Virginia Ragsdale

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Born on a farm in Jamestown, NC, just after the United States Civil War, Virginia Ragsdale grew up in simple times. She attended a private school in Jamestown. In Ragsdale's own words, her teacher there, a Mr. Jewel Weatherly, delighted in helping his students acquire "speed and accuracy" at "mental arithmetic" until they had mastered the material "backwards and forwards."

Ragsdale entered Salem Academy as a junior, where she studied piano in addition to academic studies, and she graduated in 1887 as valedictorian. She attended Guilford College in Greensboro, NC, and actively shaped the college while there. She was involved in the establishment of a Y.M.C.A. on campus, the expansion of collegiate athletics, and she helped to establish Guilford's Alumni Association.

Upon her graduation from Guilford College with a B.S. degree in 1892, she was awarded a scholarship to Bryn Mawr College for being the woman with the highest scholastic average. She studied physics there, obtaining an A.B. degree, and continued on as a graduate student. She studied with Charlotte Agnes Scott for a year before winning a fellowship from Bryn Mawr to study in Europe.

Together with two other Bryn Mawr women, she chose to go to the University of Goettingen, Germany, where she studied for one year with Felix Klein and David Hilbert. Upon returning to the United States, she taught in Baltimore for three years before yet another scholarship permitted her to return to Bryn Mawr to complete her Ph.D. degree under Dr. Scott. Her dissertation "On the Arrangement of the Real Branches of Plane Algebraic Curves," was published in 1906 by the *American Journal of Mathematics*.

Her dissertation dealt with the 16th of Hilbert's problems that he posed to the International Congress of Mathematicians in the year 1900. Namely, the question is "what are the possible arrangements of real algebraic curves embedded in the projective plane." On the basis of experimental evidence, Ragsdale formulated a conjecture that provided an upper bound on the number of circles (or *ovals*) of a certain type. The Ragsdale Conjecture, as it was called, was an important open problem in the field of real algebraic geometry for almost 90 years, and it stimulated a great deal of research. In 1994, Ilya Itenberg

created a counter-example to the Ragsdale Conjecture; a correct upper-bound to replace Ragsdale's Conjecture is still unknown.

More precisely, Ragsdale suggested looking at algebraic curves corresponding to polynomials of even degree *2k*. In this case, the curves are all topological circles---some are nested, others are not. An oval is *even* if it is contained an an even number of other ovals of the curve, otherwise the oval is called *odd*. Let *p* and *n* denote the number of even and odd ovals, respectively. The reason for considering these quantities was Ragsdale's greatest mathematical insight: the difference *p-n* is the Euler characteristic of a region bounded by the even and odd ovals. (For an expository description of this work, see the article by I. Itenberg and O. Viro in the *Mathematical Intelligencer*, 18(4), 1996. For technical details, see O. Viro, *Leningrad Math J.*, 1(5), 1990, or the article by V. Arnold and O. Oleinik, *Moscow Univ. Bulletin*, 34, 1979.)

Ragsdale's main conjecture was the following. Assume that an algebraic curve of degree *2k* is a so-called *M*-curve, meaning that the curve has the maximum number of components that is possible for a polynomial of that degree. If the curve contains *p* even and *n* odd ovals, then

$$p <= 3k(k-1)/2 + 1$$
$$n<= 3k(k-1)/2.$$

She also posed the inequality

$$| 2(p-n)-1 | <= 3k^2 - 3k +1,$$

(which was later proved by Petrovskii) and showed that this inequality cannot be improved.

Ragsdale taught for several years after completing her degree, and was eventually coaxed back to North Carolina in 1911 to accept a position in the mathematics department at Woman's College in Greensboro (now known as the University of North Carolina at Greensboro). She remained there for many years, and was the department's head from 1926-28.

Her affect on her department and college was profound. The college bought a telescope at her insistence. She convinced the math department to introduce the study of statistics into the curriculum. According to her colleagues:

> She took her work as a teacher by no means as routine but seriously. Never tolerant of slipshod work or of bluffing, she was yet patient with the slow and immature.

and again,

> She was a fine scholar and a fine woman; no student could fail to recognize those two facts, neither could she fail to see that her professor was making absolutely no effort to impress her with them.

Ragsdale retired from teaching in 1928 in order to care for her mother's health. Upon her mother's death, she built a beautiful house on the edge of the Guilford College campus, where she spent her remaining years gardening, working with furniture, and researching her family's genealogy. It is historically curious to remark that Virginia Ragsdale descended from Godfrey Ragsdale, an early settler of the Jamestown colony. Jamestown was periodically raided by a native-American tribe led by Opecancanough, the uncle of Pocahontas (yes, the famous Pocahontas). During a raid in 1644, Godfrey and his wife were killed, but managed to hide their infant son, Godfrey, Jr., who was later rescued and raised by a neighbor. It is through this surviving infant, that Virginia descended.

Upon her death, she bequeathed her beautiful Greensboro house to Guilford College. It housed many faculty, alumni, and visitors, over the years, until it was decided in 1965 that the house would be the home of the college's presidents. It remains so to this day.

The information in this article is taken from an obituary published in the Alumni Journal of Guilford College, December 1945, and from a memorial address given at Woman's College (now the University of North Carolina at Greensboro). Both of these articles refer to an autobiographical account of Ragsdale's life that she wrote for her nieces. The historical account of Ragsdale's genealogy is taken from the article "How the Jamestown Massacre of April, 1644 Brought the Ragsdale House to Guilford," by Herbert Poole.

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