears out" that portion of the battery prematurely. You are now left with a container of hard packed stale sugar at the bottom, with the top part of the container so worn out that it can barely contain the new sugar that you keep replenishing it with.

Here are several things that can be done to avoid this problem. Some I am sure you have heard before, but they are still worth repeating.

Always fully discharge the battery each time you use it in the field. Number all your batteries and learn the running time of each one through regular use. If you still carry enough battery power with you for the next day's work, wait and use that all up before recharging any batteries that have not been fully run down.

At the first sign of a sudden decrease in performance, set that battery aside until returning to the office. At the office, put this problem battery back into the instrument and set the instrument on a heavy battery demand operation (like "tracking mode" measuring against a prism). Now run the instrument to the point where it shuts off on its own from lack of battery power. Wait five minutes and repeat the procedure. Repeat this until you feel the instrument has drained as much

(continued on page 36)

My Total Station Battery Has Alzheimers . . . (continued)

as possible from the battery. Now put the battery on charge (preferably a slow charge, if your charger has that setting).

If storing the instrument away for a week or two, do not recharge the battery until the night before it is needed in the field again.

If storing the instrument for a month or two, or even longer, charge up the battery before storage and then once a month until the storage period is over. Every second month, fully discharge the battery before recharging.

Always let the battery reach room temperature before recharging. Excessively cold batteries will resist being charged and actually fool auto shut-off chargers into thinking the battery is fully recharged when in reality it is not. When the battery is not allowed to fully recharge over many cycles, you may end up with the same problem as the "memory effect".

Within the last few years, many manufacturers have switched to Nickel-Metal Hydride (NiMH) cells in their battery packs instead of the old industry workhorse, NiCd. The main advantage of the NiMH cells is their ability to hold much more charge in the same size cell as the equivalent NiCd and they are more environmentally friendly as well. NiMH cells have also been touted as not having the memory effect problem of the NiCd cells. However, our experience has shown that this is not always the case. Although they may resist the effect from taking hold as easily as the NiCds, the same maintenance procedure should be followed . . . always fully discharge the battery before recharging again. NiMH cells have one big drawback compared to their NiCd counterparts — their internal resistance is higher.

Excessively cold batteries will resist being charged and actually fool auto shut-off chargers into thinking the battery is fully recharged when in reality it is not.

The internal resistance of a cell will govern how readily it will accept a charge when applied, and how easily it will release that charge while maintaining its voltage when required to do so. Internal resistance also explains why NiMH battery packs sometimes get much warmer during recharge than NiCds. Since the internal resistance is a problem that gets worse with the age of the cell for both NiCd and NiMH, designing the instrument and charger to meet these demands is a difficult balancing act, with some manufacturers having done a better job at it than others.

A NiMH charger that is designed to charge the battery in a 12 to 14 hour period will always do a better job of topping up the battery than a charger that is designed to do it in 2 to 3 hours. The internal resistance of the battery will always fore the charger to apply a higher voltage during recharging to overcome the resistance. The resistance is more pronounced during a fast charge procedure than during a slow charge. Eventually, the charger is forced to such a high voltage that it assumes the battery is recharged and shuts off, never recharging the battery to its full potential. As the NiMH battery gets older, the problem gets worse. It is always best, if your field working procedure allows for it, to choose a slow overnight charge cycle. Many OEM charges for NiMH cells offer both fast and slow charge cycles. Also, chargers that monitor the internal temperature of the battery during a fast charge seem to do the best job of recharging the NiMH batteries quickly.

Another point worth mentioning is the idea of replacing old NiCd cells in a pc with NiMH cells, during a re-cell procedure. This is only recommended if you have only just that one battery to run your instrument. You must also be prepared to accept that NiMH cells do not maintain original performance through as many cycles as NiCd cells. But since the NiMH cells start out with the ability to hold much more charge than their NiCd counterparts, the advantages of the NiMH cells are still something worth considering. Unfortunately, your old NiCd charger may never properly recharge the NiMH cells to their full potential because it was not designed for the different requirements of the NiMHs. Even at less than 100% performance, however, the greater capacity of the NiMH cells will generally be realized if that battery is properly maintained from the beginning. In reality though, many users will just add this NiMH battery into the mix of other NiCd batteries being carried into the field for the instrument. Our experience has found that in short order; the NiMH battery will get "lazy" and settle into a performance that is no better than if it had been re-celled using NiCd cells. The advantages of converting to NiMH cells over the original NiCd cells would be lost, not to mention, this "misfit" battery pack now has a diminished life cycle.

The final bit of advice I can give is similar to the advice we often get from our own doctor: **Batteries stay healthier through regular exercise on a daily basis!**

Arthur Davis is a founding partner of Dias & Dias Electronics and www.surveybattery.com. His company has been repairing battery packs for surveying equipment worldwide for over 11 years now.

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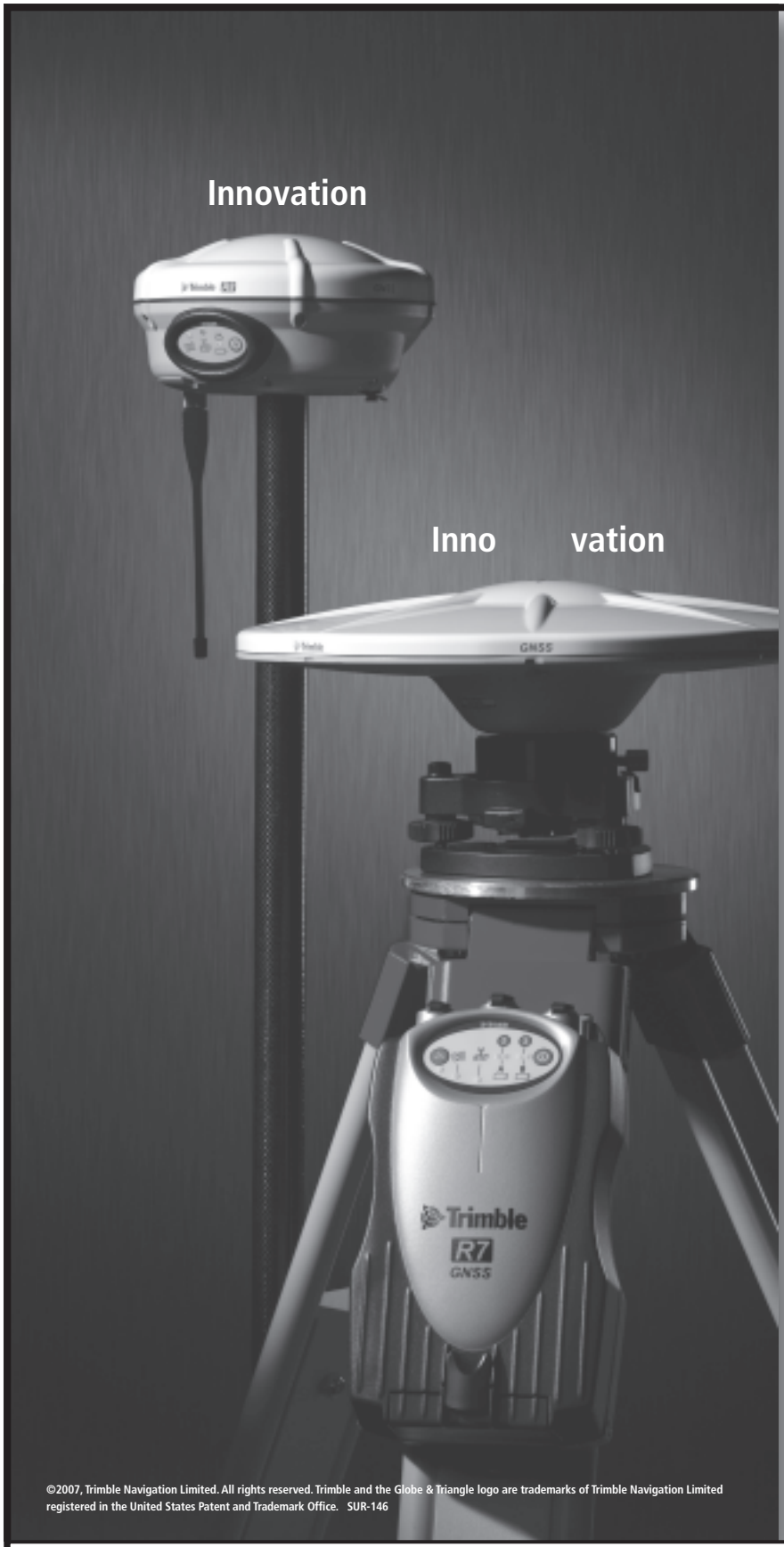

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