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The Journal of
Arizona History

PUBLISHED BY THE ARIZONA HISTORICAL SOCIETY

BRUCE J. DINGES
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Assistant Editor

C. L. SONNICHSEN
Senior Editor

Volume 29, Number 3

Autumn, 1988

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THE INITIAL POINT

Arizona's First Rectangular Land Survey

by
Marion Gray Donaldson

DAWN BROKE CRISP AND CLEAR ON January 19, 1867, in the Salt River Valley of the territory of Arizona. A chill breeze had arisen before sunup, adding a tang to the air. Now it tugged gently but insistently at the four men of the surveying party at work on the summit of the hill. Booted, in rough field clothing, they moved quickly to complete their work and return to the windless flat land and relative warmth below. There, on the east bank of the Gila River, they could see the rest of the survey party as they tended teams and busied themselves with camp chores.

The hill resembled hundreds of others in this southern region of the territory. Conical and scarcely 150 feet tall, loose rock littered its slopes. Sparse vegetation, typical of the Sonoran Desert, grew stubbornly among the rocks. The hill formed part of the Sierra de la Estrella that ranged along a short southern reach of the Salt River Valley. While of those mountains, though, it lay curiously apart, as if during convulsive upthrusts of the earth's crust that created the range, it became a vagrant afterthought.

The men on its summit ignored this geologic singularity. Their interest focused on a human-made structure, a stone monument standing alone and incongruous in contrast to the primal mountains and the valley below. The monument stood massively. Built of the stone lying about the summit and circular

Marion Gray Donaldson is a native of Mesa. His great-grandfather, Francis Martin Pomeroy, was one of the leaders of the company that founded the town in 1878. His grandfather's family, including the author's then-two-year-old mother, were members of the company. Donaldson's long career in education administration has spanned all levels from elementary through university graduate study. He holds a doctorate from the University of Arizona.

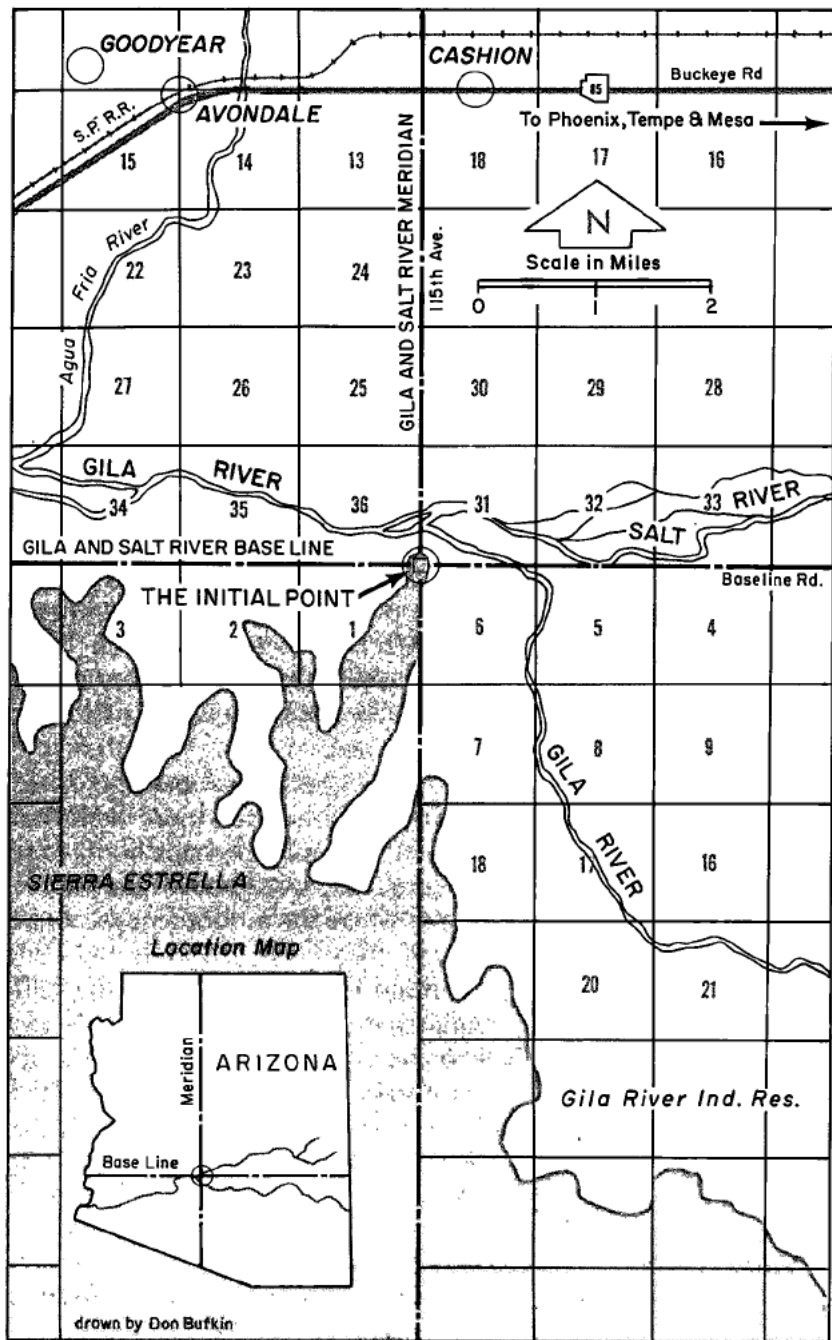
in shape, it sat solidly on its eight-foot-diameter base. From there it tapered upward eight feet to a four-foot diameter at the top. A center wooden pole, six feet higher, pointed defiantly at the sky and bore the marking: "United States and Mexico Boundary Commission, 1851."¹

For another group of surveyors had stood atop the hill, fifteen years earlier in the wake of the Mexican-American War. Article V of the Treaty of Guadalupe Hidalgo established the boundary between the two nations. In what was to become Arizona, the line from east to west ran "down the middle of the Gila River, until it empties into the Colorado." Article V also called for both nations to appoint a commissioner and surveyor to "designate the line with due precision, and to establish upon the ground landmarks which shall show the limits of both republics as described in the present article."²

Both surveying parties adhered to the Land Ordinance of 1785, which governs the survey of public lands to this day. Formulated after the Revolutionary War and before the Constitutional Convention, the ordinance responded to the lack of uniform land laws among the colonies, and to the new federal public domain lands that needed surveying prior to settlement. The Continental Congress's committee, chaired by Thomas Jefferson, decided on a rectangular survey system that called for all public lands in the United States to be divided into six-square-mile townships with lines running due north and south and east and west. The townships were then subdivided into thirty-six sections of one square mile—640 acres—each, with more subdivision as necessary or desired.³

After much argumentation, largely brought on by the faulty Disturnell map accepted in the Treaty of Guadalupe Hidalgo as the basis for determining the boundaries, the 1851 Mexican-American commission began surveying the designated lines. The American contribution presents such an amazing picture of bureaucratic malfunctioning that it is a wonder the project ever reached completion. In addition to many natural obstacles, the survey work involved so many extraneous and unsettling incidents that its story reads like the scenario of a B movie: crews stranded for lack of funds; the deposition of the original commissioner; quartermasters' refusals to provide desperately needed supplies; arguments over

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necessary equipment; a threatened employee strike; questions over who was actually in charge; failure to "go through channels"; a "lost" commissioner; habitual drunkenness and charges of "conduct unbecoming an officer and gentleman"; even the kidnapping of a Mexican girl (presumably beautiful) whom the commissioner restored to her family.⁴

The Arizona portion of the survey finally got underway in late August, 1851, with Andrew B. Gray, United States surveyor, and Lieutenant A. W. Whipple, astronomer and surveyor, as principal participants. In their party were "assistants, sub-assistants, mechanics, and instrument carriers," laborers, teamsters, and a cook. The party began work "at the point where the western boundary line of New Mexico intersects the Gila River to its junction with the Colorado." The men kept careful field notes as mandated by the 1785 ordinance, the Guadalupe Hidalgo treaty, and surveyors' manuals.⁵ The westward-traveling party would have arrived at the confluence of the Gila and Salt rivers in late September or early October, 1851. There the presence of the hill, strikingly apart from the Sierra de la Estrella range and, with high coincidence, at the exact confluence of two major Arizona rivers, would certainly have drawn the surveyors' attention as a site of a major monument. And thus it happened.

Although John R. Bartlett, the U.S. commissioner, is credited with supervising the erection of the monument, it is more likely that either surveyor Gray or Lieutenant Whipple, perhaps both, were present. With laborers and assistants, they would have climbed the butte and designated the exact spot where the monument was to be built.

Now, fifteen years later, William H. Pierce, leader of the 1867 Arizona party, supervised work at the monument. His mission directed him to carry out the first rectangular survey of public lands in Arizona. From the surveying district of New Mexico, Pierce had surveyed in Colorado from 1862 to 1866 and contracted with the district of New Mexico, through its surveyor-general, John A. Clark, "for the survey of certain lands in Arizona for the sum not to exceed seventy-five hundred dollars." The contract date: December 15, 1866.⁶

Pierce began organizing his party and making ready for the trip to Arizona. He first selected his survey crew. The chainmen were

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Andrew Napier, Robert Johnson, Albert Ashlèy, and a fourth man whose first name was William and whose last name, indecipherable in the field notes, seems to be Nunern. The cornermen were Jesse Wiley and George Henderson; the flagman and axeman, Charles H. Gray.⁷

The crew's departure from New Mexico for Arizona created a minor dispute. Joseph E. Wilson, commissioner of the general land office in Washington, admonished General Clark for "dispatching" Pierce to Arizona before he, Wilson, had approved the contract: "I have to remark that the approval of contract should have been first obtained *before dispatching him to the field of his operations.*" The scolding's severity was somewhat softened when Wilson continued, "The irregularity in this instance is waived from the fact of well-known qualifications of Mr. Pierce as a surveyor and his familiarity with the system of the Government surveys executed by him in Colorado Territory."⁸

The crew members arrived in Tucson by January 9, 1867, when they appeared before the clerk of Arizona judicial district number one, John H. Archibald, to take the oath prescribed by the Land Ordinance that they "would well and truly perform" their assigned tasks, "according to instructions given" and to the best of their "skill and ability."⁹

Pierce and his party set out at once to begin the survey. Leaving Tucson with their wagons and teams, they took the Butterfield Overland Stage Road and passed by such landmarks as Point of Mountain (sometimes called Pointer Mountain), Nine Mile Peak, Mud Tanks, Picacho Peak, Blue Water, Oneida, and Sacaton. On probably the fourth day, the party reached Maricopa Wells.¹⁰

The town was an important hub of territorial travel, where east- and west-bound stages met and exchanged passengers before heading back along their routes. To the members of the surveying party, it was a lively and welcome relief from the bleakness of most of its travels. Water from many wells was plentiful and there was ample grass for the teams. For the men, there was undoubtedly opportunity for conviviality. It is possible, too, that here they met with their military escort, most likely soldiers from the Fourteenth Infantry stationed at Camp McDowell.¹¹

At Maricopa Wells, under Pierce's direction, the crew would

have carefully inspected the surveying equipment. Among the most important items were the Burt's solar compass with its tripod, the standard chain, the working chain, and tally pins. The chain was equipment well-suited to its purpose. Invented in the seventeenth century by Edmund Gunter, an English astronomer and sometime surveyor, it was especially designed for rugged field use under all conditions. Of heavy steel wire formed into links 7.92 inches long, with three small rings connecting each link, the overall chain measured precisely sixty-six feet. After continual use, minute wear could occur at the rings, thereby lengthening the chain by a tiny but significant measure. For this reason surveyors checked the working chain against the standard chain before each surveying project. Pierce also tested the solar compass's accuracy by a sighting of the North Star.¹²

With all equipment and supplies on the wagons and the sun not yet up, the party left Maricopa Wells on January 18, 1867. Following the well-traveled Camp McDowell road until it crossed the Gila River, the men went northwest along a lesser-used road that ran along the east bank of the river.¹³ Their destination: the conical hill at the junction of the Gila and Salt rivers.

The next morning, January 19, 1867, Pierce and three of his men crossed back over the Gila in one of the wagons. The river at this point was over 200 feet wide and from three to four feet deep, but it flowed slowly and the men found a ford nearby. Leaving the wagon and team at the base, they topped the hill's summit to begin the work of the survey.

As the work progressed, Pierce shrugged his field coat more tightly about himself in the cold and stepped a few paces northward to the brow of the hill. Just below, at its base, he saw the broad sweep of the two rivers as they came together, their waters doing brief battle before intermingling. Between them, they drained more than two-thirds of the territory's nearly 114,000 square miles.¹⁴

From their point of juncture, the waters moved powerfully westward toward a great bend forty miles distant and then flowed on, unchallenged, to Fort Yuma and union with the Colorado River. There the Colorado flowed, broad and placid, to the Gulf of California, seemingly gratified to be freed from its interminable and sometimes turbulent task of grinding away at the constricted walls of the Grand Canyon.

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Mountains girded the vast alluvial valley that lay before Pierce. It stretched over forty miles to the east and ten to the north before it merged into upward slopes. Now unpeopled flat land, the valley seemed to demand grid lines for townships, ranges, and sections so a populace could someday live here in peaceful settlement. Pierce, of course, could not foresee the extraordinary development that would eventually occur here, but an entry in his field notes showed a small measure of foresight: "Salt River, at this season of the year, is a large stream . . . which renders it especially valuable for irrigation. I consider this valley . . . as containing some of the best agricultural land I have yet seen in the Territory, and would recommend that it be subdivided at an early day."¹⁵

Their general instructions stipulated the selection of an initial point at the monument, and from that point, one base line to run thirty-six miles due east and another line ninety-six miles due north along the meridian intersecting the chosen initial point. Of his first action at the summit, Pierce wrote, "I proceeded to perpetuate this corner (the center of the monument) as follows: I squared the post and marked it as a TP (township) corner."¹⁶ He and his men then set four stones an equal distance (fifty links—thirty-three feet) from the center post of the monument. With meticulous care, Pierce recorded the composition and measurements of each stone: "a granite stone 20 x 12 x 7 inches set NE, a granite stone 19 x 13 x 6 inches set SW." These notes would serve as reference points in case the center post was moved or destroyed.¹⁷

So that the chain might measure sixty-six horizontal feet with accuracy, it must be kept level, calling for extreme care on the part of the chainmen. For the Pierce party, an almost impossible condition confronted it at the very outset. The hill's slopes to the north, south, and west were steep but climbable. Directly to the east, however, an abrupt cliff confronted the party members. But surveyors are resourceful and, in cases such as this, they use a method called triangulation: if they know two angles of a triangle and the length of one side, they can easily calculate the length of the other two sides. So, sighting with the solar compass, Pierce on the summit hand-signaled to Charles Gray, the flagman, on the east bank of the Gila. There Gray fixed the due east point and forced a tally pin into the ground, and the chainmen ran a line from this east point due south, giving the corner a 90-degree angle. The line

measured five chains, or 350 feet in length, with a tally pin set at its end. Pierce sighted from the summit and had the angle at the new point measured. This produced the needed angle sizes, and with the 350-foot side, he quickly calculated the distance from the monument's center post to the first tally pin on the east bank. The cliff that might have been troublesome stood completely ignored.

Pierce and the others on the hill's summit then joined the rest of the party across the Gila and the survey continued eastward from the new point. Following accepted procedure, Pierce designated a "front" and "rear" chainman. The pair used eleven tally pins, one marking the starting point and the other ten carried by the front chainman. As the front chainman marked one chain length from the first tally pin, he used a pin at the exact point. The rear chainman then pulled up the first pin and both chainmen moved forward to measure a chain's length from the new pin. This process was repeated until the front chainman had exhausted his pins and the rear chainman had ten of them attached to his belt. The last pin set by the front chainman then became the new initial pin, meaning the team had measured 660 feet. Pierce duly entered the distance in the field notes with any other significant information.

To ensure they were precisely on a due-east course, Pierce constantly signaled the flagman, who worked ahead of the front chainman, clearing brush and marking the course with flags of cloth or other markers. This process of early-day land survey, a system of careful procedure, then as now urged accuracy in all measurements.¹⁸

The Pierce party worked its way eastward, running a base line that later became the major east-west thoroughfare, Baseline Road. It passed south of what, in another three years, would be the site of Tempe, as Charles Trumbull Hayden, a Tucson merchant, moved into the area to build his flour mill and provide a ferry across the Salt River in flood seasons. Seven miles farther east along the line, the party set monuments marking the corners of Township 1 North, Range 5 East. Section 22 in the township was identified the following year, and in 1878, the Mesa Company selected it as the original square-mile site for what became the vibrant city of Mesa. On the north side of the Salt River, meanwhile, John Y. T. (Yours Truly) Smith and Jack Swilling, early entrepreneurs, began the hay cutting and canal building that led to the official founding of the

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city of Phoenix on March 20, 1870, and brought the need for more surveying.¹⁹

Completing the east thirty-six miles of its contractual obligation, the party returned to the initial point on the hill and repeated the process, surveying north along the line designated the Gila and Salt River Meridian. The northward surveying went on uneventfully to the meridian twenty-four-mile point, completed January 31, 1867.²⁰

The Pierce contract also called for the running of parallels, or correcting lines, forty-two miles west and east from the twenty-four-mile point of the meridian, necessary because of the curvature of the earth. By February 13, 1867, both these lines reached completion but the seventy-two north contractual miles of the meridian remained. As the party began further work northward, an expected Indian uprising forced the withdrawal of the military escort. Fearing for the safety of his party, Pierce asked for and received a release from the remainder of his contract.²¹

He and his men then traveled to Camp McDowell to take the oath, again prescribed by the Land Ordinance, that they had fulfilled the contract as amended. But Pierce recorded in his field notes, "There was no civil officer at Ft. McDowell where the survey party was discharged before whom [an] oath could be taken nor was there such officer nearer than Wickenburg or Tucson 120 miles distant." The party members returned to Santa Fe and appeared before W. W. Griffin, notary public, on March 29, 1867, to swear they had faithfully executed the survey contract, as amended, in accordance with the instructions given.²² Thus ended the first rectangular survey of public lands in Arizona territory.

Additional surveys quickly followed. By February, 1868, the clamor of mining interests and settlers produced more contracts and more surveyors to continue the work of running township, range, and standard (correcting) lines of Arizona's public lands. Such surveying still continues under the Branch of Cadastral Survey, Bureau of Land Management. Located in Phoenix, the office assumes responsibility for boundary surveys of all public lands in Arizona and maintains survey records for public use.

Today, the hill sits lonely and apart. The Gila and Salt River Meridian, running north, has become 115th Avenue, crossing Highway I-10 at a point about five miles west of the city limits of

Phoenix. Back at the base of the hill, effectively blocked, 115th Avenue turns sharply westward to become a continuation of Baseline Road.

Atop the hill's summit, vandalism has erased all signs of the great stone monument so laboriously erected in 1851. In its place a virtually indestructible concrete circular slab, five feet in diameter, lies nearly flush with the rocky ground. Four arms, one-and-a-half feet long, extend from the circle, each oriented toward a cardinal point of the compass. A stainless-steel disk three and one-quarter inches in diameter is embedded in the slab's center. From the minute center of this disk, located where the monument pole once reached upward, begins the measurement of virtually all land within the state of Arizona.²³

Just west of the hill, Phoenix International Raceway operates a center for car testing and racing. On racing days, the hill affords an unparalleled view for those who climb its slopes. The mountains remain as William Pierce saw them more than 121 years ago. But the valley below, pristine on that January day in 1867, represents change and widespread evidence of human activity: farms, paved roads, clustered communities, an occasional aircraft in flight, the tall buildings of downtown Phoenix in the distance. A brownish haze often hangs over all, the unmistakable, intrusive evidence of civilization's mechanization and its love for the internal-combustion engine.

But for those on the hill on major racing days, the center of attraction lies below in the full-throated roar of 750-horsepower Indy cars as they hurtle around the one-mile track. Spectators take little notice of the view, less of the concrete circle, and none of the small disk in its center. Yet the landowners among these racing enthusiasts and all other Arizona citizens who own real property have an inescapable relationship to that disk: its existence and location exactly dictate the description of their real property.

Current Arizona residents should at least grant a measure of recognition and perhaps gratitude to William H. Pierce and his men who, "to the best of their ability," labored at the hill's summit and in the Salt River Valley so long ago. Their efforts, under conditions we of today would shun, provided an orderly and lasting basis for the growth and development of the valley and the entire state.

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NOTES

¹General John A. Clark to Honorable I. M. Edmonds, Commissioner of General Land Office, May 24, 1865. Bureau of Land Management, Santa Fe, New Mexico, copy in author's files. Dr. Victor Westphall of Angel Fire, New Mexico, kindly provided me with this and other material.

²The treaty's full title is "Treaty of Peace, Friendship, Limits, and Settlement with the Republic of Mexico." It appears in *Statutes at Large*, 31 Congress (Boston: Brown, Little and Company, 1851), vol. 9, p. 922.

³Payson Jackson Treat, *The National Land System* (New York: E. B. Treat and Company, 1910), p. 26. The committee submitted its report on May 7, 1784. In addition to suggesting a way to divide the land into states and providing for their governance, the committee under Jefferson—a proponent of the decimal system—suggested that a geographical mile of 6086.4 feet be used for survey purposes, with north-south and east-west lines drawn every tenth mile, thus producing a township of 100 square miles and sections of 850.4 acres rather than the 640 we now know. Treat calls the ordinance "one of the wisest and most influential of all the acts of the Revolutionary period" (p. 40). For more information on the ordinance, see Hildegard Binder Johnson, *Order Upon the Land* (New York: Oxford University Press, 1976).

⁴*Senate Executive Document [SED] 119*, 32 Congress, 1 Session (Serial 626), passim.

⁵John R. Bartlett to Brevet Lieutenant Colonel Craig, in *ibid.* The field notes have not surfaced but we can infer their route of travel from the letters of instruction.

⁶Index of the Territory of Colorado Surveys, Cadastral Survey Office, Denver, Colorado. Thomas Edwin Farish, *History of Arizona*, 8 volumes (San Francisco: The Filmer Brothers Electrotype Company, 1916), vol. 4, p. 303.

⁷William H. Pierce Field Notes, pp. 2-3, Branch Cadastral Office (BCO), Bureau of Land Management, Phoenix, Arizona.

⁸Joseph E. Wilson to Clark, January 2, 1867, copy in author's files.

⁹Pierce Field Notes, pp. 2-3.

¹⁰Gerald T. Ahnert, *Retracing the Butterfield Overland Trail Through Arizona* (Los Angeles: Westernlore Press, 1973), pp. 51-69.

¹¹Constance Wynn Altshuler, *Starting with Defiance: Nineteenth Century Arizona Military Posts* (Tucson: Arizona Historical Society, 1983), pp. 37-38. The fort was established in 1865 and named Camp McDowell in 1866 to honor Major General Irvin McDowell, commanding officer of the Department of California and New Mexico. It was not until April, 1879, that its name was officially changed to Fort McDowell.

¹²Margaret R. Shank, "Yesterday's Tools, Today's Treasures," *Point of Beginning* (February/March, 1986), pp. 8-16. Lola Cazier, *Surveys and Surveyors of the Public Domain* (Washington, D.C.: U.S. Government Printing Office, 1978), p. 15. Pierce Field Notes, p. 9.

¹³Lieutenant J. G. Mallery and J. W. Ward, Arizona Territory map, 1876, copy in Arizona Room, Phoenix Central Library.

¹⁴Henry P. Walker and Don Bufkin, *Historical Atlas of Arizona* (Norman: University of Oklahoma Press, 1979), p. 1.

¹⁵Pierce Field Notes, quoted in Farish, *History of Arizona*, vol. 4, p. 305.

¹⁶Clark to S. Upton, March 2, 1867, copy in author's files.

¹⁷Pierce Field Notes, p. 8.

¹⁸I am indebted to Terold Knight, cadastral surveyor of the Branch Cadastral Office, Phoenix, Arizona, for this information and for the many hours he spent explaining nineteenth-century surveying procedures, assisting me with the many old documents in the office, and accompanying me to the summit of the initial-point hill, at sunrise on bitterly cold January 19, 1987, the 120th anniversary of the start of William Pierce's survey.