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Original Research

Walter Sutton: Physician, Scientist, Inventor

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A B S T R A C T

Walter S. Sutton (1877-1916) was a physician, scientist, and inventor. Most of the work on Sutton has focused on his recognition that chromosomes carry genetic material and are the basis for Mendelian inheritance. Perhaps less well known is his work on rectal administration of ether. After Sutton's work on genetics, he completed his medical degree in 1907 and began a 2-year surgical fellowship at Roosevelt Hospital, New York City, NY, where he was introduced to the technique of rectal administration of ether. Sutton modified the work of others and documented 100 cases that were reported in his 1910 landmark paper "Anaesthesia by Colonic Absorption of Ether". Sutton had several deaths in his study, but he did not blame the rectal method. He felt that his use of rectal anesthesia was safe when administered appropriately and believed that it offered a distinct advantage over traditional pulmonary ether administration. His indications for its use included (1) head and neck surgery; (2) operations when ether absorption must be minimized due to heart, lung, or kidney problems; and (3) preoperative pulmonary complications. His contraindications included (1) cases involving alimentary tract or weakened colon; (2) laparotomies, except when the peritoneal cavity was not opened; (3) incompetent sphincter or anal fistula; (4) orthopnea; and (5) emergency cases. Sutton wrote the chapter on "Rectal Anesthesia" in one of the first comprehensive textbooks in anesthesia, James Tayloe Gwathmey's *Anesthesia*. Walter Sutton died of a ruptured appendix in 1916 at age 39.

Physician, scientist, inventor. Each of these words could easily describe Walter Stanborough Sutton (1877-1916). Numerous articles have been written about him, but they have mostly concerned his contributions to genetic research. He accomplished much in his short life and could have possibly changed the face of medicine if he had been given the chance. Unfortunately, Sutton died at the young age of 39.

Walter Sutton was born on April 5, 1877, in Utica, New York. His initial youthful years were spent there while his father practiced law and served as judge for Oneida County. Eventually, his family moved to rural Kansas in Russell County, where his family bought a ranch of several thousand acres, called "Rutger Farm," and raised livestock near the town of Russell. "Rutger Farm" achieved a reputation for breeding top-quality horses, cattle, and swine. Several of his brothers stayed to work on the farm as the years passed, and their father followed his own career to Kansas City as a lawyer [1].

Sutton showed a remarkable aptitude for invention and creativity by repairing most of the farm equipment. This area of his life led him to enroll in The University of Kansas School of Engineering on September 9, 1896. However, his life in the field of engineering was a short one, as the following summer would be a life-changing experience and would alter his career path direction. The following summer the family was struck by typhoid fever with Walter being one of the first to fall ill. Upon recovering, he undertook one of his future roles as caregiver. He was not able to help all members of his family, as his 17-year-old brother John succumbed to the disease and passed away in August 1897. In the same year, the Sutton family left Russell County and moved to Kansas City, Kansas. Two of Sutton's brothers remained in Russell County to manage the ranch.

It was this family experience that led him to change his studies in school. The following semester, he enrolled in biology to prepare for medicine as a career [1]. Through the study of biology, Sutton met one of his lifelong friends and colleagues, Clarence Erwin McClung (1870-1946), who was a zoology professor at the University of Kansas. The first day in class, Sutton helped McClung set up for his presentation. This experience brought them close together. McClung and Sutton continued to work closely in the biology lab, an educational experience, which continued into a correspondence between semesters. During the summer break, Sutton enjoyed sending McClung biological samples that he found on his father's farm. It was one of these samples, the "lubber" grasshopper (*Brachystola magna*), which would be an important discovery and aid in Sutton's future work on chromosomal inheritance (Fig. 1).

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Fig. 1. Kansas specimen of *Brachystola magna*. Photo courtesy of the Division of Entomology, KU Biodiversity Institute, University of Kansas, Lawrence, KS.

The time spent on his education was not always filled with discovery. The time was right for many individuals to come together at the University of Kansas as the birth of basketball had begun. James A. Naismith, MD (1861-1939; Inventor of Basketball, Basketball Coach, and Athletic Director, University of Kansas, Lawrence, Kansas, USA), was a medical doctor who had studied physical education in Montreal, Canada, before coming to the United States. He created the game of "basket ball" in 1891 while teaching at the International YMCA training school in Springfield, MA, to provide physical education and distraction for students during the long winter months when it was more difficult to find strenuous activity [2]. It was a blessing that Naismith eventually found his way to the University of Kansas. The game was not as popular as it is today, but it did involve many students and faculty. McClung wrote in one of his letters, "there was plenty of work to do, but time for play remained and the game that caught our fancy was basketball, then being introduced by its originator, Doctor Naismith. There were faculty-class tournaments and we both [McClung and Sutton] 'made our teams,' some years playing against each other and later on the same team. With the establishment of the varsity team, Walter, with (his brother) Will, was chosen as a member and acquitted himself with credit" [1] (Fig. 2).

Sutton graduated Phi Beta Kappa in 1900 from the University of Kansas. Sutton's education continued as he received his Master of Arts degree and, on the advice of McClung, eventually began postgraduate study at Columbia University in New York in the fall of 1901 under the pioneering geneticist Professor Edmund Beecher Wilson (1895-1972; Professor of Zoology, Columbia University, New York City, NY, USA). Wilson was one of the first cell biologists and wrote the landmark textbook, *The Cell*. Sutton continued his work in genetics and eventually published "The Chromosomes in Heredity" [3]. Sutton recognized that chromosomes carry genetic material and are the basis for Mendelian inheritance. Due to similar contemporaneous independent work by Wilson's close friend Theodor Boveri (1862-1915; Biologist, Germany), it is known as the Boveri-Sutton Chromosome theory. Sutton's plan at the time was to finish his PhD, but this never came to be. He took a leave of absence as he was again having financial trouble. He became foreman of an oil rig in Chautauqua County, in southeastern Kansas. He continued to use his creative nature designing inventions and making improvements in existing drilling methods.

While working in the oil fields, his father called, telling young Sutton it was time to return to his studies. In 1905, Sutton made his way back to the College of Physicians and Surgeons at Columbia University to finish the remaining 2 years of his medical degree. Upon completion of his degree, he was offered a 2-year surgical fellowship at the Roosevelt Hospital in New York City, where he was introduced to the idea and technique of rectal anesthesia and developed his own methods of administration on surgical patients [1].

The general principle of colonic absorption of gases to and from the bloodstream was not a new topic. Some of the early published works on rectal anesthesia were by Nikolay Pirogov (1810-1881; Surgeon, Russia) in 1847 [4]. Further use of this method did not turn up until much later as some of the earlier work had unfavorable results, which led to its discontinued use. Sutton noted that Paul Bert (1833-1886; Professor of Physiology, Sorbonne, Paris, France) in 1870 had performed experiments on kittens in which the trachea was clamped and the kittens died of asphyxiation [5]. In the same experiment, kittens' intestines were inflated with air, and their life was sustained for a few minutes longer compared to their counterparts.

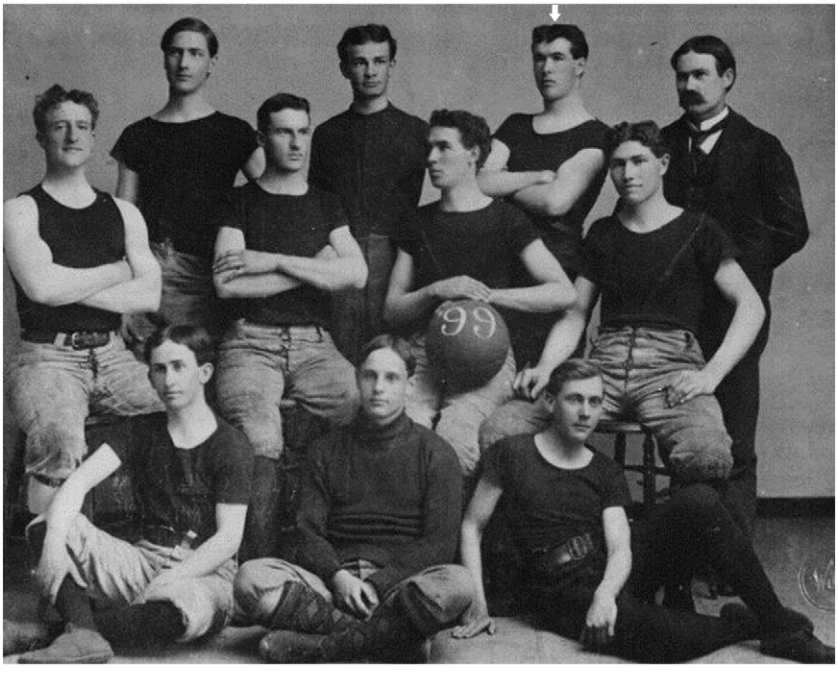

Fig. 2. Kansas University Men's Basketball team, 1899. Walter Sutton (arrow) in third row, second from right. James Naismith (coach), inventor of the game of basketball, in third row, far right. Photo courtesy of the University of Kansas Archives, Spencer Research Library, Lawrence, KS.