Figure 1. James W. Abert, 1864. Source: LOC Photographs and Prints Division.
Scientists of Kentucky

James W. Abert (1820–1897): Artist, Naturalist, Land Developer, and Topographical Engineer

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ABSTRACT

James W. Abert was an important explorer and scientist who called Kentucky home during the 1850s and for most of the period following the Civil War. At various times in his life Abert served as a government explorer in the southwest, an engineer for Ohio River navigational improvements, a military topographical engineer in the Mexican, Seminole, and Civil wars, a U.S. Examiner of Patents, a professor at two universities, and a land developer in northern Kentucky. His important contributions to the nation and to the state are often overlooked by scholars.

INTRODUCTION

Nineteenth-century Kentucky citizen James W. Abert was a figure of importance to the nation as well as to the commonwealth. During the 1840s, Lt. Abert conducted valuable surveys of the American southwest to reconnoiter the region’s plants, animals, topography, and cultural resources for the United States government. These explorations led to the first scientific mapping of New Mexico and the Texas panhandle, as well as to the collecting of biological specimens for the fledgling Smithsonian Institution (seven species and one family were named for Abert). During the 1850s, he married into Kentucky’s prominent Taylor family and was transferred to Louisville, from where he was promoted to captain and supervised numerous navigational improvements along the Ohio. During the Civil War, Cpt. Abert was Union Maj. Gen. Nathaniel Banks’s chief topographical engineer for the 1862 Shenandoah Valley Campaign; later he supervised construction of fortifications and artillery emplacements to support operations in coastal Virginia, the Carolinas, and Georgia. Following the war, Abert served as U.S. Examiner of Patents and as a professor at the University of Missouri and at the Missouri School of Mines. After a few years in academia, Abert returned to his home in Newport, Kentucky, and proceeded to develop Cincinnati’s Kentucky suburbs out of his father-in-law’s vast land holdings.

ABERT’S EARLY LIFE

Other than scattered sketches and accounts of his western explorations (Carroll 1941a, 1941b; Galvin 1966, 1970; Goetzmann 1959; Morris 1999; Reis 2000; Ronda 2003; Tyler 1996), there is no published biography of James William Abert. As a result, the following summary of Abert’s life relies heavily on the resources contained in the unpublished Abert Collections at the Filson Historical Society, Louisville, and at the University of Missouri–Rolla Archives (hereafter UMR). Abert was born in Mount Holly, New Jersey, on 18 Nov
1820 to Maj. John James Abert and Ellen Matlock (Stretch) Abert. Figure 1 reproduces a previously unpublished Civil War-era photograph of Abert.

Abert’s paternal grandfather immigrated from France during the Revolutionary War (Mann n.d.). Abert’s father, John J. Abert, was a career staff officer and the army’s chief topographical engineer who successfully maneuvered the political trip wires necessary to gain an independent Corps of Topographical Engineers in 1838. As head of a new topographical corps, it was John J. Abert who planned, supervised, and occasionally conceived the great official exploration and mapping of the Louisiana Purchase, Oregon, and former Mexican territories. Abert Lake in Oregon is named for him in tribute to his efforts to organize the expedition that led to its discovery.

Because of his father’s position, Abert was reared in Washington, D.C., and enjoyed the best culture and education the nation’s capital could then offer. He attended the Select Exclusive Seminary in Washington under the sponsorship of Salmon P. Chase (Hughes 1937). Entering Princeton’s sophomore class at the age of 15, Abert graduated 3 years later, in 1838. Abert’s interest in natural history blossomed at Princeton, where he first impressed Professor Joseph Henry (Henry 1869), distinguished physicist and later the first Secretary of the Smithsonian Institution. Immediately upon graduation from Princeton, Abert entered the U.S. Military Academy, from which he graduated 55th out of the 1842 class of 56 (Goetzmann 1959). Because of his unimpressive West Point credentials, Abert was assigned to infantry duty in Detroit until May 1843, when his father was able to secure for him a transfer to the Corps of Topographical Engineers. Abert spent 1843–1844 apprenticing in the field with Joseph Nicollet’s extensive Great Lakes and upper Mississippi surveys. He then drafted maps for a year at the topographical corps headquarters in Washington.

EXPLORING THE FRONTIER

Abert’s contribution to Manifest Destiny through his scientific and economic surveys of the southwest has been largely overlooked by historians, for whom he tends to be merely the subordinate of the prominent army geographers who dispatched him to his surveys: Cpt. John C. Frémont and Cpt. William H. Emory. This thinking tends to overlook the importance of Abert’s mapping activities and the scale of his data collection, which was fundamental to a growing scientific appreciation for the geography and natural resources of the American southwest. This paper asserts that Abert was an important explorer-naturalist who led independent expeditions as part of a broader government initiative in the first half of the 19th century. Further discussion of the culture of official exploration during this period can be found in Goetzmann (1959), Ronda (2003), and Traas (1993).

In summer 1845 Abert joined Frémont’s third expedition then assembling at St. Louis. Because Frémont’s previous expedition had strayed considerably from its purpose, it is likely that the elder Abert assigned his son to the third expedition in an effort to reduce the threat of similar insubordination this time. However, in early August when Abert arrived at Bent’s Fort in present-day southeastern Colorado, Frémont commenced to divide his command into two exploring parties. Frémont’s larger and better-equipped group would proceed west to conduct a survey of the Great Basin and, eventually, to participate in the Bear Flag Revolt and the U.S. occupation of California. Setting out on 12 August, Abert’s party headed south to explore “Purgatory Creek, [and] the waters of the Canadian and False Washita” rivers eastward to Indian territory in what is now Oklahoma (Abert 1846). Abert’s detachment served several important purposes. Perhaps most significant for Frémont, the expedition disburdened him of his superior’s son and of Lt. William G. Peck, the only army officers accompanying him and, therefore, the only people in a position to ensure him for violating his orders by entering California. According to Isaac Cooper’s journal, published under a penname, Frémont also sent all his malcontents along with Abert (des Montagnes 1972). But Abert’s survey had broader purposes than simply to relieve Frémont of undesirables, for the mission fulfilled the Congressional mandate that had authorized Frémont to take the field in the first place. As originally authorized, Frémont’s expedition was part of Missouri Sen. Thomas H. Benton’s plan to survey the various potential
railroad routes to the west coast (Abert 1876). Furthermore, since Abert's line of march passed through Kiowa and Comanche territories, he was expected to reconnote these potentially hostile enemies of U.S. westward expansion, taking note of the region's natural resources along the way. Finally, Abert would also test the viability of the valley of the Canadian as a wagon route to Santa Fe. During his journey Abert was expected to collect scientific specimens and observations to be examined by armchair academics in the east (at this time it was not customary for scientists to collect their own data in the field). Lt. Abert's first independent command was therefore multifaceted in purpose.

Included among Abert's party were several highly experienced mountain men who greatly eased the burden of command. While Thomas "Broken Hand" Fitzpatrick assumed functional leadership of the team, Abert also enjoyed the services of experienced traders and trappers John Hatcher and Caleb Greenwood. This arrangement was sensible, productive, and amenable to all, as discussed in Abert (1846), des Montaignes (1972), and Hafen (1973). This situation afforded Abert and Peck greater opportunity to take astronomical observations and otherwise perform their scientific mission. The expedition's basic mapping obligation was hampered by a scarcity of appropriate equipment, since Frémont could only spare one compass, one sextant to determine latitude, one chronometer to determine longitude, and no barometer for estimating altitude—a great deficiency in a railroad survey.

From Bent's Fort, Abert followed the Santa Fe Trail southwards into New Mexico through the Raton Pass. Crossing to the headwaters of the Purgatory River, Abert descended roughly south to that stream's confluence with the Canadian. Shortly after that juncture the Canadian turns sharply east and Abert's route met with the Comanchero Trail out of Santa Fe, which vague trace he followed to the Cross Timbers region of the Texas-Oklahoma borderlands. From there they traveled to Ft. Gibson around present-day Oklahoma City, where the party was resupplied and refitted with wagons and animals for the march to St. Louis through western Arkansas and southern Missouri (camping, incidentally, in the vicinity of Rolla [Abert 1876], where a quarter century later Abert would chair a university engineering department).

Overall the mission was quite successful, although circumstances prevailed to hinder the full development of the expedition's scientific potential. The presence of a band of white men in their territory who occasionally started prairie fires through careless camping habits necessarily excited interest among the natives along their route. Their progress was continually shadowed by the various groups of Pawnee, Kiowa, Comanche, and Kaw whose summer ranges they intruded. This intense surveillance encouraged vigilance among Abert's party, and Fitzpatrick instituted a policy of camping behind a "kraal" (corral) of felled timbers and circled wagons (Abert 1846). Abert's expedition is the first time this innovation was employed by a government party in potentially hostile territory.

Whenever possible Abert invited the Indians who neared camp to eat, talk, and trade for tobacco. Abert was even invited to visit Kiowa and Comanche villages. He used these opportunities to gather cultural, linguistic, population, and military data on these likely enemies of the United States, which intelligence he conveyed in his report to Congress. Abert's (1846) report was the first information on the Kiowa and Comanche collected in the field by a U.S. government agent (Goetzmann 1959).

The expedition's scientific goals were hampered by the presence of potentially hostile natives, which prevented anyone from straying too far from camp to search for appropriate specimens. In accordance with the mission's primary purpose, Abert took the necessary astronomical observations to reckon their geographic position on each day that atmospheric conditions permitted suitable readings (these coordinates are dutifully recorded in his report). From these data Abert drafted the first scientific map of the Canadian route from central Oklahoma to Santa Fe, which is reproduced in Galvin (1970). Abert's work was the basis for all mapping of this region until the Southern Pacific Railroad was finally built following the Civil War. Abert's report occasionally mentions preserving an animal pelt, but there is no record of the plant, animal, and mineral samples that Abert collected on this expedition.
Shortly after completing his report of the survey of Comanche country, Abert again went west, this time to join Col. Stephen W. Kearney's invasion of New Mexico as part of the war against Santa Ana. En route to join Kearney's command, Abert fell ill and had to recuperate at Bent's Fort while the army proceeded to take Santa Fe unopposed. By the time Abert arrived at Santa Fe, Kearney was on his way to California. Abert was ordered to make a map and thorough reconnaissance of the settled regions of the new U.S. territory of New Mexico.

While Abert was still recovering at Bent's Fort, Peck surveyed the vicinity of Taos and assisted Emory, their superior, in his collection of coordinate and altitude data for important locales in and around Santa Fe. When Abert arrived, he surveyed the Rio Grande valley and into the Hopi and Navajo lands west of the capital. Abert's report to Congress of the New Mexico survey includes numerous sketches (such as Figure 2) and watercolors, as well as Abert's impressive Map of the Territory of New Mexico, reproduced as Figure 3. This map served as the basis for topographic knowledge of most of New Mexico until it was surpassed by new government surveys following the Civil War.

As important as Abert's map was to providing accurate topographic information about the nation's new territory, it was in his role as field naturalist that he made his greatest contribution to scientific knowledge of New Mexico and northeastern Arizona. Abert's report is replete with macabre scenes of his topographer's field wagon rolling across the plains with an assortment of pelts, skins, and taxidermed critters drying on its canvas roof. As a result of Abert's aggressive efforts, his New Mexico exploration collected specimens of 15 mammals, 13 birds, and 179 plant species. Of these, Abert discovered—and recognized it at the time—3 new mammals, 2 new birds, and 25 new plant species. These samples were delivered to the Smithsonian Institution, where they were examined and their descriptions published by formal scientists. Abert also collected samples of 16 minerals to be evaluated for their economic potential, including gold and silver ores from New Mexican mines. A complete list of the specimens Abert collected appears in Appendix A of Galvin (1970).

Abert's efforts as a field naturalist impressed the scientists in Washington and Philadelphia, who named an entire family of fossil sand dollars (Abertellidae) and seven species after him: Abertella aberti (a fossil echinoid), Ammophila aberti (a thread-wasted sand wasp), Cyprogenia aberti (western fantail mussel), Eriogonum abertianum (Abert's wild buckwheat), Pipilo aberti (Abert's towhee), Sanvitalia abertii...
James W. Abert (1820–1897)—Person

Figure 3. James W. Abert's map of the territory of New Mexico. Source: J. Willard Marriott Library, University of Utah.
Abert's orders for the New Mexico exploration instructed him to survey the territory's cultural resources as well. Specifically, he was ordered to search for the Seven Cities of Cibola mentioned in the Spanish chronicles of exploration. Abert correctly deduced Coronado's line of march to have been up the Puerco River to the San Jose Valley pueblos of Cibolleta, Moquino, Pajuate, Covero, Laguna, Rita, and Acoma (Goetzmann 1959). Of the six surviving settlements, only Acoma impressed Abert. Unfortunately for history's opinion of Abert's anthropological acumen, he accepted Alexander von Humboldt's belief that the Anasazi-built environment represented the remains left behind by Aztecs as they gradually migrated southward into the Valley of Mexico. By contrast, both Albert Gallatin and Abert's immediate superior, Emory, believed that the Anasazi were simply the ancestors of the Hopi and Pueblo groups inhabiting the region in modern times. Even as late as the end of the 19th century, Abert persisted in his belief in the Aztec hypothesis, as expressed in his paper on “The Indians of North America” (Abert 1890) and as inferred from two other academic publications about the Aztec introduced in a later section of the present paper.

If Abert were old-fashioned in his convictions about the Anasazi, one observation he made during the exploration was on the cutting edge of science. During the expedition he collected some coal and fossils from a Permian coal bed west of the Continental Divide that he realized matched other fossils he had encountered on his previous expedition through a Permian coal bed to the east of the Rockies. Abert correctly surmised that this indicated the coal bed predated the emergence of the mountains and that the swampy lowlands that had once characterized the prairie to the east once also extended to his location west of the Continental Divide. Abert announced this theory in his official report of the expedition (1848), and thus is one of the first Americans to recognize evidence of landform evolution as interpreted by modern geology. A similarly sophisticated understanding of surface and subsurface processes pervades both Abert's official report (1848) and his private journal of the expedition (Abert 1966).

Following these protracted surveys, Abert enjoyed a brief assistant professorship of drawing, painting, “English literature, belles lettres and moral philosophy” at West Point from 1848 to 1849 (Hughes 1937).

FAMILY LIFE AND CIVIL WAR

Around 1844 Abert wed Jane Lenthall Stone of Washington, D.C., with whom he had a son, William Stone Abert. Jane Abert died in 1849. Published and archival sources lack further information on Abert's first wife. It appears that William Abert was somewhat estranged from his step-family, although he appears to have been close to his uncle Charles Abert, with whom he lived during the 1860s (Abert 1861–1862). Like Charles, William Abert became a powerful attorney in the District of Columbia and its Maryland suburbs (Abert Collection, UMR).

The widowed Abert wed Lucy Catherine Taylor in Newport, Kentucky, on 18 Jul 1851 (Veterans Administration Pension Records, UMR). Lucy came from the very wealthy and influential family of Gen. James Taylor and was connected to the equally powerful Preston family of Louisville (Abert Collection, Filson). Abert had three daughters with his second wife: Susan Barry, Ellen Matlock (“Nellie”), and Jane (“Jennie”). Jennie was the only one of Abert's daughters to marry. Susan and Nellie lived with their parents until the latters' deaths and then with each other (and Jennie following her husband's demise) (Mann n.d.). Abert had no grandchildren through his daughters, although William had several children.

Undoubtedly as a result of his family connections, Abert was transferred to Louisville shortly after his marriage to Lucy. Between 1851 and 1859, he supervised river improvements along the Ohio. His most notable achievement during this period was the construction of a navigational channel around rapids in the Ohio River at Marietta, Ohio (Mann n.d.). From 1856 to 1858 Abert took the field in Florida to serve as senior topographical engineer for army operations against the Seminole. This absence from Louisville and from his wife and children was a point of contention in Abert's personal life, as suggested by a
lengthy letter to his father-in-law in which he explained how his service in Florida was crucial to his career (Abert 1856). When hostilities ended, Abert returned to Louisville to serve as senior engineer on the Louisville and Portland Canal around the Ohio’s falls (Abert Collection, Filson). Abert persisted in these duties until sectional tensions late in the Buchanan administration foretold coming civil conflict.

In preparation for the impending rebellion, Abert was sent to Europe from 1860 through spring 1861 to observe the latest developments in military science. He also used the opportunity to absorb European high culture, as evidenced by the many sketches of museum masterpieces that fill his sketchbook from the trip, which is now preserved in the Abert Collection at the Filson Historical Society. On 21 Jun 1861 Col. Hartmann Bache, who had replaced Abert’s retired father as chief of the topographic corps, telegraphed Abert at Louisville ordering him to “Proceed to Hagers-town Maryland report to Gen. Patterson for duty” (orders preserved in Abert Collection, Filson). Abert served as chief topographer for Patterson and later for Patterson’s successor, Maj. Gen. Nathaniel Banks, throughout federal operations in the Shenandoah Valley in 1861 and 1862.

Abert’s field service in the Shenandoah was quite varied, as demonstrated in his unpublished military journal (Abert 1861) in the Filson Historical Society’s Abert Collection. During the summer 1861 campaign Abert was most frequently occupied with general staff service and with mapmaking. When his time spent actually drafting maps is combined with his reconnaissance activities, over 40% of his time was devoted to these basic cartographic tasks, as indicated by an analysis of Abert’s journal. During this period Banks’ troops were frequently repositioned in the Valley in skittish response to localized Confederate aggression. It is therefore not surprising that Abert often had to guide troops or wagon trains to their destinations. Abert was on furlough for over 11% of his days of service that summer, frequently visiting his brother’s Maryland farm outside Washington. Besides these dominant activities, he was also required to undertake various other duties, such as fording and bridging, fortifications engineering, camp selection and management, provost duties, and drilling troops. Abert even spent 1 day translating a brief French military textbook for Banks. In general, Abert’s 1861 journal indicates that he spent most of his time providing Banks with the type of service one would expect from a senior career topographical officer on the staff of a predominately volunteer army. Pearson (2004) provided a detailed analysis of Abert’s Shenandoah service in comparison to those of the other Union and Confederate topographical engineers in the theater.

During summer 1861 Abert produced for Banks a fine triangulation survey of the Shenandoah River. The carefully executed manuscript Map of the Shenandoah River from Harper’s Ferry to Port Republic is housed at the National Archives as RG77:Z116. Figure 4 reproduces this 135 × 32 cm work. Although primarily intended to be a survey of the river itself, details such as tributaries, mills and dams, and place names facilitate the broader application of this data. The inset to Figure 4 demonstrates Abert’s fine draftsmanship as well as the triangulation grid on which the map’s features were registered. This map was most likely prepared as part of an unsuccessful Union scheme to transport supplies by steamboat on the Shenandoah.

Injuries plagued Abert’s service after the Valley Campaign. He was severely wounded at Frederick, Maryland, in late 1862. After a period of convalescence, Abert assisted in the 1863 siege of Charleston, South Carolina, where he planned and supervised construction of the forts and battery emplacements that battered the city and its defenses from 4 to 6 miles away with tens of thousands of shells. This bombardment “rendered it uninhabitable to women and children, and converted the city into a mere soldiers’ barracks, where . . . no quiet or comfort obtained” (Abert 1889). Abert also supervised construction of military works throughout coastal Virginia, Georgia, and the Carolinas through his role as chief engineer for all Union coastal operations. Abert’s most notable achievement during this period was the design and construction of the batteries on the south side of the Savannah River that pounded the reportedly impregnable Fort Pulaski to submission in a single day (Abert 1889).

In early summer 1864 Abert was appointed
chief engineer for the military department then being organized to supervise the lower Delta from Vicksburg following that stronghold's capitulation (Mann n.d.). Abert resigned from the army before he could relocate to Mississippi because of the sudden severe illness of his wife as well as the lingering complications from his wound earlier in the war.

POSTWAR SCHOLAR AND LAND DEVELOPER

Abert immediately entered business in Cincinnati and remained so engaged until being appointed one of three U.S. Examiners of Patents by President Ulysses S. Grant in 1868. He did not find the work rewarding. Instead of the intellectual stimulation he had expected from this position, Abert found only a tedium that, as he explained, “leaves so many of my talents and capabilities in a dormant state that I feel it cannot fill out the measure of my desires” (Abert 1871).

As a result of his desire for more stimulating employment, Abert secured a position as professor of English language and literature at the University of Missouri in Columbia, where he also taught courses in French, German, drawing, and painting. The University of Missouri’s catalog for 1871–1872 states that Abert’s “particular taste and artistic culture eminently qualify him to give instruction of the highest order to this important art [English literature] . . . indispensable . . . in all the applications of science to the pursuits of life” (Weinbach 1941, p. 20). Abert’s decision to pursue a career in higher education was motivated by his enjoyment of occasional assignments over the years to teaching duties at West Point. I also suspect that his attraction to a career in academia was motivated by familiarity with his friend William G. Peck, who had resigned from the army in the early 1850s to pursue a long, successful career as a professor of mathematics at the University of Michigan.

After only a year in Columbia, Abert accepted a position as chair of civil engineering and drawing at the newly formed Missouri School of Mines (MSM) at Rolla. A photograph of Abert with others of the university’s inaugural faculty is reproduced as Figure 5. Abert served MSM from 1872 until 1877, first as professor of civil engineering and drawing.
and later as professor of applied mathematics and graphics. He left the institution in late October 1877 because of failing eyesight and impending university salary cuts (Mann n.d.).

Abert's family remained in Newport during his years in Missouri except for the 1876–1877 academic year, when three of his children (William, Nellie, and Jennie) attended MSM (Enrollment Records, Abert Collection, UMR). Abert constructed a large frame house in Rolla, which appears to have been visited only once by his wife (Abert Collection UMR). Abert, however, made frequent long trips to Kentucky during this period. Besides that which might be implied by their spatial separation, there is evidence that Abert and Lucy's marriage was troubled during this period. Sometime during the 1930s, MSM professor Claire V. Mann interviewed a colleague, Dr. Amaud N. Revold, who had been a student of Abert at MSM. Abert had frequently employed Revold "as ‘driver’ for week end parties . . . at Yancy Mills, on Little Piney River" (interview notes, Abert Collection, UMR), during which Abert would commonly escort the sister of his colleague Maj. George D. Emerson (who stands behind Abert in Figure 5). Frequently Abert and the female Emerson were physically indiscreet during her painting lessons on these excursions. Revold indicates that it was quite apparent that the two had some sort of relationship that was beyond casual.

After resigning from MSM, Abert returned to the home of his family in Newport, Kentucky. There he worked with his father-in-law to map, survey, and subdivide "the latter's extensive land holdings, which now comprise the town-sites of Newport and Fort Thomas, Kentucky" (Mann n.d.). Abert was very active in community affairs. He founded and was president of the local Henry Clay Society, as well as...
as the local Grand Army Post No. 178, which was named for him (Anonymous 1897a). Eight members were still alive in the 1930s when the post was closed and its membership folded into the local VFW (Dunlap 1938).

Following Abert’s return to Kentucky from the Missouri School of Mines, he published six papers in The Journal of the Cincinnati Society of Natural History. His research was quite varied. Half of Abert’s papers were ethnographic studies on native Americans, the Aztec calendar stone, and Aztec astronomy. Besides providing evidence of Abert’s reluctance to accept the Anasazi as an advanced native culture independent of those of the Valley of Mexico, Abert’s work—both here and in his earlier reports to Congress—indicates a very progressive attitude toward indigenous North American societies. For example, Abert (1890) wrote that the “character [of pre-contact native Americans] must not be judged by the Indians of the present time, who have had their nobler sentiments destroyed during a period of four hundred years of cruelty, oppression, and injustice. The Indian of the present day is treacherous, ferocious and savage, filthy, miserable, drunken, broken-hearted and beggarly” (p. 89).

If one can overlook the Victorian paternalism in Abert’s presentation, his comments indicate a conviction that, whatever degraded state he might ascribe to contemporary Indians, this cultural degradation is manifest only because of the ill worked against them by Europeans and Euro-Americans. Abert’s writings of the 1840s (Abert 1846, 1847) indicate an appreciation for the right of native groups to exist as they always have, unmolested, even if that freedom required the reservation of territories large enough to sustain the herds of buffalo, elk, and other natural resources necessary for their subsistence along traditional lines. Throughout his life Abert believed that white Americans should curb their occupation of the landscape to accommodate native interests and prior claims to the land.

Abert’s work on the Aztec calendar stone was connected to his interest in the Indians of the southwest because of his belief that the Anasazi culture was connected to that of the Aztec. Abert (1884a) wrote a detailed description of the use and construction of the ancient Mexican calendar device, as well as an analysis of Aztec astronomy and celestial timekeeping skills (Abert 1884a). This study relies heavily on Don Antonio de León y Gama’s 1792 trea-
tise on the subject, which Abert translated from the original Spanish (Abert 1885a). Abert's articles on these subjects indicate his long-standing interest in mathematics, mechanics, and earth systems processes.

This interest in the natural sciences is also evident in Abert's other scholarly publications from the last decade of his life. Cited in a previous section of this paper, Abert's (1889) article "Big Guns" explores the physics and mathematics of modern artillery in the context of technological advancement from the guns employed during the Civil War to the best field pieces and naval ordnance of the day. Abert's concise "On Color" (1884b) is focused primarily on the use of color wheels and the application of color theory to painting, interior design, and clothing. Throughout his discussion is a clear confidence that the principles of color theory can be systematically applied to solve all color issues in art and design. Abert's remaining scholarly paper from this period is a botanical study on the natural history of palms (1885b). Abert's (1893) last known publication is a biographical sketch about his brother Gen. William Stretch Abert.

Although he still dabbled in real estate development in northern Kentucky until the end of his life, Abert formally retired in 1887, when he applied for and received a military pension (Veterans Administration Records UMR). Abert died 10 Aug 1897 at Hillspoint, his estate on West Front Street in Newport, Kentucky, which was removed in the early 20th century to facilitate levee construction. His obituary in the Kentucky Post (Anonymous 1897b) attributes "the predisposing cause of [Abert's] death" to "poison recently contracted from handling weeds." Lucy Abert died at Hillspoint on 16 May 1916 in Newport, Kentucky. The gravestones of James and Lucy Abert in Evergreen Cemetery, Southgate, Kentucky, are shown in Figures 6 and 7, respectively.

Abert's daughters lived in the Highlands District of northern Kentucky until well into the 20th century. Susan Abert died on 15 Nov 1928 and Nellie Abert died on 6 Sep 1942. Both had lived together since 1912 at the former Shaw mansion at 26 Audubon Place in Fort Thomas (Daniels 2000; Mann n.d.). After her husband died, Jennie Abert Neff moved...
to the house to live with her sisters. Jennie
died on 12 Apr 1956. All three daughters are
buried along with their parents in the Abert
family plot shown in Figure 8.

CONCLUSION
Abert had a long career as explorer and sci-
entist. During the 1840s Abert was an army
topographical engineer exploring the frontiers
of American settlement. He surveyed and
mapped the future route of the Southern Pa-
cific Railroad and the new U.S. territory of
New Mexico. As part of these explorations
Abert collected valuable geographic and bio-
logical data, which so impressed the scientists
at the Smithsonian Institution that they named
one family and seven species after him. His
maps of New Mexico and parts of Arizona,
Colorado, Oklahoma, and Texas were valuable
documents which facilitated the administra-
tion and settlement of a large area of the
American southwest during the mid-19th cen-
tury. During the 1850s and 1860s, Abert sup-
ported the military and economic interests of
the United States through his work on im-
provements to Ohio River navigation and
through his service as topographical engineer
during the Seminole and Civil Wars. Follow-
ing the Confederacy's capitulation, Abert
served as U.S. Examiner of Patents and then
on the faculty of the University of Missouri at
Columbia. He helped organize the Missouri
School of Mines, where he served as the first
Chair of the Civil Engineering Department.
After leaving Missouri in 1877, Abert worked
to develop Newport and Ft. Thomas, Ken-
tucky out of his father-in-law's vast land hold-
ings and contributed to the intellectual and
cultural life of northern Kentucky through his
various social and scholarly interests.

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