

Cain, William ^[1]

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by George-Anne Willard, 1979

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William Cain, civil engineer, mathematician, university professor, and author, contributed for over half a century to the advance of engineering theory and practice in his state and country. Although his life began and ended in [Orange County](#) ^[2], Cain's career carried him to Western and Eastern North Carolina and into South Carolina, and his influence on civil engineering extended even further.

Cain was the fourth in a line of William Cains to reside in Orange County. His Irish great-grandfather, who lived from 1743 to 1834, settled in Orange County, married the widow of Sir Thomas Dudley, served in the state legislature, and was an early patron of the new state university. The fourth William Cain was born near Hillsborough, the son of Dr. William and Sarah Jane Bailey Cain. His father, who died when Cain was almost eight, was a [planter](#) ^[3] and [physician](#) ^[4]. His mother, the daughter of Judge John L. Bailey, was noted for her musical interests.

Cain spent his youth in Orange County, where he attended a private school in Hillsborough. From 1859 to 1866 he continued his education at the [Hillsborough Military Academy](#), ^[5] recently established by Colonel C. C. Tew. Cain's education was interrupted by the [Civil War](#) ^[6], and as a cadet of fourteen he served briefly as a drillmaster for [Confederate](#) ^[7] recruits at [Asheville](#) ^[8] and [Wilmington](#) ^[9]; in the last stages of the war, he and fellow cadets guarded Union prisoners. After the war, Cain studied law under his grandfather, Judge Bailey, and then returned to the military academy (renamed the North Carolina Military and Polytechnic Institute) to earn the M.A. degree.

From 1866 to 1868, Cain worked on the staff of the North Carolina state geologist [W. C. Kerr](#) ^[10]. For the next twenty years he was alternately employed as a railroad surveyor and as an instructor at military schools. He was an engineer and surveyor for numerous railroads in North and South Carolina from 1868 to 1874 and again from 1880 to 1882. From 1874 to 1880 he taught math and engineering at the Carolina Military Institute in [Charlotte](#) ^[11]; he held a similar position from 1882 to 1888 at the [Citadel](#) ^[12] in Charleston. In 1888 he was elected professor of mathematics and engineering at [The University of North Carolina](#) ^[13]. There he served as head of the department until his retirement in 1920. In 1918 he was selected as one of the original five Kenan professors in recognition of his teaching success.

Throughout his career, Cain engaged in original work in both pure and applied mathematics. One of the South's most notable engineers, he formulated important theories concerning the strength of masonry dams, reinforced concrete arches, earth pressures, and retaining walls. He insisted, too, that engineering theory have practical application: his formulas were influential on the building of railroads, bridges, and dams throughout the country.

The results of Cain's research were published in widely used civil engineering text books and in a variety of scientific journals. In the 1870s and 1880s, he contributed studies to the [Van Nostrand Science Series](#) ^[14], including *A Practical Theory of Voussoir Arches* (1874), *Maximum Stresses in Framed Bridges* (1878), *Voussoir Arches, Applied to Stone Bridges, Tunnels, Domes and Groined Arches* (1879), *Theory of Solid and Braced Elastic Arches* (1879), and *Symbolic Algebra and Notes on Geometry* (1884). Other books were *Practical Designing of Retaining Walls* (1888), *A Brief Course in the Calculus* (1905), and *Earth Pressure, Retaining Walls and Bins* (1916). He published numerous articles in *Van Nostrand's Engineering Magazine*, *Engineering News*, *Journal of the Franklin Institute*, and *Journal of the Elisha Mitchell Scientific Society* ^[15]. His first scientific publication, "Uniform Cross-Section and T Abutments," appeared in the November 1874 issue of *Van Nostrand's Engineering Magazine*. Subsequent articles in the same journal included "Retaining Walls" in April 1880, "Earth Pressure" in February 1882, and "Trusses with Superfluous Members" in October 1882. Two of his most influential papers were "Unit Stresses," published in *Engineering News* in 1887 and "Experiments on Retaining Walls and Pressures on Tunnels," in *Transactions of the American Society of Civil Engineers* (1911).

In 1926, still productive, Cain received the J. James R. Croes Medal from the [American Society of Civil Engineers](#) ^[16] for a paper entitled "The Circular Arch under Normal Loads." Cain had become a member of the society in 1888 and had served as a director of the organization from 1912 to 1914. The student chapter of the society at [The University of North Carolina](#) ^[13] was named the William Cain Civil Engineering Society in his honor. Cain also held memberships in the [American Mathematical Society](#) ^[17], the [Elisha Mitchell Scientific Society](#) ^[15], the [North Carolina Academy of Science](#) ^[18], and the [American Association for the Advancement of Science](#) ^[19]. In addition to the Croes Medal, he was honored for his work with the LL.D. from the University of South Carolina in 1916 and the Sc.D. from The University of North Carolina in 1920.

Cain represented a combination of the practical, technical bent of the New South and the romantic values of the Old South. He was both the pragmatic scientist and the Civil War veteran affectionately known as "the major." A courtly and gracious gentleman, Cain never married, still preferring at age eighty to wait for the "years of discretion." Those who knew

him described him as industrious, exact, affectionate, loyal, kind, witty, and genial. His life, said Archibald Henderson ^[20], was "one of earnest endeavor, guided by high ideals and a strict devotion to duty." He loved classical music and was an accomplished violinist. He was also an avid sportsman, still pursuing his hobby of fly-fishing in 1930. He was active in the Protestant Episcopal church and served on the vestry of the Chapel of the Cross. Though not actively involved in politics, he was a loyal Democrat ^[21].

In his later years, Cain suffered from deafness. He was struck by an automobile while crossing the street in front of his Chapel Hill home and died a few hours later. The funeral was held at the Chapel of the Cross and interment took place in Hillsborough.

A portrait by William Steen is displayed in Phillips Hall at The University of North Carolina at Chapel Hill ^[13].

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North Carolina Collection (University of North Carolina, Chapel Hill), for a 1926 bibliography of Cain's works.

North Carolina State Archives (Raleigh), for Cain correspondence in the Theodore Fulton Davidson Papers.

Raleigh News and Observer, 21 Jan. 1923, 8 and 9 Dec. 1930.

Southern Historical Collection (University of North Carolina, Chapel Hill), for the John Lancaster Bailey Papers, William Cain Books (including a 1925 memoir on his Civil War experiences), Archibald Henderson Papers [picture], and John Steele Henderson Papers.

Who's Who in America, 1920–21.

Additional Resources:

William Cain, M. Am. Soc. C.E. : died December 6, 1930, by Thomas F Hickerson <https://www.worldcat.org/title/william-cain-m-am-soc-ce-died-december-6-1930/oclc/32812385> ^[22]

Wm. Cain Books, 1868-1896, and 1920s (collection no. 00124). The Southern Historical Collection. Louis Round Wilson Special Collections Library. University of North Carolina at Chapel Hill. <http://www.lib.unc.edu/mss/inv/c/Cain,Wm.html> ^[23] (accessed July 9, 2013).

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Origin - location:

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