

An aerial, black and white photograph of a city, likely Pittsburgh, Pennsylvania. The image shows a dense urban landscape with a prominent Gothic cathedral (Cathedral of Learning) on the left. A large river (the Allegheny River) flows through the city, with several bridges crossing it. The overall scene is a high-angle, wide-area view of the city's architecture and geography.

the *American* Surveyor

MARCH 2020

BEHIND THE LINES

What Is A Surveyor?

Math or evidence?

Unsung Hero

Tennessee-North Carolina

Supreme Court Monuments

Group effort needed



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New Order Professionals

I have the great privilege of presenting at various state conferences throughout the year. This experience allows me to genuinely connect with our readers. I'm continually humbled and honored by the number of folks that share their experiences in common with our featured topics. Of course there's always some great boundary tales usually followed up with everyone's two cents. Heck, on paper I'm a billionaire philanthropist holding that logic. Our conferences offer the opportunity for our vendors to show off the latest and greatest tech. By the way, vendor support is a huge chunk of what makes the conference happen, remember nothing is free. Incidentally, in Oregon I had the great pleasure of chatting with some young folks that were taking the CST test right there at the conference. In fact there was a swarm of new blood from the campuses and the field buzzing around that conference. The last twelve years have been economically brutal on our profession but we are still here and new blood is showing up to carry the torch. I see that as a huge upward trend. What doesn't kill us makes us stronger and although the "great recession" ran through our economy like the strep throat through a middle school we are seeing a better cut of professional emerging from the ashes.

Technology and connectivity have exponentially affected productivity and commerce. We've adapted and the emerging candidate is one that can "do it all". Field, office, public meetings, IT/IS, database management, GIS, client relationships and make a decent pot of coffee. In other words, a professional. I am continually encouraged by our emerging young professionals, especially their ability to communicate. After three decades of listening to folks whose verbal tact generally amounts to a binary choice of yelling or mumbling, I surmise that even the best surveyor can easily be reduced to a blithering idiot if he doesn't take care to professionally develop his social engagement skills. Land development requires public interaction. The land survey is merely a single component of every land development project. The professional that merely delivers a survey to his client then walks away is no more than a party chief responsible for his own withholding tax. Granted there's an attempt at an honest living and perhaps an uncomplicated existence but what happens when that humble scenario is threatened? You can't slope chain your way out of human conflict. We no longer need warm bodies in this profession, we need the right minds. Our rising stars are facing serious professional challenges created at the whim of every drive thru politician clinging to the winds of change. Whether it's over-regulation or deregulation you can be certain our small numbers will be one of the sacrificial lambs.

In Darwinist fashion our sub-professional driftwood was purged in the economic catastrophe of 2008. Since then, digital technology and connectivity have far surpassed a large skilled labor force. Filling this smaller void with high quality minds is more critical now than ever. I mean minds that can articulate our function to the least sophisticated land individual owner, as well as global corporations, and of course to peers, and most importantly to the courts. Oh yeah, and maybe even roll around with the popular kids down in the funball bouncy house of your state legislature. I assure you the young talent I've met on this year's conference circuit are promising. Let's mentor them to be professionals and not just registered surveyors. ■

Jason Foose is a Professional Surveyor licensed in multiple jurisdictions.

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PUBLISHER Allen E. Cheves
allen.cheves@chevesmedia.com

MANAGING EDITOR Jason E. Foose, PS
jason.foose@chevesmedia.com

EDITOR EMERITUS Marc S. Cheves, PS
marc.cheves@chevesmedia.com

ASSOCIATE EDITOR Joel Leininger, PS

CONTRIBUTING WRITERS

C. Barton Crattie, PS	Lee Lovell, PS
James J. Demma, PS, Esq.	Wendy Lathrop, PS
Dr. Richard L. Elgin, PS, PE	John Matonich, PS
Chad Erickson, PS	Michael J. Pallamary, PS
Linda Erickson	Jerry Penry, PS
Joseph D. Fenicle, PS	Walt Robillard, Esq., PS
Gary Kent, PS	Fred Roeder, PS

The staff and contributing writers may be reached via the online Message Center at amerisurv.com

GRAPHIC DESIGN LTD Creative, LLC

WEBMASTER Joel Cheves

OFFICE ADMINISTRATOR Becky Sadler

AUDIENCE DEVELOPMENT Edward Duff

ACCOUNT EXECUTIVE Richard Bremer

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decided **guidance:** case examinations

Q-2 LLC v. Hughes

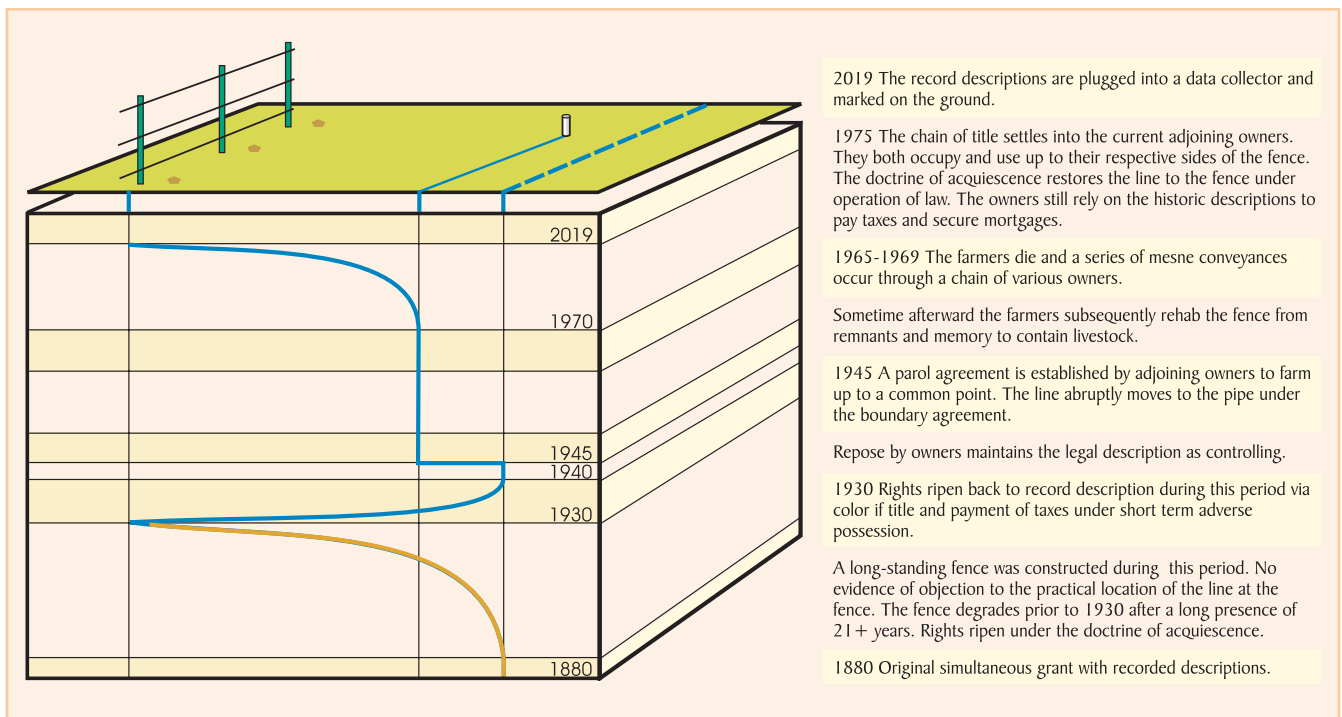
I feel that the surveyor best represents a boundary when we represent that which the owners have expressed as the true boundary on the ground. I don't just mean your client or just his deed, but rather both chains of title on each side of the line from day one of the original subdivision. It's not a light task. Simply puppeting deed calls on the ground has proven problematic despite a basis in law. Conversely the surveyor who trades his rope for a robe and takes license to adjudicate a broken cadastre might just be hung from that same rope. What danger lurks among those two extremes? Well, there's the legal doctrines of acquiescence and adverse possession for starters. The Utah Supreme Court recently

revealed the legal complexities of these related concepts and how they commingle throughout the life of a chain of title. Sorry, not much bob dangling this month but a lot of head scratching is promised for anyone that makes it to the end of this read.

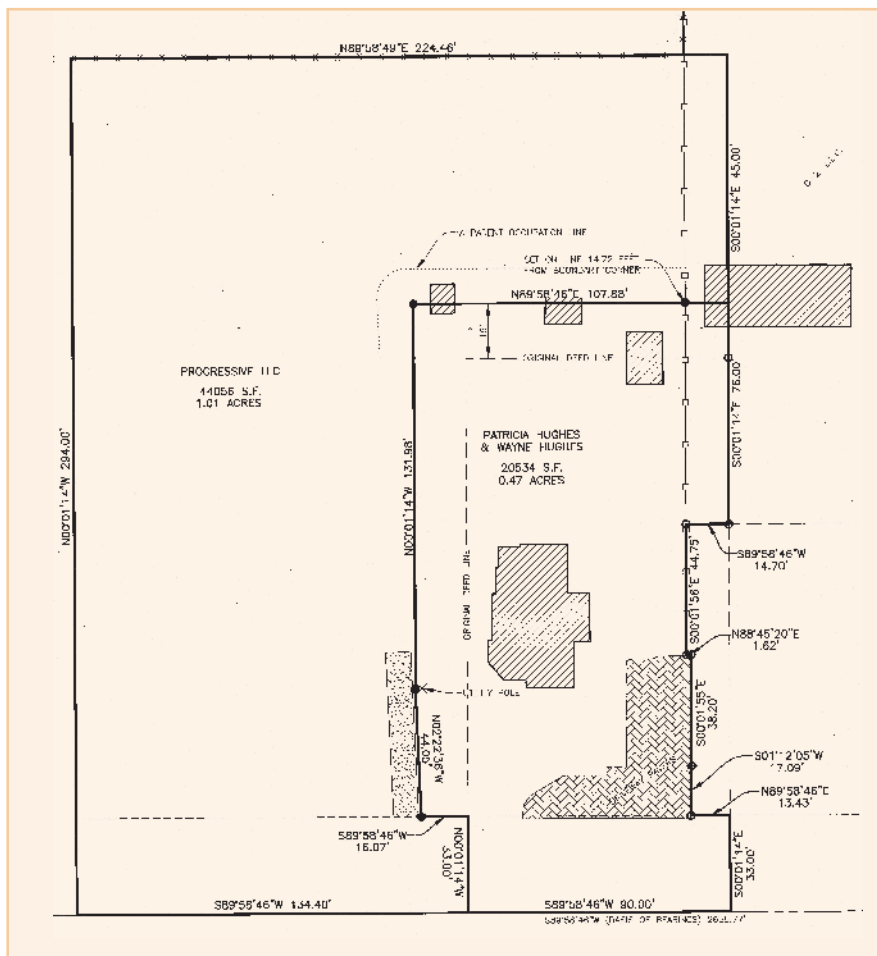
The Case of *Q2 LLC v. Hughes* is a trip through the space time continuum, at least when it comes to boundary dispute cases. The Court was asked "...to decide only one issue in this case: how and when does a party acquire title to property under the doctrine of boundary by acquiescence?" The Court further broke it down into "...Does title transfer by operation of law at the time the elements of boundary by acquiescence are met or by judicial decree at the time the trial court enters its order?" Understandably

this question also piqued the interest of Utah's land title community and they jumped on the appellate bus in amicus. Well, as a surveyor I thought this was an intriguing question but I do recognize that solving matters of law doesn't fit in my vest pockets or stake bag. So there's the disclaimer of the month.

The answer in Utah is that title transfers at the time the elements are met and it's automatic. The Court summed up their role as follows "*The precedent found in Brown and Veibell controls the issue before us, and we take the opportunity today to reaffirm our prior decisions by explicitly stating that the doctrine of boundary by acquiescence grants title by operation of law when its elements are met. The doctrine simultaneously*



Thought provoking scenarios arise with a migratory influence of unwritten title. Evidence includes the element of time. Despite the operative transfer's abrupt nature, the persuasion of the evidence fits curvilinear trends when considered on the ground. Note that the boundary appears most stable when the owners are in clear agreement of a fixed position.



A record map of the scene shows a jog in the line that seems to fit occupation.

extinguishes the previous owners' legal title and leaves them with only bare record title."

Okay, that's how the cards played out, now here is their reasoning. "To be sure, there will be cases in which judicial adjudication becomes necessary to resolving disputes, but a judicial adjudication of a boundary dispute does not itself confer title. Rather, it merely determines the prior point at which title vested." That is my emphasis added to show the Court's role in the deal. FWIW it makes sense to me. The title companies don't like it because rights can be harbored outside of the record. I see their dilemma and uneasiness when the Court introduces terms like "bare record title."

So we apparently have two adjoining on the other side of the Hughes line. Facing from Hughes side, let's just assume the left and right adjoining are Q2 and Dahl respectively. The subject fence cuts off a swipe of Hughes property along the entire length of the line. Precedent to Hughes taking title there was

the reliable fence from 1927 to 1971, a varying description, and occupation all happening on the ground that ripened favorably to adjoiner Dahl. Hughes lost a portion of their claim to Dahl at trial then Hughes appealed. The court of appeals upheld the trial court's order in 2004, rejecting the Hughes arguments that the deterioration of the fence and their non-acquiescence to the fence line defeated Dahl's claim. This nailed down our "right half" of the line under the doctrine of acquiescence in the 2004 case. A few years later Q2 brought suit against Hughes for the left half of the line holding the exact same fence line and argument as Dahl. Seems like a no brainer and reasonable, right? Well, this is where the whole time space continuum thing kicks in.

The Court determined that Dahl acquired title under acquiescence no later than 1971 and this vacated the adjoiner's title (Hughes "predecessor"). So the fence is the boundary as of 1971 and the record description

is consequently inaccurate at that time. Ironically, the same doctrine that offers repose under acquiescence also creates an adverse possession potential for the loser. Yup, and Hughes proved it. After 1971 the fence degraded and in 1998 Hughes took possession of the property per the historic but legally inaccurate record description. Okay, ya' can't convey what you don't own so Hughes never took title to the acquies-ed strip, right? Right! The Court pointed out that Utah's adverse possession doctrine doesn't always fly because it includes the payment of property taxes. "...one who possesses land for a long period without having legal title, but believing he is the actual owner, is unlikely to think of procuring a tax description in order to pay taxes on the land because he will think that he is already paying taxes on it." A rare bird was hatched with the 1971 operative transfer to Dahl and Q2 under the doctrine of acquiescence. The tax folks weren't notified of the operative boundary change so Hughes and "predecessor" were still stuck with the tax bill for that strip of property. That of course was inarguably substantiated with the ripened Dahl claim observed by the court.

According to the Utah Court adverse possession needs actual possession that is open and notorious, hostile, exclusive, continuous, and accompanied by taxes or color of title for five to seven years. All of those except the time, taxes, and "actual" may have occurred in "Hughes" favor operatively at the moment title transferred in 1971. By 1978 the time, taxes, an "actual" could have also accrued under the predecessor. Hughes took title 1998, so not counting any tacking they could have wrapped their adverse claim up by 2005. Q2 notified Hughes of their trespass in 2005 and took action in 2008. The long story short is that Q2 did actually pull the carpet out from under the predecessor in 1971 through acquiescence then Hughes spun the table and took it right back in 2005 under adverse possession. I suspect ownership could ebb and flow under operation of law in perpetuity. Let that soak in!

The doctrine of acquiescence is an evolving concept. The Utah Court worked through an acquiescence question in the 2016 case of Anderson v. Fautin. Early Utah Courts associated acquiescence with an agreed boundary. Evidence or inference of



the parties mutually behaving was required to sustain a claim. Later courts have found that acquiescence is more akin to adverse possession and have abandoned any mutual occupancy requirement. I wildly speculate this evolution might reflect concerns arising between actual occupants and absentee title holders. The term seisin comes to mind but I'll check my chain tension before I record that in my field book.

The law somehow arrives at the conclusion that acquiescence is a conveyance. That seems counterintuitive doesn't it? Let's break this down a little bit. If a boundary is known and the parties want to change it, well that's a conveyance and they need to follow the laws of conveyancing. If someone possesses land and doesn't hold title then that land can be conveyed according to law under adverse possession. Here's where the waters start to muddy. When adjoining do not know where a boundary is they can fix that line by agreement. Agreement can be written (best), oral (okay till somebody dies), implied through use, actions, or acceptance, and last but not least inferred by a court. This is a cheap simplification of the legal standards so please, a grain of salt. Considering those elements it's easy to see why the earlier courts associated acquiescence with the agreement doctrine. Okay let's get something clear, the term "uncertainty" is broad but in the strongest sense might include a broken description, a broken chain of title, an ambiguous natural monument, no original survey or marks to retrace and no reliable occupation. I wouldn't expect a surveyor to be able to competently retrace such a boundary and the best the owners can do is just get something to work between themselves. So that's a full-blown agreement and operatively the title is momentarily bubbled together, vacated, and then immediately redistributed equitably at the owners' free will. The bubbling and

redistribution part seems necessary and evokes thoughts of a quitclaim conveyance.

On the other hand when chains of title are harmonious and descriptions are reasonably intelligible the adjoining may find it necessary to simply fix that title line to the best of their ability. It might be done with a tape measure, a lawnmower, a hedgerow, a driveway, or through any conceivable improvement, but it is nonetheless done. This is the owner's expression and interpretation of that platted line between lots "such and such" in "whatever estates" subdivision. By the way, we see a similar circumstance within the subdivision of sections. Now, we all know where everything is "supposed" to land respectfully by measurement from the block and section corners. Despite our astonishing ability to precisely repeat recorded measurements from a grantee's receipt, the facts may be that the owners were left to pack their own groceries at the checkout line. This is true of the interior of the vast majority of G.L.O. sections. This is also a common occurrence in many residential subdivisions laid out prior to our contemporary local land regulation practices. So, exercising repose with respect to a bona fide delineation of an original grant has been a long standing function of the surveyor. For the record I'll call that Cooley's doctrine of repose. Nobody is giving or taking or selling or conveying or doing anything except marking their claim. These owners know they own no more and no less than the lot they bought according to the title papers and the Assessor's records. They also know that the neighbors used to be really nice folks until the last block party and everybody still mows to the marker somebody set or found years ago.

The issues in Q2 v Hughes and the 2016 Utah case Anderson v. Fautin are questions of law and it's pretty clear that "measurements

and monuments" were not issues in these cases. It's also clear that boundaries can ebb and flow repeatedly or more aptly snap back and forth under operation of law. We also learn that a dimension of time can be applied to evaluate operative conveyances in an unwritten chain of title. The law looks for evidence of resolution or repose. However, the visible characteristics of occupation and written title may not reveal the extent or complex questions behind ownership. My prism pole is not a magic scepter. If retracement work reveals a conflict then further action is required by the owners' to complete the boundary survey. They must offer resolution or repose where the former might include a new record partition and the latter would substantiate the existing record description. Either way is fine by me. I just need an answer before I finalize my boundary survey.

A special thanks to Surveyor and Attorney Mark Gregersen of Gregersen Law in Salt Lake City, and Surveyor John Stahl of Cornerstone Land Consulting in Sandy, Utah for sharing the Utah cases of Q-2, *Anderson v Fautin*, and *Bahr v. Imus*. I encourage every student of boundary surveying to read up. The plat provided is of public record however Reeve & Associates, Inc. requests potential users to obtain permission prior to use. The surveys show that things really weren't as cut and dried as detailed by the court decision. I have found this to be at least not unusual when researching decisions. I had the pleasurable opportunity to chat with Daryl Penrod who is still practicing locally with his current firm of Ludlow Engineering and Surveying outside of Provo, Utah. Daryl confirmed that there were some additional moving parts to this puzzle and there's always more to the backstory. Feel free to contact me at jason.foose@chevesmedia.com with any questions or comments. ■

The case can be found here: <https://archive.amerisurv.com/PDF/Q2VersusHughes.pdf>
The Report of Survey can be found here: <https://archive.amerisurv.com/PDF/Q2versusHughesPlat.pdf>

Jason Foose is the County Surveyor of Mohave County Arizona. He originally hails from the Connecticut Western Reserve Township 3, range XIV West of Ellicott's Line Surveyed in 1785 but now resides in Township 21 North, Range 17 West of the Gila & Salt River Base Line and Meridian.

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EVER COME ACROSS A U.S.S.C. STAMPED CAP?



It is part of a Surveyor's field work to locate government monuments. An infrequently found monument is stamped "U. S. Supreme Court". These rare marks are set along state lines at the direction of the Supreme Court after settling interstate boundary disputes.

When one looks through U. S. Supreme Court cases over two centuries there are many interstate disputes. The Constitution directs the Supreme Court to original jurisdiction resolving interstate disputes. Such disputes can cover many topics and the locations of boundary lines between the states being frequent.

As soon as New Mexico became a state it sued Texas¹ over the location of its southern and eastern boundary lines. A United States Supreme Court (USSC) Boundary Commission was tasked to mark the Court determined New Mexico/Texas boundary line in accordance with the Court determination. Another USSC Boundary Commission was assigned to mark part of the line between Oklahoma and Texas² as discussed last year in *American Surveyor* magazine article by Nedra Foster, "The Red River Flows On". Vermont and New Hampshire³ after almost two hundred years of simmering dispute ended up at the Supreme Court in the early 1930's. In these cases, after the Court reached its decision it appointed a Special Master to oversee the setting of boundary line monuments along boundary lines adjudged to be correct. Caps stamped "U. S. Supreme Court" or two state boundary commission are the result of this process.

Over the years some of these caps have become part of the National Geodetic Survey (NGS) database as stations. Recently, assisted by Scott Lokken, Mid-Atlantic Regional Geodetic Advisor, a database search for monuments stamped USSC was conducted for the states mentioned above. His searches disclosed 47 PIDs. Then photos for

these PIDs (NGS Permanent Identifiers) were downloaded from DSWorld.com application. There probably are many more USSC monuments to be identified but the search method is restricted to individual states. Because the Court sometimes would direct a joint state Boundary Commission to participate in overseeing the setting of directed monuments, the monuments are recorded as such as the "New Mexico/Texas Boundary Commission" even though they were set at the direction of the Supreme Court. Not all USSC monuments have been recorded as PIDs. However, where there is one along a state boundary there probably are more.

It is sobering to encounter a USSC cap in the field do to its rarity and significance. Your help is requested to identify more. Tell us cap locations. Photographs formatted to NGS standards would also help; the face close-up, the mark from eye-level, then a photo at a distance with a heading in the photo name.

A University Librarian in Pennsylvania has agreed to update and maintain a master list of USSC monuments in the format of the NGS datasheet database. Because the majority will be PIDs it will be in that format. Photographs will be uploaded to DSWorld if PIDs or stored in a separate PICTURES database. ■

¹ New Mexico v. Texas, 276 U.S. 558 (1928)

² Oklahoma v. Texas, 260 U.S. 606 (1923) and 'The Red River Flows On' by Nedra Foster, *American Surveyor* magazine, May 25, 2019.

³ Vermont v. New Hampshire, 289 U.S. 593 (1933)

Special thanks to New Mexico Civil Engineer/Land Surveyor, Ira L. Harding, whose discussions and article in Rhonda L. Rushing's 2006 book "Lasting Impressions" page 79 guided me to the USSC topic.



HAVE YOU EVER COME ACROSS A USSC CAP?

Please report any USSC monuments you have found to USSC.caps@igmail.com. Also upload your JPG photos to DSWorld.com for permanent storage. It is intended to share the list developed in a later issue of this magazine along with the photos of these unusual boundary line monuments found around the United States.

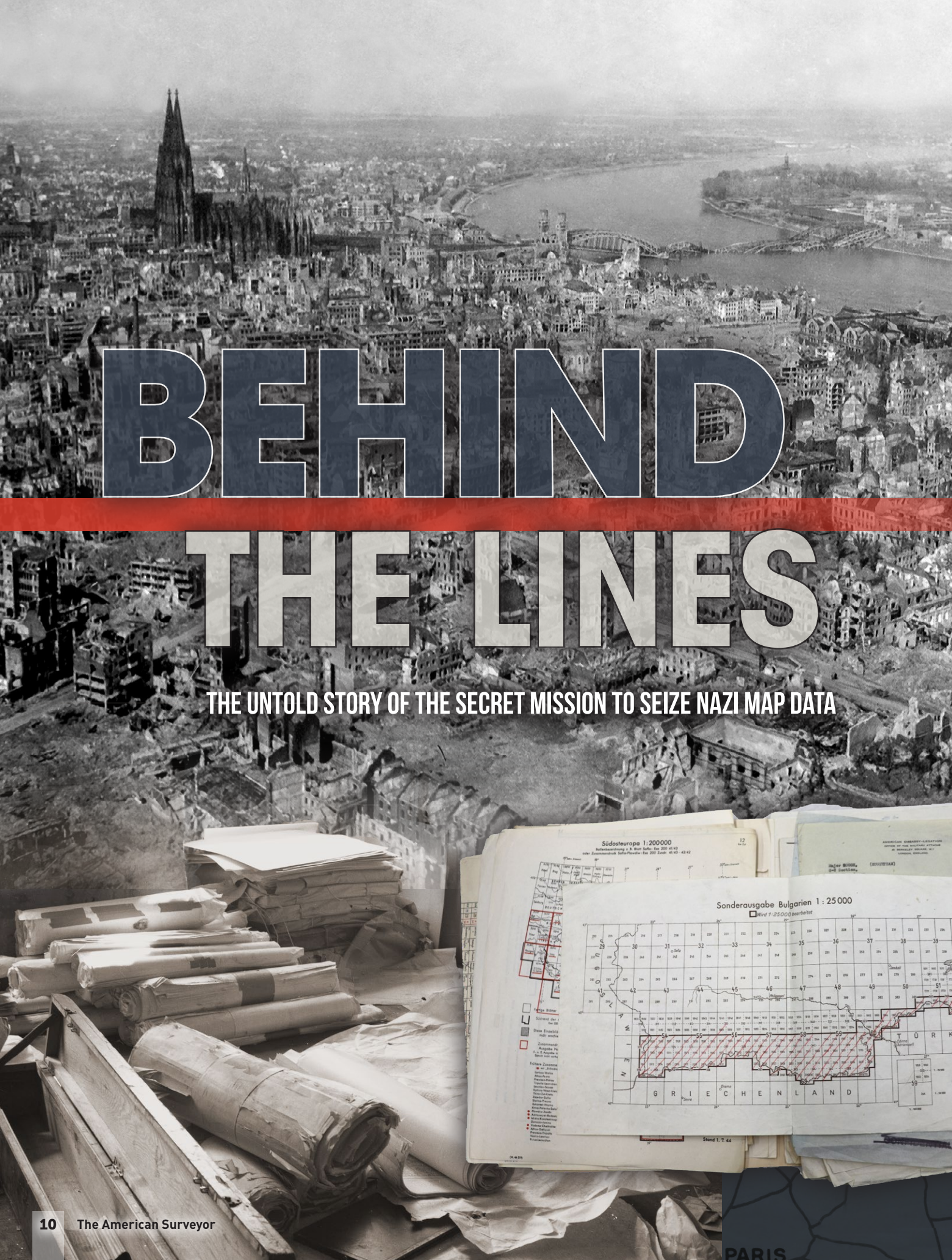
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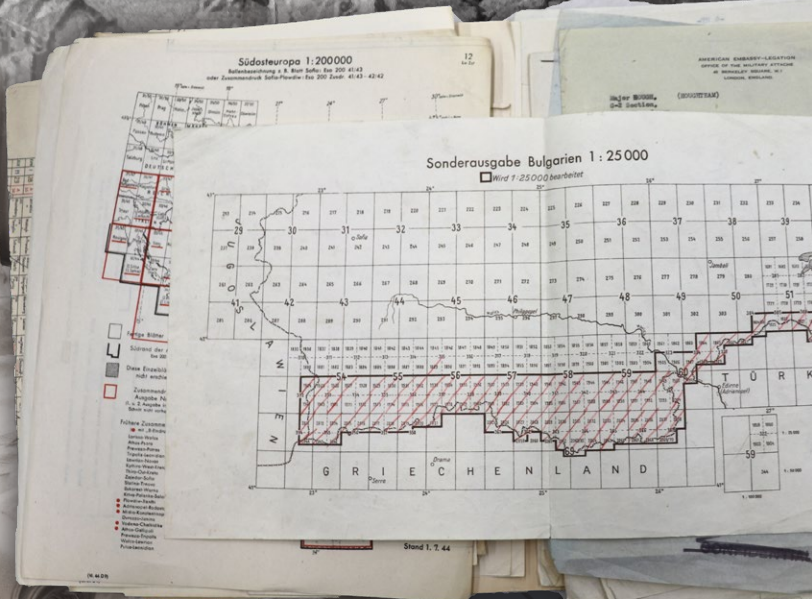
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BEHIND

THE LINES

THE UNTOLD STORY OF THE SECRET MISSION TO SEIZE NAZI MAP DATA





Note: The following is an excerpt of an article that appeared in the November 2019 issue of Smithsonian Magazine and is reprinted with permission.

The fighting for Aachen was fierce. American planes and artillery pounded the Nazi defenses for days. Tanks then rolled into the narrow streets of the ancient city, the imperial seat of Charlemagne, which Hitler had ordered defended at all costs. Bloody building-to-building combat ensued until, finally, on October 21, 1944, Aachen became the first German city to fall into Allied hands.

Rubble still clogged the streets when U.S. Army Maj. Floyd W. Hough and two of his men arrived in early November. "The city appears to be 98% destroyed," Hough wrote in a memo to Washington. A short, serious man of 46 with receding red hair and wire-rimmed glasses, Hough had a degree in civil engineering from Cornell, and before the war he led surveying expeditions in the American West for the U.S. government and charted the rainforests of South America for oil companies. Now he was the leader of a military intelligence team wielding special blue passes, issued by Supreme

Headquarters Allied Expeditionary Force, that allowed Hough and his team to move freely in the combat zone. Their mission was such a closely guarded secret that one member later recalled he was told not to open the envelope containing his orders until two hours after his plane departed for Europe.

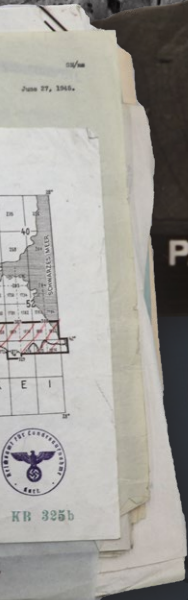


**PASSPORT
HOUGH**



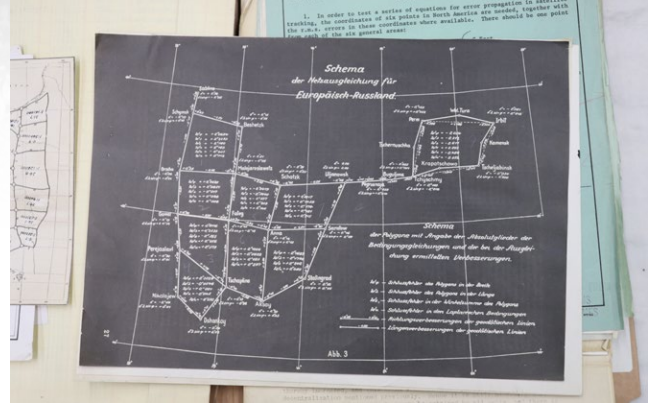
Entering German cities within days of their capture by Allied forces, a team led by U.S. Army Maj. Floyd W. Hough slipped into bomb-ravaged Cologne (top left) in early March 1945.

NATIONAL ARCHIVES / U.S. DEPARTMENT OF DEFENSE



IN AACHEN, THEIR TARGET WAS A LIBRARY.

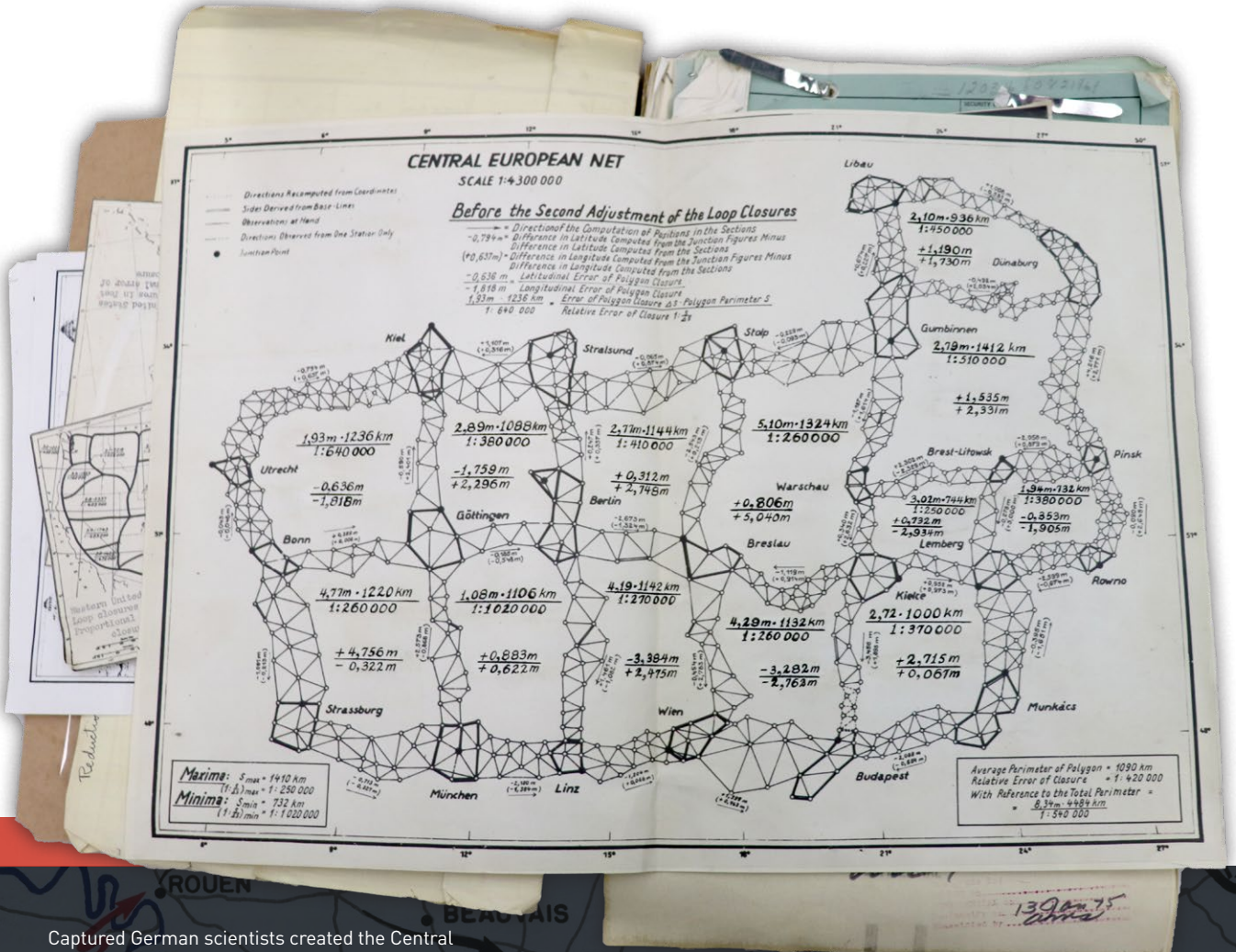
HOUGHTTEAM, as the unit was known, was made up of 19 carefully selected individuals. Four were highly educated civilians: an engineer, a geographer who had worked as a map curator at the University of Chicago, a linguist who spoke five languages, and the dapper son of a prominent Kentucky family who'd grown up mostly in Europe as the son of a brigadier general posted to various capitals as a military attaché. There were also ten enlisted men. One was a Japanese interpreter on loan from the Office of Strategic Services, the spy agency precursor to the CIA. Others had been through the secret Military Intelligence Training Center at Camp Ritchie, Maryland. Among the Ritchie Boys, as they were known, were European immigrants who had fled to the United States to escape Nazi persecution. At Camp Ritchie they received training in interrogation and other psychological operations. Their job was to question European civilians about the movement of enemy troops, translate captured documents and interrogate pris-



Captured German geodesists and their data laid the foundation for the first geodetic network covering the European continent.

THE NATIONAL ARCHIVES

oners of war. For the refugees among them, it was a chance to leverage their language skills and cultural familiarity to defeat the enemy that had uprooted their lives.



Captured German scientists created the Central European geodetic network at Hough's request. Later the network expanded to cover all of Europe.

THE NATIONAL ARCHIVES



Early in his career, Hough (at right) led survey parties across the American West, including a 1921 trip to Arizona.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Along with 1,800 pounds of cameras and other equipment for creating microfilm records, HOUGHTTEAM also carried 11,000 index cards detailing the holdings of the Army Map Service as well as numerous target lists of technical universities, government institutes, libraries and other places likely to have the materials they had been sent to capture. The lists also named German scientists who seemed likely to cooperate, and some who were not to be trusted.

In Aachen, the library that Hough was looking for was at the *Technische Hochschule*, or technical university. Though it had been nearly wrecked by American bombs, thousands of books remained. But what caught Hough's attention were the bundles of folders stacked outside. It appeared as if the Germans "had left a number of files all roped up ready to load onto trucks when they made a hasty exit," Hough wrote. The abandoned documents included tables of exceptionally precise survey data covering German territory that the Allies had yet to reach—just what Hough was looking for. His team quickly microfilmed the material and sent it to the front, where Allied artillery units could immediately use it to improve their targeting.

The Aachen seizure was the first in a series of remarkable successes for HOUGHTTEAM that promised not only to hasten the end of the war but also to shape the world order

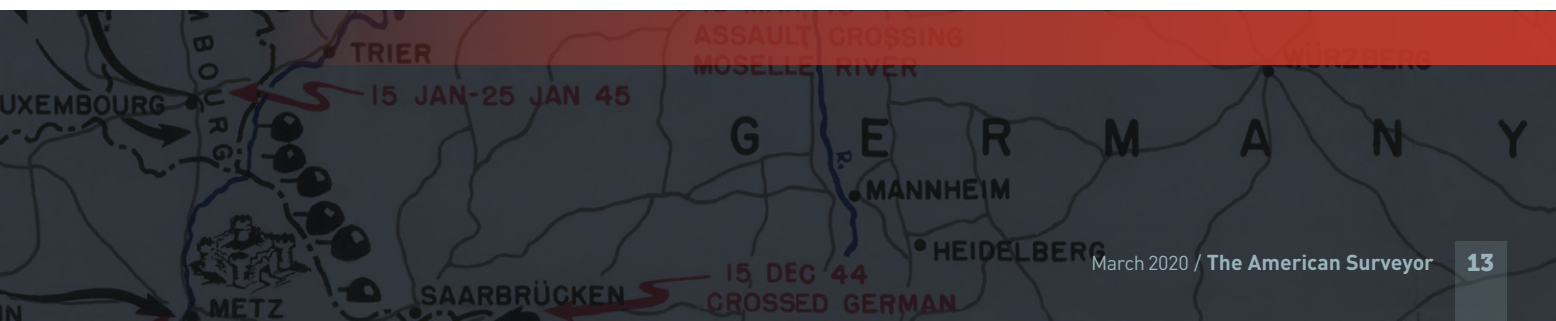
“HOUGH'S ORDERS WERE TO FOLLOW THE FRONT, AND RIDE THE FIRST TANK INTO BERLIN.”

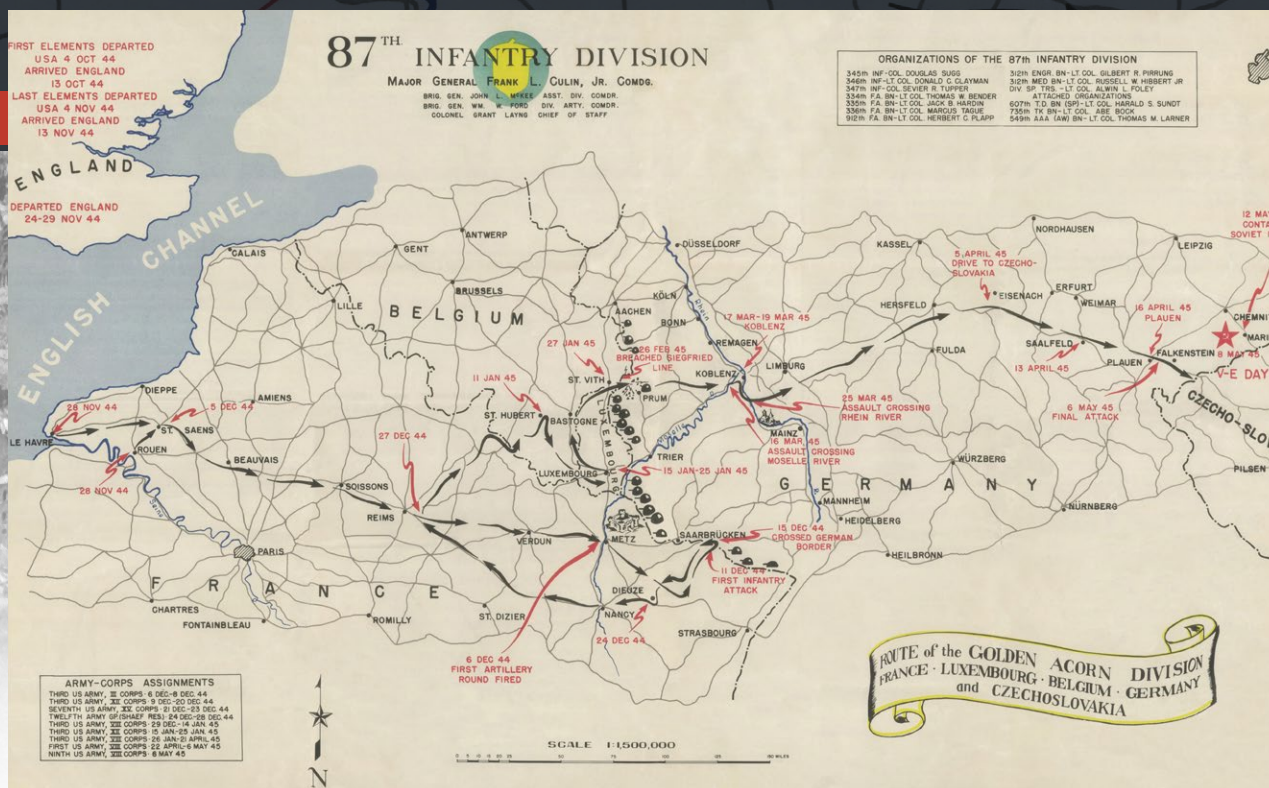
for decades to come. Little is publicly known about the true scope of the information that Hough and his team captured, or the ingenuity they displayed in securing it, because their mission was conducted in secret, and the technical material they seized circulated only among military intelligence experts and academics. But it was a vast scientific treasure—likely the largest cache of geographic data the United States ever obtained from an enemy power in wartime. Relying on Hough's memos to his superiors in Washington and other declassified records about the mission, which are stored at the National Archives, in addition to private letters and other materials provided by the families of several team members, I have pieced together the outlines of this historic military feat. The operation seems all the more astonishing because it was executed by an unlikely band of academics, refugees, clerks and soldiers, all led by Hough, an Ivy League-trained engineer with a passion for geodesy, the centuries-old science of measuring the Earth with utmost mathematical precision.

In 20th-century warfare, men and machines could achieve only so much without exact location data to guide them. The Americans knew that the Germans had a trove of this material, and had most likely captured even more of it from the countries they had invaded, including the Soviet Union. If Hough and his team could exploit the chaos of war to hunt down this prize, they would not only help to finish off the Nazis but could give the Americans an incalculable advantage in any global conflict to come.

Hough's orders, then, were to follow the front, and ride the first tank into Berlin.

These days, when the phone in your pocket pinpoints your location in seconds, it's easy to forget just how new that technology is—the U.S. military launched its first GPS satellite only in 1978—and just how laborious it used to be to gather and synthesize definitive geographic data. Unlike a traditional survey used to determine property lines or mark the route for a new road, a





Hough’s team entered Saalfeld on April 17, 1945, just days after the U.S. 87th Infantry Division had captured the town and continued its eastward march.

THE U.S. ARMY

geodetic survey of a region accounts for the curvature of the Earth and even variations in this curvature. That extra precision becomes more critical over long distances. The nature of combat in World War II gave geodesy new urgency, as it required coordinating air, ground and naval forces across far larger areas than ever before.

Captured data could give the Americans a pivotal advantage in realizing what would become one of geodesy’s ultimate goals—creating a unified geodetic network that covered the entire globe. In such a system, any point on Earth’s surface could be defined by numerical coordinates, and its distance and direction from any other point calculated with precision. This capability would prove incredibly useful for any long-distance human endeavor, including guiding missiles to a target on another continent, as the Cold War would soon demand.

Not long after the fall of Aachen, the Allies’ military situation worsened. In December of 1944, the Germans mounted a counteroffensive, pushing through the Allied line in southern Belgium and Luxembourg in what became known as the Battle of the Bulge. Foul weather initially grounded the Allies’ superior air power, and the fighting dragged on into January.

Hough waited in Paris. The weather was miserable. Electricity was intermittent. The enlisted men relied on fireplaces for

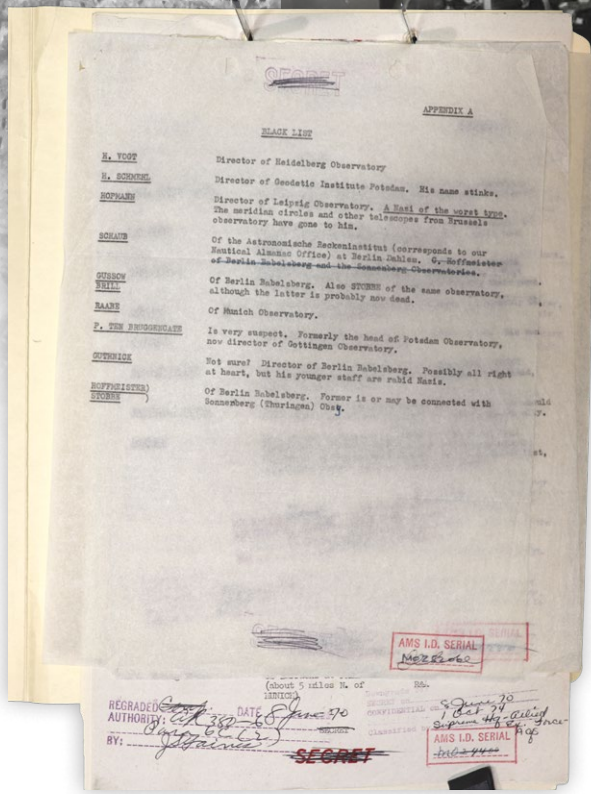
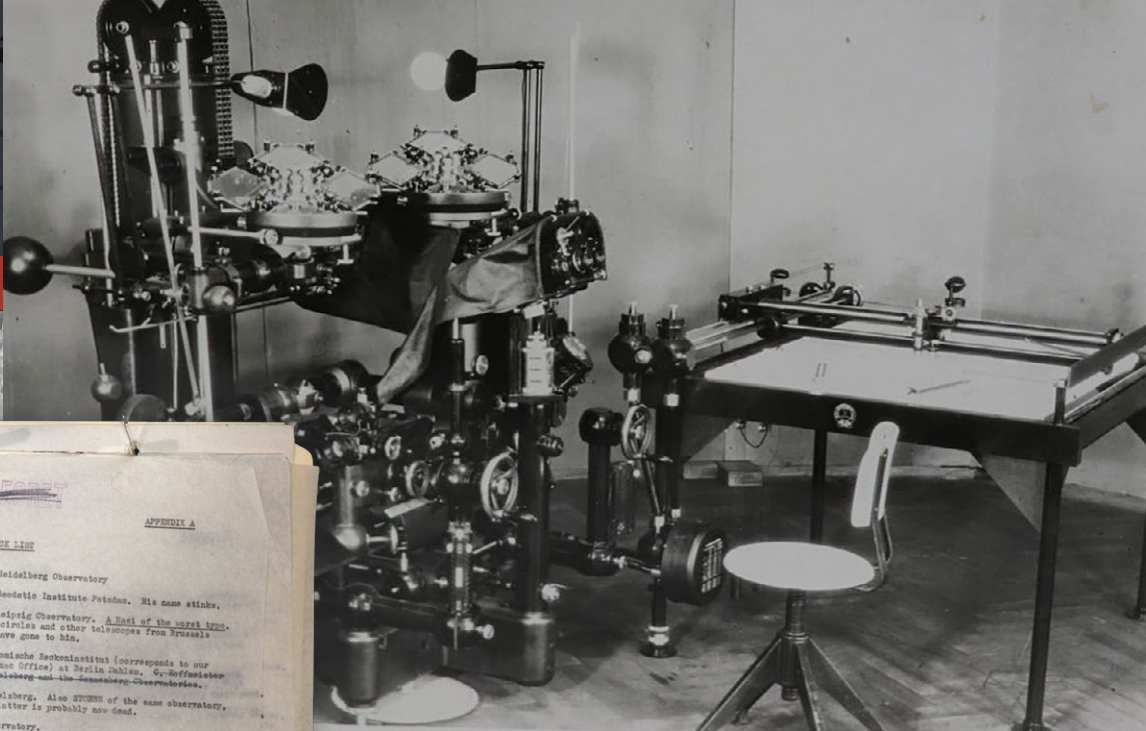
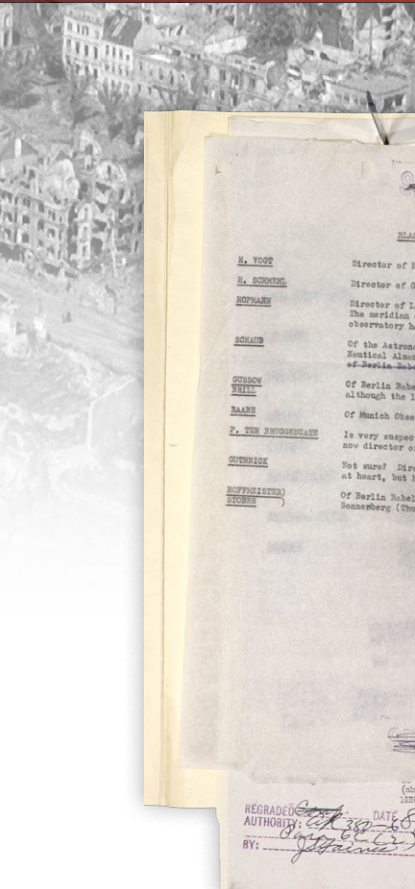
heat—when they could find coal or wood to burn. Everyone seemed to have a cold they couldn’t shake. HOUGHTTEAM did what research they could in France and other friendly or neutral countries. They worked six days a week, mostly nibbling at the edges of the real mission, but made the most of their downtime.

Raymond Johnson, a 24-year-old telephone company lineman from Chicago, explored the movies and cabarets of Paris and practiced a few words of French with local women, as he later wrote in an unpublished memoir his daughters shared with Smithsonian for this article. Berthold Friedl, a 46-year-old linguist who struggled to make small talk with the enlisted men when the group gathered in the evenings to drink wine, wrote a book in French about Soviet military strategy and philosophy of war that was published in 1945. “Dr. Friedl was not capable of idle chit-chat,” Johnson recalled.

Martin Shallenberger, 32, the Kentucky blue blood, spoke fluent German and French, and though he could be charming, the G.I.s found him arrogant, according to Johnson. They bristled when he made them wait while he paused to capture some scene with his Leica camera or the watercolor paint set he carried around.

David Mills, a mild-mannered geodetic engineer, and Edward Espenshade, the geographer, were more at ease with the G.I.s.

“THE NATURE OF COMBAT IN WORLD WAR II GAVE GEODESY NEW URGENCY”



The Americans created a “black list” of untrustworthy German geodesists. The director of the Leipzig Observatory was “a Nazi of the worst type.”

THE NATIONAL ARCHIVES

Espenshade collected rare books, especially pornographic ones, which he left out for all to inspect, including Mildred Smith, one of two Women’s Army Corps members on the team. A geography teacher from Illinois, Smith was brought on for clerical support, but Hough took note of her initiative and intelligence and assigned her to search the map shops of Paris, and later sent her on a research trip to London. The enlisted men called her Smitty. Some, like Johnson, had never met such a woman. “Up to this point in my life I had had little personal contact with the liberated type of woman who could read our underground books and discuss them with the men with perfect composure,” he wrote.

Hough remained busy. When the Belgians requested help microfilming some survey data and secret lists of artillery coordinates, he was happy to oblige—and saw to it that an extra copy was sent to Washington without the Belgians’ knowledge. When the French city of Strasbourg was recaptured by the Allies, his men removed a cache of top-quality German survey equipment before the French had a chance to claim the gear for themselves.

Hough’s team shipped 371 boxes of captured German equipment to the U.S., including this stereoplanigraph made by renowned German optics firm Zeiss.

THE NATIONAL ARCHIVES

If an obstacle arose, Hough was willing to get creative. After several neutral countries balked at letting Espenshade and Shallenberger search their institutes and libraries, Hough procured letters from the Library of Congress certifying the men as its representatives engaged in bibliographic research. A similar ploy got Shallenberger into the pope’s private library at the Vatican, which was strictly off-limits to members of any military, owing to the Vatican’s status of neutrality.

Finally, by early March, the Allied forces resumed their eastward progress and were poised to cross the Rhine into the German heartland. HOUGHTTEAM’s window of opportunity was opening.

On March 4, Hough left Paris with Mills, his fellow engineer, and three enlisted men. They entered Cologne on March 7, and, the next day, toured the captured city’s massive Gothic cathedral, seemingly the only building to have escaped Allied bombing. On March 9, they received word that Bonn had been captured, and they made it there by nightfall. There they interrogated the director of the local geodetic institute, who led them to a hidden alcove that held a box of valuable books. The man claimed he’d stashed the materials there despite orders to evacuate them across the Rhine. “It is surprising that these Germans cooperate as they do,” Hough wrote in his daily memo to his superiors in Washington. Whether the scientist was anti-Nazi or was simply afraid of what the Americans might do to him, Hough wasn’t sure.

Hough and his men entered Frankfurt at the end of March, the day after it was captured, taking shelter in one of the few structures still standing in the business district. Buildings were still burning. Water was scarce. They found some in two bathtubs the Germans hadn’t drained before fleeing. But HOUGHTTEAM’s target institutions in Frankfurt had been reduced to rubble. In the basement of one building, the men saw what looked like books, but they disintegrated into fine ash in their hands.



In the German town of Saalfeld, Hough and his men captured the map and data repository of the German Army, which had been moved from Berlin to keep it safe from Allied bombs.

THE NATIONAL ARCHIVES

In Wiesbaden, a city just to the west, their luck began to improve. In the basement of one building, they found 18 bundles of survey data, hidden behind a pile of rubbish. Marked “Secret” or “Confidential” in German, the sheets covered thousands of survey points in southwestern Germany. The data had immediate operational value for the U.S. Seventh Army, which was beginning to push its way across the Rhine into that area. Hough decided to shortcut the chain of command to get the information directly to the artillery units that could use it.

Hough and his team also got a tip from a captured officer of the Reichsamt für Landesaufnahme, or RfL, the German national survey agency; he revealed the names of two small towns, about 140 miles to the east in Thuringia, a hilly, forested region dotted with medieval villages, which had not been on any of Hough’s target lists.

The U.S. Third Army was just moving into the area, which was famed for its artisanal bisque dolls, named for the unglazed porcelain that gave them a lifelike appearance. On April 10, Hough headed east with four enlisted men. In the small towns of Friedrichroda and Waltershausen, dispersed among three doll factories, private homes, a ranch house and a stable, the team found the entire archive of the RfL, which represented the German government’s best survey data of its own territory. The documents had been spirited from Berlin and hidden. It was by far the team’s biggest haul to date. “Cannot begin to estimate yet what is here but it is plenty,” Hough wrote.

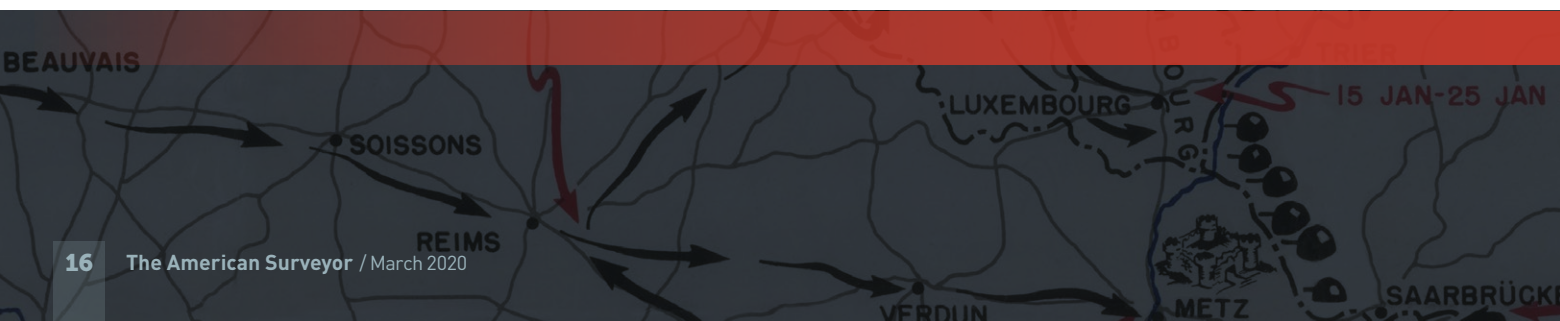
On April 12, Hough and several of his men visited Ohrdruf, a subcamp of the infamous Buchenwald complex, and the first Nazi concentration camp liberated by American forces, just eight days earlier. Generals Dwight Eisenhower and George Patton visited Ohrdruf on the same day as Hough. “There are no words capable of expressing the horrible scenes on every hand,” Hough wrote. “It was revolting and we were left almost speechless.”

That night, Johnson and a few other HOUGHTTEAM enlisted men stayed in a home in the nearby city of Gotha. In that stage of the war it was common practice for the Army to billet the troops in commandeered civilian homes. Johnson was struck by how familiar they felt. “They were charming and comfortable,” he recalled in his memoir. “Plants in the windows, closets full of clothes, children’s rooms with toys in them, sewing articles, cabinets full of good china and silver.” It seemed impossible to reconcile these cozy scenes of German domestic life with the horrors they had witnessed. One of the men sat vacantly burning holes in the upholstered arm of a chair. “There was nothing we could do that could measure up to the enormity of what we had seen,” Johnson wrote.

Days later Hough and his men interrogated several captured RfL officials, including the institute’s president, Wilhelm Vollmar, who tried the Americans’ patience and spent a night in jail as a result. Erwin Gigas, the chief geodesist, was more cooperative. A third German, whom Hough identifies only as “the real man we were interested in,” proved of more immediate value. They’d been searching for him since Wiesbaden... ■

Note: To read the rest of the story of how Hough and his men tracked down the central map and geodetic data repository for the German Army, including how the data was quickly put to use, please visit bit.ly/hough-smithsonian

Greg Miller is a science journalist and co-author of *All Over the Map: A Cartographic Odyssey* (National Geographic, 2018). A former neuroscientist, he has worked as a writer at *Wired* and *Science*, and lives in Portland, Oregon.

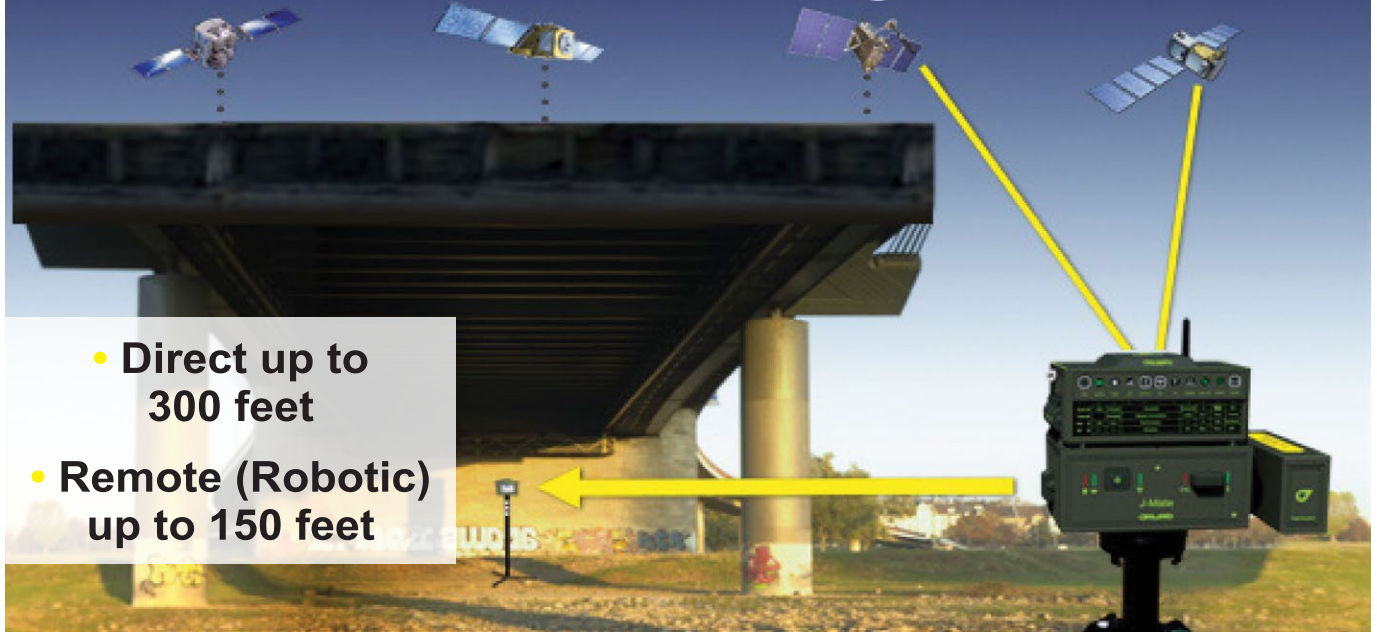


Where Have You Been with Your TRIUMPH-LS Lately?

"I bought my system March of last year (2019) and since then have definitely drunk the Kool Aid. It has revolutionized my life, getting good shots in places GNSS has not been appropriate until very recently. Chopping line is mostly out of my life. I survey mostly smaller localized jobs less than 100 acres and with the 1 watt internal radio, I regularly get 4,000' of coverage and have gone 6,300' from ridgetop to ridgetop. I am a big fan of the collapsible monopole for serious brush work and absolutely despise a fixed 2 meter rod."

See inside TLS2TLS, following the Target and more >>

Total Solution Bridge to RTK

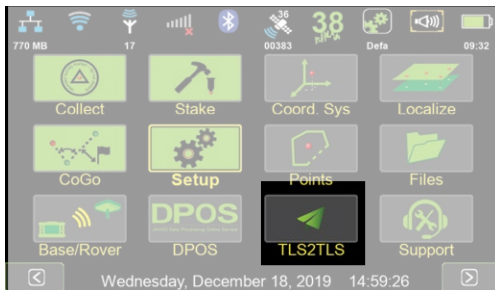


- Direct up to 300 feet

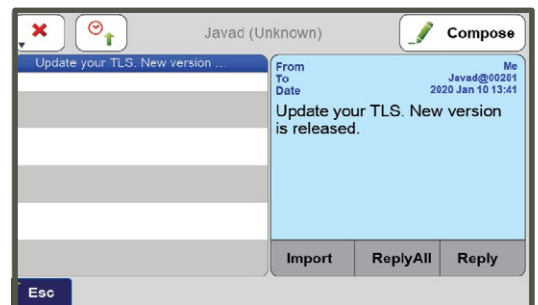
- Remote (Robotic) up to 150 feet

J-Mate is a bridge between RTK and areas that GNSS signal is not available.

TLS2TLS



You can send and receive text messages and files from and to other TRIUMPH-LS units. In the Main screen click TLS2TLS and then in the “Compose” screen, click and enter names and serial numbers of the TRIUMPH-LS units that you want to communicate with.

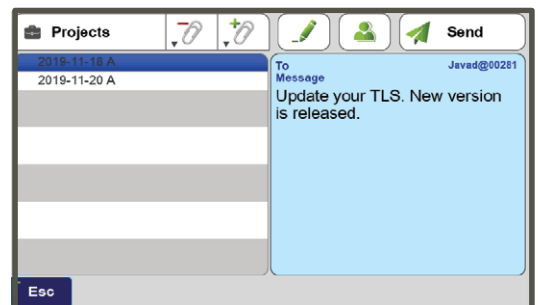


You can attach Projects, Screenshots, Images, Audio, GNSS RAW files to your text messages and send to the selected TRIUMPH-LS units.

The received messages are shown in the first screen. You can “Import” the attached files, if any, to your local unit. Click “Reply” to reply to a message.

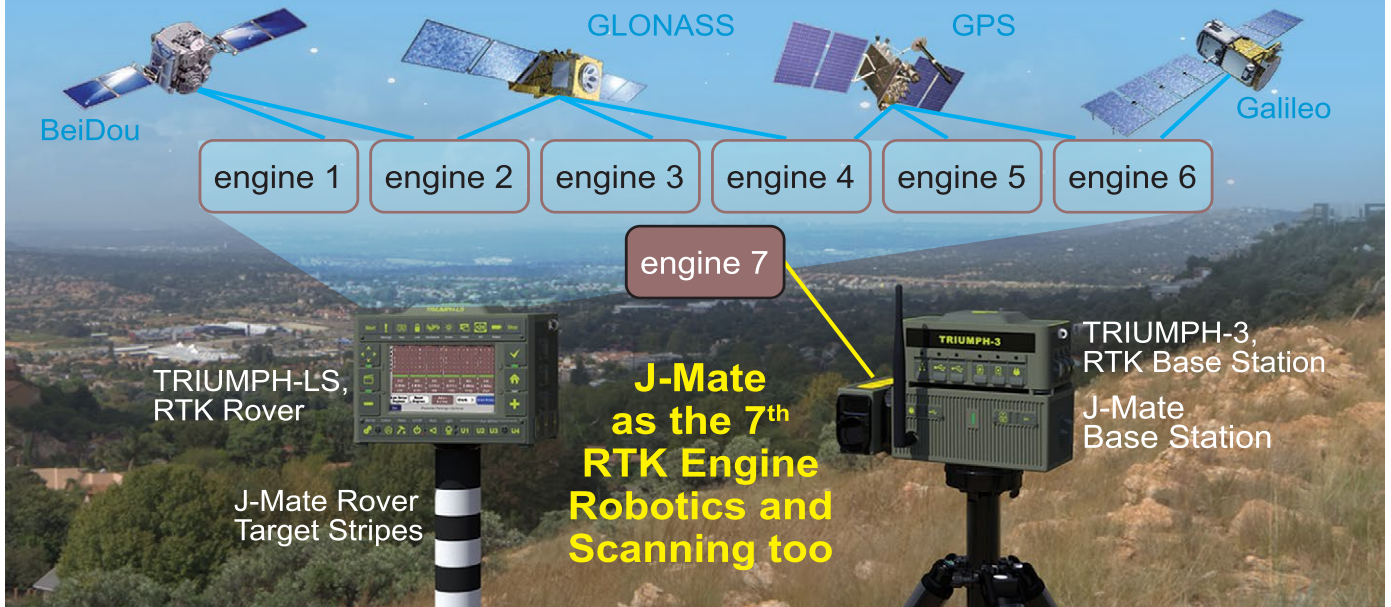
You can reply to received messages by clicking the “Reply” (only to sender) or “ReplyAll” (to all recipients) buttons.

You may receive “Public” messages from JAVAD GNSS team. You do not to reply to them.



As with the TRIUMPH-LS, with the J-Mate we also provide software improvement updates regularly and free of charge. Download the J-Mate update in your TRIUMPH-LS and then inject it to the J-Mate.

RTK and Optical United



RTK has six engines. We treat the J-Mate solution as the seventh engine of the system.

Connecting the TRIUMPH-LS to the J-Mate

Let's set the record straight: J-Mate is not a total-station. J-Mate and TRIUMPH-LS together make the "Total Solution" which is a combination of GNSS, RTK, camera, angle encoders and laser range measurements that together do, conveniently and cost-effectively, a lot more than a total station. For long distances, you use GNSS and for short distances (maximum of 300 feet in Direct mode and 100 feet in Remote/Robotic mode), you use the J-Mate along with the TRIUMPH-LS. Together they provide RTK level accuracy (few centimeters) in ranges from **zero to infinity**.

TRIUMPH-LS communicates with the J-Mate through Wi-Fi. Turn on both the TRIUMPH-LS and the J-Mate.

Click the Setup icon on the TRIUMPH-LS Home screen and click "J-Mate" to connect to J-Mate.


The J-Mate SSID will be in JMatexxxxx format, where xxxxx is your J-Mate's serial number. After Wi-Fi connection is established, click the "Collect" or "Stake" icons according to your job.



See details at www.javad.com

Searching and finding objects by laser and by Optics

J-Mate has the unique feature of searching for objects by laser and by optics (camera).

Click button  and select “Target Feature” to see the setup screen for target selection and parameters. If you know the approximate distance to the target, click the check box and enter the distance and accuracy percentage. This will help J-Mate to ignore targets that are outside the range.

Horizontal and Vertical Limits are the limits that J-Mate will search around the starting point to find targets.

“**Keep Fixed Height**” check box, scans horizontally on fixed target height. You may rarely need to use this feature. It will reduce the scanning speed by a factor of 2.

“Laser time limit”

The time that it takes for a laser measurement depends on the reflective surface of the target and weather conditions (dust and moisture in the air).

On a good white reflective surface and in clean air, it takes about 50 milliseconds to have a laser reading. If there is no reflective surface, or the reflective surface is black, it may take up to 4 seconds to have a laser reading.

If the surface of the object that you want to scan is a good reflective surface, limit the laser time to a fraction of a second. This will cause the laser to skip points that do not reflect enough energy in the time limit that you specified. This will significantly increase the scan speed and will ignore points that are not possibly your target and reduces the chance of identifying a wrong object.

Target Features and its offset from the top of the pole are shown in the “Target Features” screen. You can change the parameters by selecting the “Custom” button.

TRIUMPH-LS Back: You can use this feature to search for the back of TRIUMPH-LS and measure to its center to make sure laser range measurement is not from an unintended object.

TRIUMPH-LS New Options

Integrated J-Target painted on the back of TRIUMPH-LS



Little heads-up on what is coming for TRIUMPH-LS

Soon will be an option available for the TRIUMPH-LS with the following features, using the new ASIC:

- Improved signal tracking and signal processing (wideband tracking) and adding Galileo and BeiDou L6 bands.
- Improved multipath reduction due to wide band tracking.
- Improved spectrum analysis to show and reject spoofers and jammers option.
- Improved RTK with four “Super Engines”. Each engine uses all signals of all satellites but with different parameters for different conditions.
- Improved internal Wi-Fi antenna that works both as directional and omnidirectional. No need for external Wi-Fi antenna.
- Improved internal Bluetooth antenna and longer range.
- Lower power consumption and extended battery life.

Price for the current TRIUMPH-LS remains at \$12,990 and can be purchased as before.

Price of the improved option is \$4,990. ($\$12,990 + \$4,990 = \$17,980$).

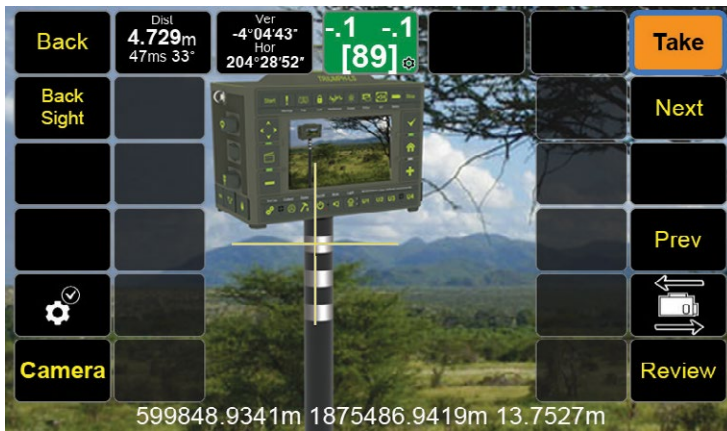
Please see our website for additional available options for the TRIUMPH-LS.

Owners of current TRIUMPH-LS units (in working condition) can upgrade their units to the improved option at \$5,450 and for \$5,700 we will also install a brand new set of batteries.

J - M a t e f o l l o w s y o u >

Zebra

Zebra is a pattern of black and white rings around the pole. Zebra can be searched only by optical search.

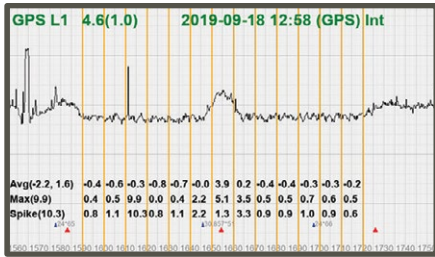


We added the “Aim” option for stake-out.

In this mode J-Mate points to the selected stake point and you follow the laser to reach the intended point. This is in addition to the robotic mode which J-Mate follows your Zebra pole.

carrying the target

RTK Engines



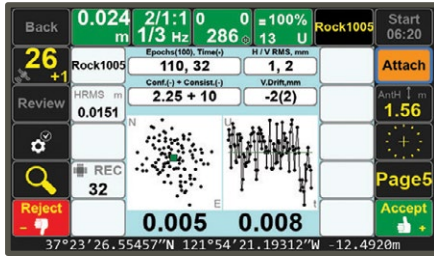
30 MHz-wide spectrum of the signal.

SAT	EL	SRG	SS	MR	C1	SS	MAX	C1	SV	Spec	noise	stat
GPS1 07	15	0A	36.7	4.5	16	34.5	25.5	12	77	--	-0.4	8%
GPS10 15	0A	29.9	4.5	3	3.5	25.5	0	79	36	-0.4	8%	
GPS11 55	0A	30.5	4.5	16	13.1	25.5	2	4	--	-0.4	8%	
GPS14 68	0A	36.2	4.5	16	12.2	25.5	2	4	--	-0.4	8%	
GPS17 17	0A	6.4	4.5	9	2.7	25.5	0	4	--	-0.4	8%	
GPS18 68	0A	31.8	4.5	16	15.8	25.5	2	4	--	-0.4	8%	
GPS22 52	0A	34.3	4.5	16	13.6	25.5	2	4	--	-0.4	8%	
GPS3 25	0A	13.0	4.5	9	2.3	25.5	0	78	43	-0.4	8%	
GPS31 20	0A	8.9	4.5	9	3.2	25.5	0	56	--	-0.4	8%	
GPS32 52	0A	38.6	4.5	16	18.6	25.5	2	77	--	-0.4	8%	
GPS8 14	0A	34.1	4.5	3	5.6	25.5	2	71	--	-0.4	8%	

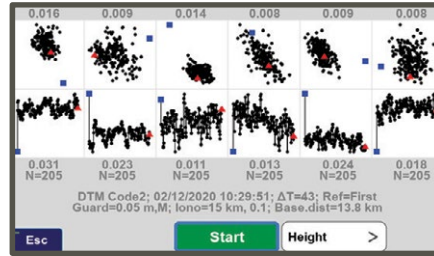
Two-peak information and spoofer.

GPS	CA	0%	P1	0%	P2	0%	C2	0%	L5	14%	1C	
7	7	0	7	0	7	0	4	0	2	0	--	
GLONASS	C1	0% <td>P1</td> <td>0% <td>P2</td> <td>0% <td>C2</td> <td>0% <td>L3</td> <td>65%</td> <td></td> <td>N/A</td> </td></td></td>	P1	0% <td>P2</td> <td>0% <td>C2</td> <td>0% <td>L3</td> <td>65%</td> <td></td> <td>N/A</td> </td></td>	P2	0% <td>C2</td> <td>0% <td>L3</td> <td>65%</td> <td></td> <td>N/A</td> </td>	C2	0% <td>L3</td> <td>65%</td> <td></td> <td>N/A</td>	L3	65%		N/A
5	5	0	5	0	5	0	5	0	1	0		N/A
Galileo	E1	0% <td>E5</td> <td>15B</td> <td>4% <td>E6</td> <td>--</td> <td>SA</td> <td>12%</td> <td></td> <td></td> <td>N/A</td> </td>	E5	15B	4% <td>E6</td> <td>--</td> <td>SA</td> <td>12%</td> <td></td> <td></td> <td>N/A</td>	E6	--	SA	12%			N/A
6	6	0	6	0	6	0	--	6	0			N/A
BeiDou	B1	0% <td>B2</td> <td>0% <td>BB</td> <td>0% <td>B3</td> <td>BA</td> <td>12%</td> <td>1C</td> <td>4%</td> <td></td> </td></td>	B2	0% <td>BB</td> <td>0% <td>B3</td> <td>BA</td> <td>12%</td> <td>1C</td> <td>4%</td> <td></td> </td>	BB	0% <td>B3</td> <td>BA</td> <td>12%</td> <td>1C</td> <td>4%</td> <td></td>	B3	BA	12%	1C	4%	
5	5	0	4	0	5	0	--	4	0	4	0	

Noise and spoofed signals.



Status of RTK survey collection.



Horizontal and vertical result of each engine.

New feature

There are three types of RTK engines:

- 1) 6 engine GPS + GLONASS;
- 2) 6-engine multi constellation, and
- 3) 2-engine multi constellation.

The engine selection button is on the bottom of the “engine view” screens. Changing the engine type takes about one minute for the TRIUMPH-LS to reboot.

“Auto Setup Engines” button selects signals for each engine automatically. You can click and hold on each engine to assign signals manually. The number assigned to each signal is the “Figure of Merit” of that signal according to the number and strength. “0” is perfect. “10” is very bad.

“GDOP” of used satellites are shown below each engine. “GNSS Status” button shows the Figure of Merit number for each signal. Click on any signal number to get details. The lower the number, the better the signal.



TRIUMPH-3

The new TRIUMPH-3 receiver inherits the best features of our famous TRIUMPH-1M.

Based on our new third generation TRIUMPH chip enclosed in a rugged magnesium alloy housing.



The TRIUMPH-3 receiver can operate as a portable base station for Real-time Kinematic (RTK) applications or as a receiver for post-processing, and as a scientific station collecting information for individual studies, such as ionosphere monitoring and the like.

It includes options for all of the software and hardware features required to perform a wide variety of tasks.

- UHF or Spread Spectrum Radio
- 4G/LTE module
- Wi-Fi 5 GHz and 2.4 GHz (802.11 a, b, g, n, d, e, i)
- Dual-mode Bluetooth and Bluetooth LE
- Full-duplex 10BASE-T/100Base-TX Ethernet port
- High Speed USB 2.0 Host (480 Mbps)
- High Speed USB 2.0 Device (480 Mbps)
- High Capacity microSD Card (microSDHC) up to 128GB Class 10;
- “Lift & Tilt”
- J-Mobile interface



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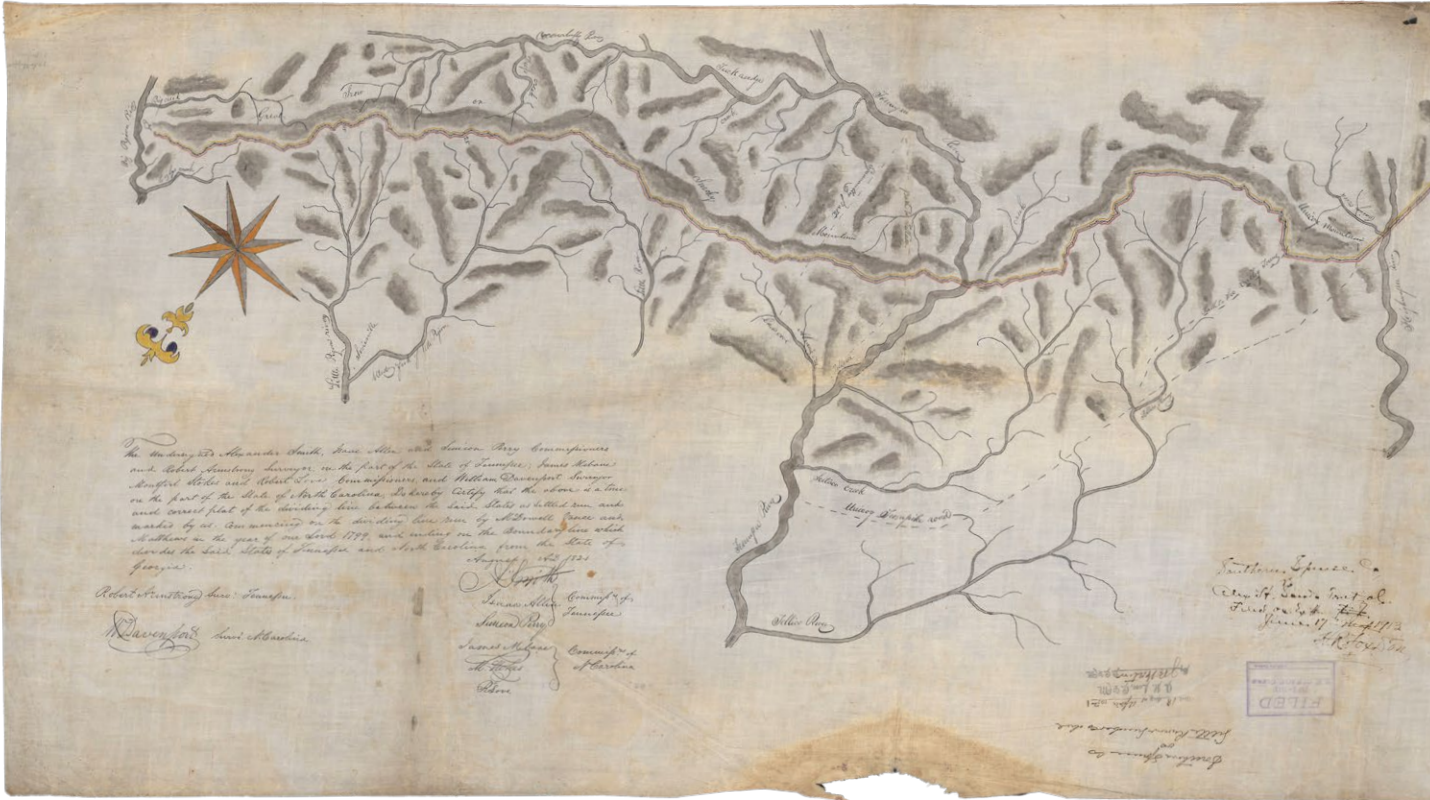
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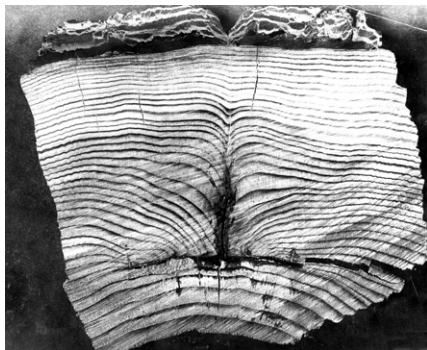
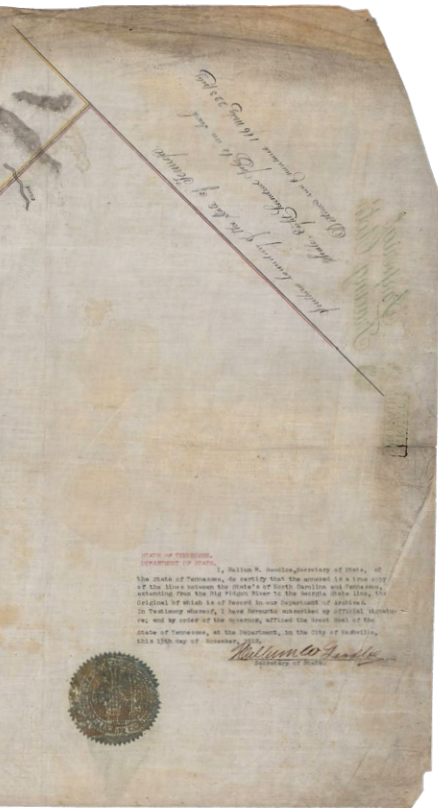
The Tennessee-North Carolina Line

For about 100 miles the Appalachian Trail (AT) runs along the border between Tennessee and North Carolina. The last shelter in the Great Smoky Mountains National Park is nicknamed “The Smokies Sheraton”, but its official name is the Davenport Gap Shelter. Not many hikers know the real name or the history behind it—they just want a roof over their head and a place to dry out their gear. The history here though is immense and just a few miles down the trail the state line was so disputed it ended up in

Above: Boundary between North Carolina and Tennessee
1912 Imperial Tracing Cloth copy of the original 1821
Davenport Survey

COURTESY OF THE DIGITAL LIBRARY OF TENNESSEE

» JOSEPH D. FENICLE, PS



Left: Section of fir witness tree, showing annual growth. Idaho and Washington Boundary Retracement. 1909.

COURTESY OF USGS DENVER PHOTOGRAPHIC COLLECTION

Below: Section of fir witness tree, showing annual growth. Idaho and Washington Boundary Retracement. 1909.

COURTESY OF USGS DENVER PHOTOGRAPHIC COLLECTION



the Supreme Court. Before the highest court got involved, though, the Attorney General from North Carolina called upon the United States Geological Survey (USGS) to give an opinion on the location. The USGS appointed the State Line Boundary Retracement Specialist, Samuel Stinson Gannett, to retrace the 1821 William Davenport Survey demarking the State Line between Tennessee and North Carolina.

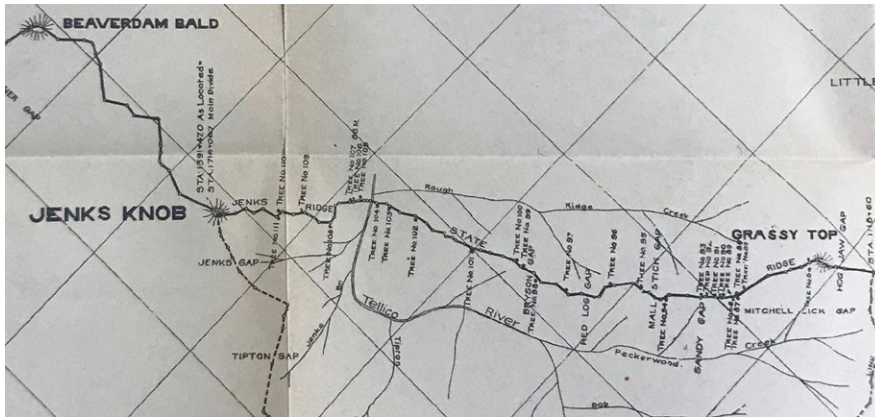
North Carolina became the 12th State on November 21, 1789. At this time it ceded part of its Western claim to the Federal Government for the expansion of new states. The Territory of Tennessee claimed this land and they eventually became the 16th State on June 1st, 1796. The Act of Cession between North Carolina and the United States described the dividing line as “..thence along

the extreme height of the said mountain (Great Iron or Smoky Mountain), to the place where it is called Unicoy or Unaka Mountain, between the Indian towns of Cowee and Old Chota; thence along the main ridge of the said mountain, to the southern boundary of the said state”¹. When Tennessee came about they clearly used the same language. In their constitution they define the state line as “..thence along the extreme height of the said mountain (Great Iron or Smoky Mountain), to the place where it is called Unicoi or Unaka Mountain, between the Indian towns of Cowee and Old Chota; thence along the main ridge of the said

¹ https://www.constitution.org/uslaw/acceptance_cession_north_carolina_western_territory_1790.html

mountain, to the southern boundary of the said state, as described in the act of cession of North Carolina to the United States of America”². Right away both states agreed to have commissioners survey the agreed upon line, but only North Carolina actually acted upon it. In 1799 commissioners Joseph McDowell, David Vance and Mussendine Matthews surveyed (most) of the line with their crew. The main surveyors were Robert Henry and John Strother with a crew of six chainmen amongst others. This surveyed line was agreed upon by both States and not questioned until 1819 when the Treaty of the Cherokee was signed on February 27, 1819. It then became necessary to complete

² <http://www.capitol.tn.gov/about/docs/tn-constitution.pdf>



Map of Transit Survey [By Gannett] of a Section of the State Line between Tennessee & North Carolina
 COURTESY OF REFERENCE LIBRARIAN REBECCA BRYAN AT THE UNIVERSITY OF TENNESSEE JOEL A. KATZ LAW LIBRARY

the line that was never quite finished in 1799. This time both states came to the table with commissioners. North Carolina was represented by James Mebane, Montford Stokes & Robert Love. Tennessee was represented by Alexander Smith, Isaac Allen & Simeon Perry. The surveyor in charge was William Davenport. The 1799 crew stopped about two and a half miles southwest of the Cattaloochee Turnpike. Davenport and crew started their survey at a “rock” at the Cattaucha Track, being one and the same as the Cattaloochee Turnpike, known today as Mt. Sterling Road in Haywood County, North Carolina—most likely a stone set from the 1799 crew. For hikers on the AT this is fittingly called Davenport Gap. They marked this rock “N.C. 1821” and “T.E.N. 1821”. They then ran “...with the line the J M Dowel M. Matthews & D. Vance run in the year 1799...” for the next two and a half miles³. Davenport’s notes were meticulous—that is once they were found. On November 10th, 1910 the great-grandson of Davenport found a secret drawer in a sideboard cabinet. Inside the secret drawer was the only known copy of the field

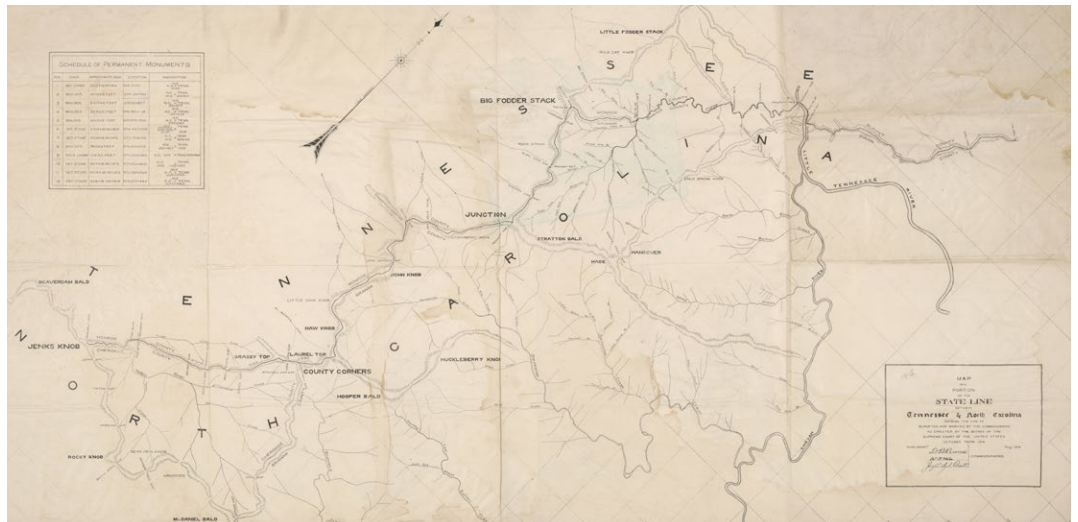
notes of Davenport’s 1821 Survey. The book was six and a half inches by four inches and stitched together with coarse thread. The front and back were covered with heavy brown paper and was noted to be “...in a perfect state of preservation”. This find would end up being a game changer for the dispute that would erupt later on in 1910. The only known, original, map of this expedition has also disappeared, but was luckily meticulously hand traced on Imperial Tracing Cloth to the finest detail prior to being lost.

Davenport and crew surveyed the common State Line starting on July 19th and hit the Georgia line, and the end of their survey, at the end of August. On, or around,

August 16th, 1821 Davenport and crew stopped and took in the view atop Gregory Bald—marking the 57th mile. They continued on crossing the Little Tennessee River and this is where the controversy later began between Tennessee and North Carolina starting with the overlap of dispensed lands by both States. This controversy was very likely caused by an error of the famous Swiss Geographer Arnold Guyot. During the summers of 1859 and 1860 Guyot “...engaged in the monumental task of charting the topography of the entire Appalachian chain”⁴. The University of Princeton Professor literally climbed each peak and measured the altitude with a barometer, carefully checking the air pressure at dawn and dusk for the most accurate results.

After his survey, Guyot’s nephew produced a map of his findings and ultimately showed that he drew a portion of the State Line in a position different than that of Davenport in 1821. To complicate matters, the U.S. Coast Survey published his findings in a map compiled by W.L. Nicholson and A. Lindenkohl, appropriately nicknamed the Lindenkohl Map of 1865. In 1892 things boiled over and the first suit was filed. The main argument in the case was what defined the “main ridge” and the “extreme height” as

4 Great Smoky Mountains Colloquy, Spring 2010, Volume 11, Number 1, Page 1.



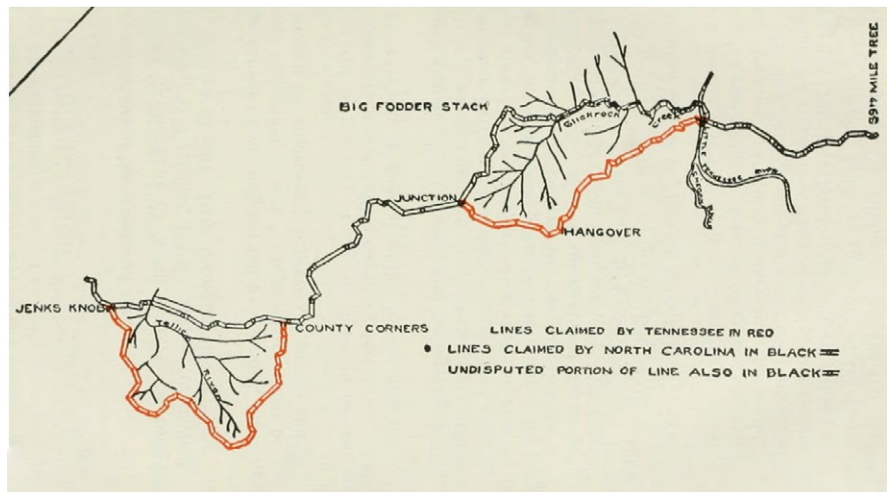
Map of a portion of the state line between Tennessee & North Carolina showing the line as surveyed and marked by the commissioners as directed by the decree of the Supreme Court of the United States, October term, 1914

COURTESY OF NORTH CAROLINA MAPS/STATE LIBRARY OF NORTH CAROLINA

3 <https://wcdigitalcollection.contentdm.oclc.org/digital/collection/p16232coll8/id/687>

stated in the Act of Cession between North Carolina and the United States. Arguments continued over the years as to the location of two main sections of the State Line, the Slick Rock Section between the Little Tennessee River, through Big Fodder Stack, and Junction and the Tellico River Section between County Corners and Jenks Knob.

It was in April of 1910 that Gannett got involved and started with his fieldwork—at the request of the North Carolina Attorney General. This was not the first time in the Smokies for Gannett as early in his career he did triangulation work under Professor Washington C. Kerr starting in 1883. This work was done under the 2nd director of the USGS, John Wesley Powell and Chief Geographer and Samuel's older cousin Henry Gannett. Along with D.B. Burns and other crew members, Gannett retraced the line as surveyed by William Davenport in 1821 and ultimately agreed upon by both States. He was able to prove the true location of the Davenport Survey by finding line trees hacked upon by the crew in 1821. Without a doubt he was on the same line as Davenport. In 1821 Davenport marked a Holly Tree at the 86th Mile. In April of 1910 Gannett found "...a holly 16 inches in diameter, decayed on south side, two hacks and blaze on north side; marked on west "86 M"; the holly is 8 feet north of decayed hemlock, 38 inches in diameter; side line tree". The holly was stationed at 1332+07 and identified as Tree 107 in the 1910 Survey, and lies about 800 feet southwest of the crossing of the Tellico River. Gannett and Burns blocked a tree around the 101st mile and counted the rings exactly at 88. Between County Corners and Jenks Knob alone Gannett found and identified twenty trees that were marked in the survey of 1821 and between Big Fodder Stack and Junction he found over two dozen additional marked trees. In total Gannett found and identified 47 marked trees from the survey of 1821 between the Little Tennessee River and Junction. There was no question whatsoever that the line they were retracing was the 1821 Davenport Survey. They then continued on the line past the end of the disputed section(s) and surveyed and proved the Davenport line all the way past the Little Tennessee River to the 59th Mile—almost to Gregory Bald. The 59th Mile tree was a 36 inch Mountain Oak with "59"



A Map Showing the Disputed Sections between North Carolina and Tennessee

carved into it with numbers being 12 inches tall. Davenport called this a Red Oak in his notes. Gannett used the same methods, and instruments, as he did on the 1908 survey between Idaho and Washington when he retraced the 1873 Rollin Reeves GLO Survey.

The actual survey of the disputed sections for the Supreme Court wasn't accomplished until August of 1915. This survey was ordered by a decree issued in the October Term of 1914. The commissioners for this survey were D.B. Burns, W.D. Hale and Joseph Hyde Pratt. Burns was alongside Gannett in 1910 and very familiar with the State Line already. Pratt had a most distinguished background. During his career Pratt was a professor at both Yale and Harvard as well as being the State Mineralogist and Geologist for North Carolina. He also worked for the USGS as a field geologist and was the author or multiple books and hundreds of papers. The survey work started where Gannett ended—the 59th Mile Tree from the 1821 Survey. It was now identified as Tree No. 1 and was a towering Red (Mountain) Oak marked on the Southeast Side "59 M". The crew surveyed Southwest setting stakes and marked stones like Monument No. 6. It was a "...Stone 5 inches thick, 14 inches wide and 18 inches high, and on it we cut on the southeast side N.C., 427+25.0, D.B.B., W.D.H., J.H.P., on the northwest side TENN., 1915, and an X in the top". Again the 86 Mile holly tree was passed after setting a marked Stone, identified as Monument No. 11, at

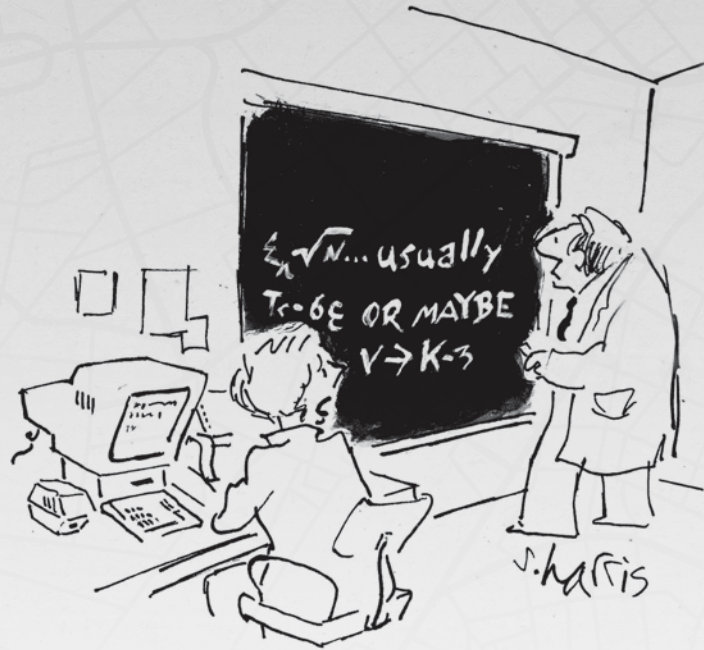
Station 1210+69 on the Northeast Side of the Tellico River. Their survey ended at Jenks Knob and according to their final report "...at the end of the contention in this cause"⁵.

The survey by the commissioners matched that of Gannett almost exactly as it also matched the 1799 and 1821 Surveys. The Supreme Court ordered "...that the real, certain, and true boundary line between the States of North Carolina and Tennessee between said certain points is as delineated in the said report and on the map..."

Gannett was called to testify as to his 1910 Survey in front of the Supreme Court and his knowledge and experience no doubt made the 1915 survey much easier. Gannett couldn't be at two places at once though as he inevitably would have been called to do this survey. He was however on a different survey at that time, my favorite survey, the one between the States of Ohio and Michigan. ■

Joseph D. Fenicle, PS is the Chief Surveyor at the Office of the Fulton County Engineer in Wauseon, Ohio. Joe also owns Angular By Nature, LLC a company specializing in Continuing Professional Development for Surveyors and Engineers as well as offering Land Surveying Services across Ohio and Michigan. He is also an adjunct surveying instructor at the University of Toledo. Joe lives outside of Sand Creek, Michigan on his own active farm with his wife and three young boys.

⁵ United States Reports, Volume 240, Cases Adjudged in the Supreme Court at October Term, 1915. Charles Henry Butler. The Banks Publishing Company, New York, 1916.



"FACE IT — ANECDOTAL EVIDENCE JUST DOESN'T CARRY ANY WEIGHT IN MATH."

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What is the Function of the Land Boundary Surveyor?

Mathematician or Discoverer of Evidence?

In answering these questions, we first dispense with the subject of the proper subdivision method of a Township, a task essentially completed in the Lower 48 States by the 1940s (page 12 of *Surveying our Public Lands*, a BLM 1980 publication). Equally, the first staking of a platted subdivision lacks ambiguity and controversy and can be dismissed from this discussion for this reason. Yet, in the view of the public, in the eyes of the court, and especially within our profession, the “Proper Function of the Land Boundary Surveyor” remains a great controversy. Just where does a missing property corner of record belong?

The land survey profession is not in control of itself

Much of the controversy is because the Land Boundary Survey profession is not in control of itself. On the National and State level, nearly without exception, we are controlled by engineers and quasi-engineers who head our societies, administrative boards, and schools of surveying. Engineers are men and women who live in a world of mathematical exactitudes, where every problem within their realm is expected to have a sole and accurate solution. Such an attitude is not compatible with retracement surveys.

» CHAD & LINDA ERICKSON



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KEYNOTE

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MICHAEL ZANETTI
PLANETARY SCIENTIST, NASA



ALIGNING PROJECT SPECIFICATIONS WITH LIDAR AND UAS TECHNOLOGIES

QASSIM ABDULLAH
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Lost for 60 years. Misplaced 20 feet by math. Linda, "Maybe its over here."



Linda, "Here's Another One."



Engineers live in a world of exactitudes... an attitude incompatible with retracement surveys

Next, we should exclude from this discussion those in the Public Land Survey States who claim that they are now surveying in a virgin section, one that was never surveyed before, and foolishly tell their clients such. Federal Lands were supposed to be surveyed before segregation into private ownership. Thus, in the realm of private land in the PLS states, there is no justification in presuming that a section is unsurveyed. Nearly the same can be said of the subdivision of sections. Just as the GLO performed a million± miles of section line surveys, local surveyors, often in the form of Land Locators, performed the same number of miles in subdividing those sections into 160 acre aliquot parts.

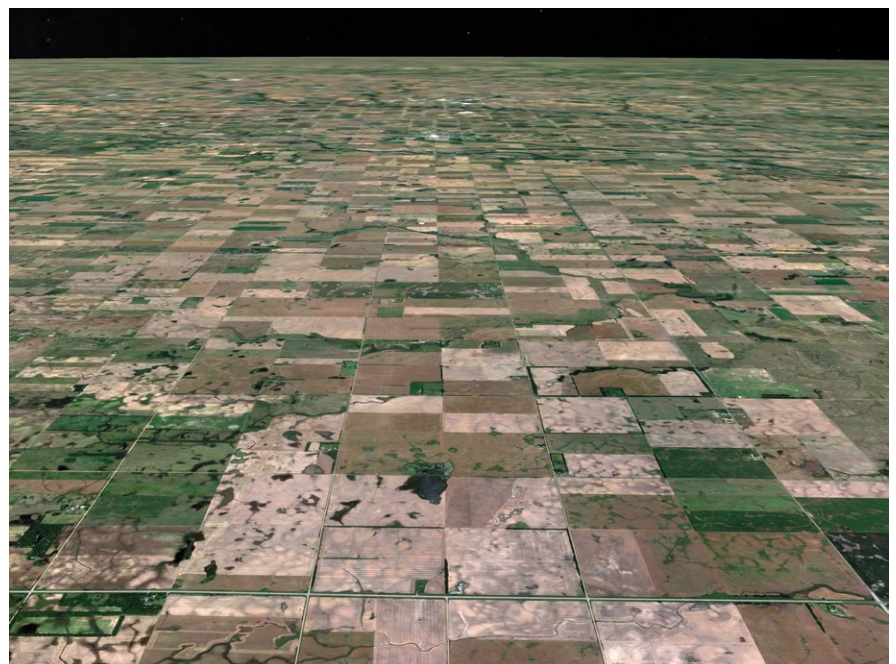
The GLO and BLM Township survey design was simple but exact, was surveyed by sworn officers and nitpicked by the review sections. Thus in prairie conditions, we should be able to view waves of perfect one mile squares perspecting into the distance, like the Google pro image to the right.

However, on closer examination, GLO and BLM surveys actually look like an extract from page 12 of the 1914 treatise by Robert Harvey, titled: *Circular of Instructions to the*

County Surveyors of Nebraska (<https://sso.nebraska.gov/pdf/harvey1914.pdf>). Such Shortcut Methods as seen on the next page were sanctioned on page 33, Article X, Sec. 8 of the 1881 GLO Manual of Surveying, and such deviations were not to be noted in the Field Notes. This is also found in the Manuals of 1890, 1894 and 1902.

Shortcuts sans Field Notes Were Sanctioned in GLO Manuals

Or, in the words of Abraham Lincoln: "Nearly, perhaps quite, all the original surveys are to some extent erroneous, and in some of the sections, quite so. (...The) error is infinitely various". (From page 6 of *The Early Surveyors and Surveying in Illinois* by Z.A. Enos, 1891.) Added to the weakness of such organic error is the general lack of



Google Earth Pro, 6-27-2019, Ten Miles west of Hutchinson, Kansas

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31	32	33	34	35	36

🎵 *There was a crooked surveyor,
 and he had a crooked smile,
 He set a crooked township,
 with a hundred crooked miles.
 He worked for a Surveyor General,
 Who wore a crooked hat
 Wrote crooked field notes,
 With a crooked little plat.* 🎵

Page 14 of Circular of Instructions to the County Surveyors of Nebraska. The shotcuts here represent a savings per township of 35 miles, or 35%. There were few if any check-ins and thus little quality control.

permanent markers, so much so that Land Locators and homesteaders often could not find the corners a mere few years after they were set. Such markers were often wooden stakes which the prairie cowboy later used to heat his coffee. Pages 34-37 of the 1894 GLO manual permits the marks required on stone monuments to be placed, instead of on the stone, on a wooden stake in the southeast pit, with no mention of such a swap was to be made in the notes. Even when the marks were on the section corner stones, such marks can be indistinguishable from marks made by cultivator discs.

The photo to the left, showing markings on a stone is the first photo of the stone that was the central issue in the recent Idaho Supreme Court Case of Erickson v. Idaho Board of Licensure (<https://law.justia.com/cases/idaho/supreme-court-civil/2019/45205.html>). This stone was presented by another surveyor to be the original SW corner of the subject Section 24, even though a 1915 deed shows it to be 272 feet out of position. Notice the faint lead-in and following marks on the lower notch, as though they were made by a cultivator disc, and this stone was found in an area with 90 years of cultivation history.

Such weaknesses in the GLO's design for its monuments are a continuing bane in the United States. In contrast, 27 years earlier than in the U.S., in 1883 Canada required its sectional surveys to be monumented with iron posts. The short-sightedness and misfeasance of the GLO/BLM survey sections are still negatively affecting private ownership rights, especially when com-



This stone was the central issue in Erickson v. Idaho Board of Licensure.

bined with undue adherence to what were intentionally farcical Field Notes.

Some would suppose that platted subdivisions are more reliable. Not so, neither in freedom from errors nor permanency of marks. In the MODERN subdivisions of Arizona and Idaho, only 20% of the property corner monuments are visible. The old plats predating the recordation laws are even more horrendous on these points. One old subdivision plat in Clearwater County, Idaho, only shows eight monuments on the plat and half the bearings and distances were never given!

It is common, common we say, for surveyors to replace “missing” monuments where the record math would place them, rather than analyzing the record and digging for evidence. Which isn’t surprising since our colleagues are taught in class and manuals, to be good little mathematicians. However, that is not the precedence of the courts.

Even BLM’s 2009 Survey Manual, that is reputed to give more weight to evidence, is actually more dismissive of evidence in many instances. In their rush to be the nation’s Cadastre, §5.5 of the 2009 BLM Manual sets forth that all private surveys are purported surveys. In Case No. 2008-271 the IBLA ruled that purported surveys are not evidence. This dismissal of good evidence can be further seen at the BLM 2009 Survey Manual §3.137; 3.217; 5.36; 5.49; 5.50-75 & 6.69-77; 5.77; 6.5; 6.11; 6.13(3); 6.16-20; 36, 41-46; 49, 53, 54; 10.23 & 7.3.

The BLM Cadastral Survey Section, in dismissing evidence, is in serious error, as are any private surveyors who follow BLM’s lead. This is shown in the number of court cases BLM is losing. This is the most important lesson of Dykes v. Arnold: “follow the BLM Manual in dismissing evidence and you will lose in court”.

Follow the BLM Manual and You Will Lose in Court

To follow the bearings and distances of the Field Notes or plats, in disregard to available evidence of the original location, can bring into legal dispute every property line in the involved sections or subdivisions. The courts frown on such behavior. However, it

is much, much cheaper to proportion than it is to dig for evidence; so, proportioning is the preferred route of many surveyors. When proportioning is inappropriately used someone loses and someone gains. And some clients will seek out the surveyor whose methods give them the most advantage. Indeed, some surveyors will do what the client tells them to do. Where does professionalism end and larceny begin? And is the moldable surveyor an accessory to this larceny?

To recap, it is the duty of a bona fide Land Boundary Surveyor to:

1. Research and search for the original monuments and accessories.
2. When the monuments are not discernible, to research, survey and look (dig) for evidence.
3. Where possible, respect use lines.
4. Keep in mind that though he is a quasi-officer of the court, all parties are free to challenge a surveyor’s decisions in court.

Much has been written on this subject by surveyors who are more capable than we, but it is hoped that other surveyors, who would make a buck by expeditiously ignoring evidence, would learn from this missive. But, until they get gut-hooked in court, it is not likely.

In case you haven’t noticed by now, this article is a rewrite, or paraphrase, of Justice Cooley’s 1876 essay, “The Judicial Functions of Surveyors”, including the phrase “it is not likely”. <https://onlinelibrary.wiley.com/doi/pdf/10.1002/9780470950050.app3>

Note from the authors: The *American Surveyor* articles we have written were often critical of the BLM, NSPS, NCEES and State Boards. In apparent response, in 2014 a national cabal conspired to silence us via administrative board discipline actions. On October 28, 2019 the Idaho Supreme Court, in *Erickson v. Idaho Board of Licensure* ruled that the Board’s actions were illegal. Yet, an NSPS speaker is now announcing that “...in the Gem State, another surveyor successfully escaped the consequences of



BY JAN PIETRUSZKA / PIXTA

some highly problematic survey decisions... because (the Board) had neglected to take action against him with sufficient promptness”. The speaker is ill-informed on the nature of Court civil rulings. We appealed to the Supreme Court on 36 points yet, in a normal action, the court ruled on only one point. It is juvenile on the speaker’s part to believe that the court would have ruled favorably on a vague timeliness statute if there was not merit to most, if not all, of the other 35 points. However, the Supreme Court didn’t just acquit, they unanimously found in our favor at both the original and substituted opinion. In fact, at the top of page 9 of its Substituted Opinion, the Court slammed the Board for its frivolous petition for a re-hearing. There is nothing quite like being shot at and seeing the gun blow up in the shooter’s face, twice. ■

Chad Erickson has been licensed as a PLS in multiple states since 1985 and he and his wife Linda have been published in *The American Surveyor* 17 times.

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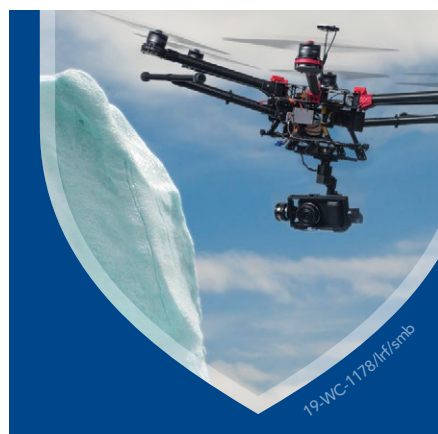
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The Loss of a Quiet Hero

Two weeks before Thanksgiving brought sad news of the loss of two great people. One is well known through his national prominence in the Surveyors Historical Society and the Maryland Society of Surveyors. Chas Langelan brought great warmth and his love of our profession to everything he did, and his sudden heart failure was a shock to me. I will continue to miss him for quite a while.

But it is the other person now missing from my life, a quiet hero of surveying and a good friend, who I will miss more. After a number of years of declining health and a recent worsening, Thomas McGrath decided to turn down life support, knowing that his heart would completely fail within some unknown number of hours and his death would be hastened—but under his own terms. He always questioned deeply, considered clearly, and decided firmly.

Within the realm of surveying in New Jersey, Thomas' influences on a generation of upcoming surveyors and on those who were of his own era were worthy of the highest accolades. Yet the 1989 award as NJSPLS Surveyor of the Year and 1999 award for Lifetime Achievement barely touch the depth of his devotion to the profession.

I met Thomas about 35 years ago, a few years after I became active in NJSPLS, captivated by and swept up into the many shared interests of its members to improve our profession. Meeting one person led to meeting another and another and another, until eventually I somehow met Thomas while he was teaching surveying classes at Middlesex County College. His devotion to teaching and learning became immediately obvious, and formed one of the strong ties between us for the next decades.

The New Jersey State Board had just passed regulations phasing in requirements for a four year degree in surveying as prerequisite to sitting for the licensure examination. At about the same time, the single educational institution in the state offering such a curriculum abruptly decided to terminate its program. During a highly charged meeting, university higher ups told members of NJSPLS that it would restart the degree program if NJSPLS put it together, apparently expecting us to fail in the process of compiling first a list of course

“He always questioned deeply, considered clearly, and decided firmly.”

credits and then syllabi for all the courses to comprise such a program that would be accredited by ABET.

It was Thomas who stepped to the forefront, and with his experience in fulfilling similar assignments, convened a number of meetings to decide the all-important question of what it takes to be a well-educated and well-rounded surveyor. In those days before email, we used physical meetings and phone calls and snail mail correspondence to argue the balance between technical background and legal background, and how the humanities fit into the scheme of things. Under Thomas' guidance and energy, we researched programs at other colleges and universities, wrote a program with course outlines and syllabi, and forced the university's hand to re-introduce—and re-invigorate—its surveying program.

That vast investment of heartfelt energies began a long friendship. With two other surveyors who had worked on the survey

program, and another who was equally invested in learning, we began meeting at the State law library one Saturday morning every month to look through the statutes and case law affecting surveying. I don't remember exactly how that all started, but perhaps it was because I had taught myself how to do legal research when studying for my first licensing exam and couldn't believe that all the laws and regulations I had to know were included on the single double-sided page the State Board had sent me. I honed our group's researching skills.

We pulled books from the shelves either to search for specific laws or to see if there were any new cases that might be of interest to us. In the process, we decided there was much more applicable to the surveying profession than the few titles most commonly referenced, and started compiling lists of statutes relating to pierheads and bulkheads, wetlands, adverse possession, fences, forms of conveyancing, validity of contracts, and on and on and on.

We would gather around a table and discuss what we had found, then go out for lunch and continue to talk well into dessert, with Thomas often playing Devil's Advocate. Sometimes others would join us for a meeting or two, but we core members came through that pastime with a joy of discovery and debate.

Thomas' generosity of spirit and sense of mission propelled him to offer my chapter of NJSPLS two days of his time to help us pay an insurmountable legal tab from a case we

“His devotion to teaching and learning became immediately obvious...”

had won against our insurance company for event coverage for our annual picnic. Our attorney had reassured us at the start of the suit that fees would not be a problem, and we could work things out later. At the suit's successful conclusion, in which we won the coverage but not reimbursement of our legal fees (this was a contract dispute and not a

tort action), it turned out that the accommodation would be an extension of time over which the five digit fee would have to be paid, not a reduction in fee despite this law firm representing the state surveying society and all of its chapters, one of which I was then president of. Thomas presented two full-day workshops for us, filling the room with several hundred surveyors each time, and we paid off the bill immediately afterwards, with enough left over to return donations from other chapters that had stepped up to save us from sure demise under a burden that could have been any of theirs as well.

Terrible weather meant I could not get to Thomas' viewing and funeral more than two hours away. I try to console myself by thinking of the twinkle in his

eyes as they suddenly crinkled with a sly smile or full laugh, his rich Shakespearian voice, complete with dramatic pauses, how we used to talk about gardening (his love of roses and my refusal to grow any after being traumatized by Japanese beetles and thorns), and solemn musings about our profession. Most of all, I wish more people knew the quiet hero that Thomas McGrath was. ■

Wendy Lathrop is licensed as a Professional Land Surveyor in NJ, PA, DE, and MD, and has been involved since 1974 in surveying projects ranging from construction to boundary to environmental land use disputes. She is a Professional Planner in NJ, and a Certified Floodplain Manager through ASFPM.

DAVE LINDELL / PS



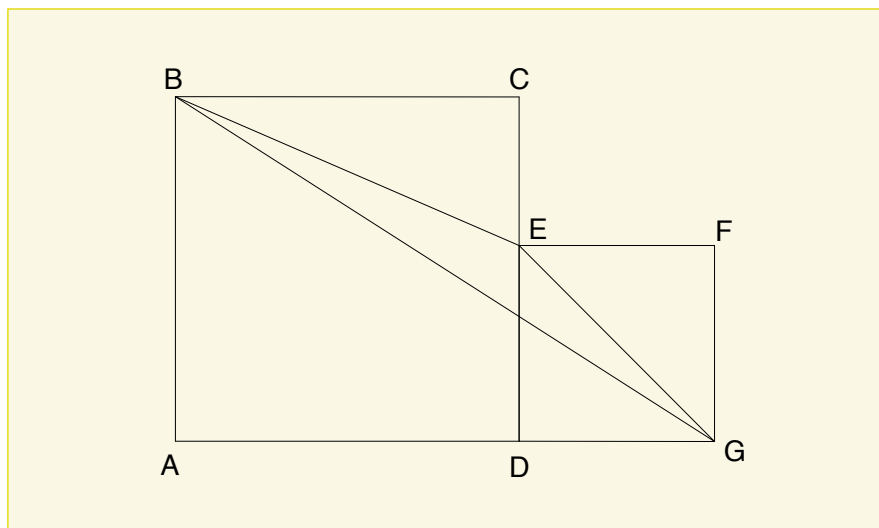
test yourself

Th-th-that's all folks

Two square parcels, ABCD and DEFG, abut along line DEC. Side EF is 1389.11', what is the area of triangle EGB? ■

For the solution to this problem (and much more), please visit our website at: www.amerisurv.com. Good luck!

Dave Lindell, PS, retired after 36 1/2 years with the City of Los Angeles. He keeps surveying part time to stay busy and keep out of trouble. Dave can be reached at dllindell@msn.com.



book. review

Putting California on the Map

Von Schmidt's Lines

Land Surveying has a very rich history in these United States of America. Most surveyors point with pride to the men who have come to define and create this country by drawing lines on maps and land. Amongst the most significant of these men, several have had an extraordinary influence on the lands they charted and they include Washington, Lincoln, Banneker, Jefferson, Lewis, and Clark, all of whom come to mind naturally.

In the eastern states where Washington, Lincoln, and others operated, they worked within a system adopted from England, where much of our laws come from. It wasn't until Thomas Jefferson developed the rectangular system before the vast hills, valleys and mountain of America were corralled. Once Jefferson's system was in place, men like Lewis and Clark, and John Fremont, opened the great curtain and gave the country a peek at what lay west. Unlike the eastern parts of the country, rich with water, streams, lakes, and rivers and lush, fertile valleys, the lands west, were anything but bucolic. They were harsh and hostile, barren and tough country filled with angry native Americans, buffalo as far as the eye could see and snakes as thick as a man's leg.

Other than the various manuals, adopted from Jefferson's guidelines, early surveyors had to rely on their wit and wile to create a country and this required men of exceptional intelligence, bravery, and instincts. At the risk of hyperbole, this was not a job for mere mortals. It was a job for extraordinary men; men like Alexey W. von Schmidt, a surveyor and engineer who claimed California as his home from the great gold rush days of 1849 to 1906, the year of the great San Francisco, a disaster that destroyed the city and much of Von Schmidt's work.

Author David Carle, a former California State Park Ranger, has published a very comprehensive book, sure to please historian buffs, land surveyors, and anyone interested in the history of California. Carle's research is impressive and informative and best of all, a pleasure to read, unlike stoic stories that lull the reader to sleep. As Carle points out, with great gusto, Von Schmidt's impact and influence on California are quite remarkable given the magnitude of his efforts along with the size of the state.

In addition to his prowess in surveying, Von Schmidt was an engineer who designed and built some of the state's most impressive utility systems including San Francisco's first long-distance water delivery system. He also developed a system of underwater excavation of a spectacular dry dock for repairing ships. He is akin to today's Elon Musk, an innovator in many areas of science and engineering. Perhaps his greatest accomplishment is establishing the boundary line between California and Arizona, in 1872 and 1873.

On its face, the legislatively-devised line was a simple matter on paper, established at the state's 1850 constitutional convention, setting the line on the 120th meridian, south from the Oregon border, to an intersection with 39 degrees in latitude, placing the corner at the bottom of Lake Tahoe, hardly a station that could ever be occupied. From there, the line continued south to an intersection with 35 degrees north latitude and the sinewy, and ever-moving Colorado River, another angle point that moved on a daily basis.

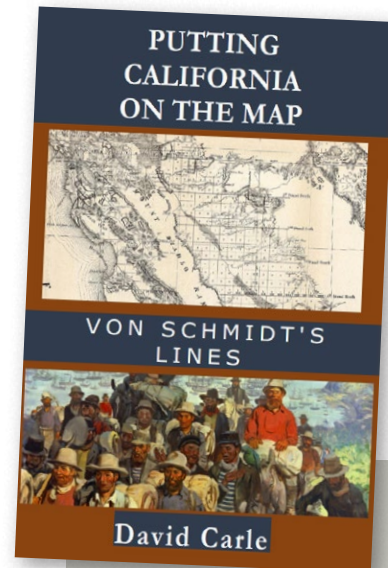
Carle brings to life the incredible challenges Von Schmidt and his crews encountered including bears, hostile

Indians, and adverse weather. He also credits, rightfully so, Von Schmidt's import in the development of California:

The survey lines Alexey W. von Schmidt laid down across much of the state guided the development of homesteads, ranches, and towns. He had the curiosity and energy to go first into unknown places, to lead to others could follow. . . Alexey Waldemar von Schmidt's life's work helped put California on the map."

For anyone interested in learning how a country is built, I recommend David's book. It is a rare treat for all. ■

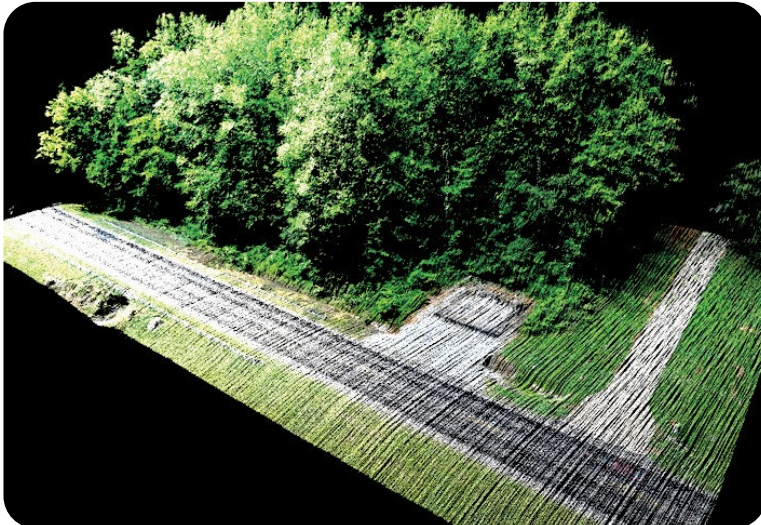
Michael Pallamary, PS, is the author of several books and numerous articles. He is a frequent lecturer at conferences and seminars and he teaches real property to attorneys and other members of the legal profession. He has been in the surveying profession since 1971.



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