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history

Otto Folin's Decade in Minnesota, 1882–1892: A Brief Review[1]

A century ago, research in organic chemistry was deeply imbedded in things physiological and biomedical that later evolved into distinctly separate, though related, scientific disciplines. Editors of *Hoppe-Seyler's Zeitschrift für Physiologische Chemie* included distinguished physiologists, organic chemists, and medical (physician-trained) chemists such as A. Kossel, E. Fisher, E. Salkowski, and O. Hammarsten. Their community of interests was viable because chemical research in biology was largely descriptive. The structure and composition of natural substances such as proteins, nucleic acids, carbohydrates, and lipids must first be characterized as organic compounds before their origin and metabolism could be explored. Consequently, clinical applications had to wait.

Otto Knut Olof Folin (1867–1934) helped bridge this gap between organic chemistry and medicine by forging a connecting link of "biochemistry" through research into the metabolism of protein and its excretory products. This link was strengthened by his use of human rather than animal body fluids as a major material resource for chemical studies. Professor Folin developed his laboratory at the Harvard Medical School into a center for research and education, emphasizing quantitative methods in biochemistry. In this milieu, Hsien Wu and he would inaugurate a remarkably practical and simple system of blood chemical analysis that would be useful in the clinical laboratory for the next 50 years (*1*, *2*). Along with a few kindred spirits, particularly Stanley Benedict and Donald D. Van Slyke, Folin pioneered modern clinical chemistry in the United States. Two of his graduate students, James B. Sumner and Edward A. Doisy, later won Nobel prizes, and others made notable contributions. He provided consulting services to several local hospitals, as well as to the Metropolitan Life Insurance Company of New York. Folin himself worked for seven years (1900–1907) as a research chemist at the McLean Hospital of Waverley (Belmont) Massachusetts, and there wrote his first papers that drew international attention. He was a founder, councilor, and third president of the American Society of Biological Chemists, and a longtime editor of the *Journal of Biological Chemistry*.

Later on, I shall elaborate extensively on Folin's scientific and professional achievements in a full-scale biography. Now, to honor the hundredth anniversary of his emigration to the United States as a Swedish boy of 15, I shall here present features of his "Minnesota" period: the 10 years following his arrival in Stillwater, in August 1882.

Although the bustling town of Stillwater was then the focal point of the great lumber industry of the St. Croix Valley, and jobs were plentiful for men—and women scarce—Otto's brother Axel, who had provided him with passage money to emigrate via an American Line steamship from Gothenburg, sent him to live for a few months with an Aunt Ingrid and Uncle Nels Peter Johnson, and their two adult children, Hannah and John, on a farm about 30 miles north, in Chisago County, near Center City. There he could work, attend grammar school, and presumably learn English. It was for this reason, Otto recalled much later, that his grasp of the language was delayed. Not only was the school too far away, but his companions and relatives spoke only Swedish interspersed with some English words so that, though he felt at home, the new tongue came laboriously. However, Otto had been quite impressed when Axel had pointed to a Swede in Stillwater and said that there goes a successful fellow countryman, a fireman, who got his job because he had learned English immediately after his arrival. With the first money he earned, Otto bought an etymological dictionary and began reading what he could find (*3*). Before the year was out, Otto returned to Stillwater.

In the rural economy of that era, education was universally limited to grammar school, which, once completed, led directly for boys to the labor and farmhand market or to an apprenticeship in a trade. Otto had received two extra years of education in his home area of Åseda, his birthplace in the province of Småland, in Southern Sweden. Only one other of the eight Folin (Fohlin) children was given this privilege.

Otto's father, Nils Magnus (1825–1903), was a tanner—apparently not a very successful one, because none of his seven sons followed in his footsteps, and because the family moved to Åseda from Ryssby in 1864 when Otto's mother, Eva (Olson) Olofsdotter (1830–1915), became the midwife for the parish, a job that provided board, housing and a small salary. In 1883, the year after Otto left, the family moved to Traryd, again prompted by the midwife's position.

It seems fairly certain that Otto's mother perceived his intellectual acuity early in his life, and stirred his interest in science. Otto was a self-propelled reader, thoughtful, laconic. He was healthy, strong, tall, and loved the outdoors. His sense of duty and his dedication to humanitarian services must have been profoundly stimulated by his mother's example. Otto's niece, Hildur (1888–1970), described Eva as "... on duty twenty-four hours a day. For her there was no rest. She had a wonderful constitution, a cheerful disposition, and a wholesome philosophy of life, which enabled her to carry on until the children were self supporting ... she was truly a remarkable woman."

Why had Otto's brother, the 17-year old Axel, come to the U.S. in 1871? Emigration had then reached epic proportions. In the last half of the past century almost 20% (more than a million between 1860 to 1910) of the Swedish population departed to the U.S., primarily for economic reasons. As health improved in Sweden, attributed to "peace, potatoes, and vaccines," the birth rate considerably exceeded the death rate, so that despite the expanding, mainly agrarian economy, it could not meet the needs. The United States offered powerfully tempting opportunities to the dispossessed, the landless, the hungry, and the dissenting (*4–6*). Here was Småland

[1] In preparing for the biography to be published and this sketch, the author has received reference material from a large number of people as well as archival sources. Space does not permit listing them here, but they will be acknowledged fully in the biography.

This biographical sketch is the fifth in a series that is being prepared by or at the request of the Subcommittee on Archives of the Professional Affairs Committee, AACC. The preceding one is referred to here (*1*).

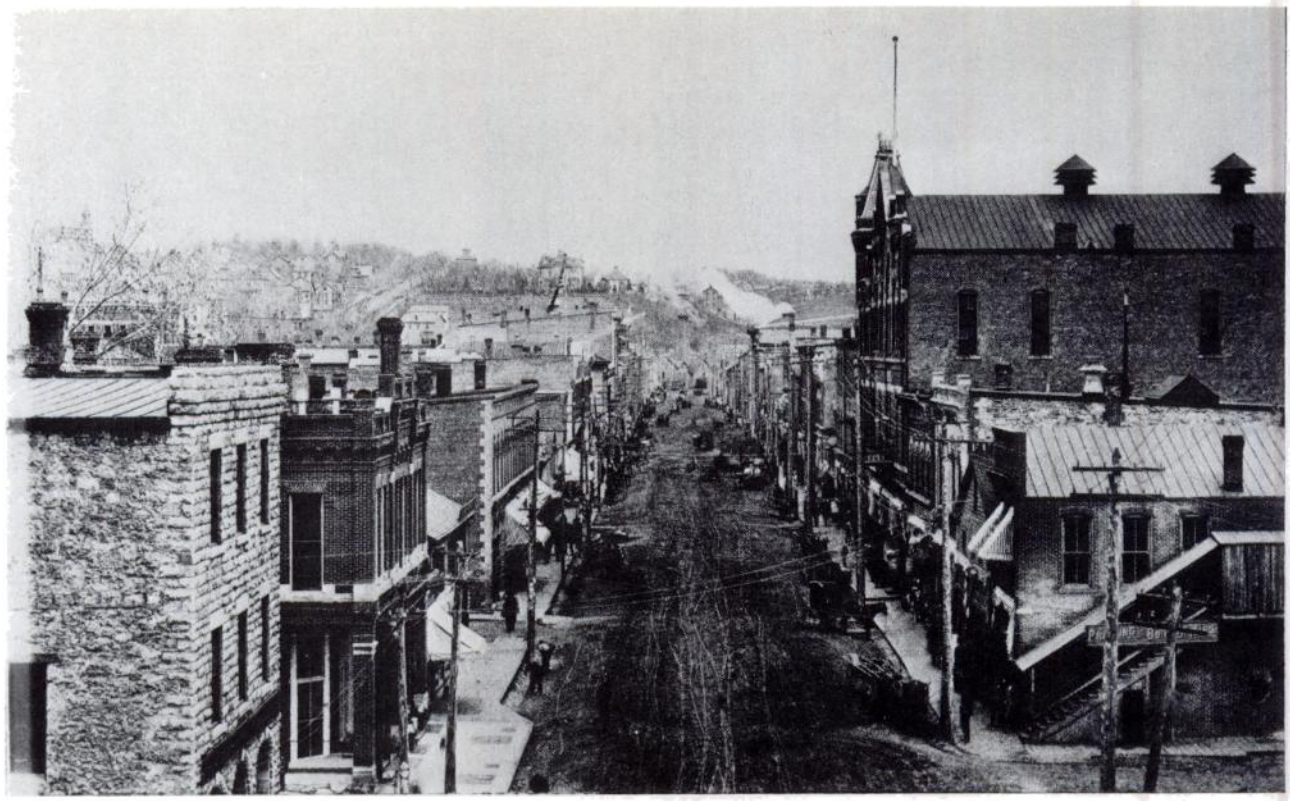

Fig. 1. Looking north on Main Street, Stillwater, Minnesota

Picture taken in 1885 from the Main Street stairs. Collected by John Runk, photographer, Stillwater, MN (Historical Collection No. 218, Minnesota Historical Society). Note the horses and wagons, dirt street, wood sidewalks, and telegraph lines. Electricity had appeared, and telephones were in their infancy

without its interminable stones. Fertile farm land sold for as little as $1.25 per acre. Early settlers merely "squatted" on the land until they raised the purchase price. The Homestead Act of 1862 provided millions of acres of free land. Railroad-owned land sold cheaply along the right of way. Axel had come to Minnesota not only because of the promise of economic stability but because relatives and a host of Smålanders had preceded him there, and had written of America in glowing, beckoning terms. At least four families of kin were already established; two aunts (Johnson, Bredenberg), and two cousins (Miller, Liberg). In a few years, a third brother, Alfred, would also emigrate (1887), and finally, much later (1906), the niece Hildur. Axel was a head sawyer in a lumber mill across the river, but eventually bought and worked his own farm north of Center City, near Almelund, in the Chisago Lake region made famous by the great Swedish historical novelist, Vilhelm Moberg.[2] Alfred was a harness and saddle maker, and a shoe repairman.

Axel, older than Otto by 13 years, married a Norwegian woman, Anna, but the couple was childless. He was Otto's "big brother," counselor, and supporter. Not only did he encourage Otto to get an education—which he himself had been denied—but provided the means to do so in the form of loans, a fact of critical importance to Otto's postgraduate university training. Otto, however, soon supported himself, and worked for his keep wherever he went. Before he graduated from high school, he paid off all of his early debts to Axel, including his passage money.

Until the autumn of 1885, Otto was mostly a farmhand, first, as mentioned previously, for a few months at his aunt's, and then in the following year for a much longer period with an Irish family across the river in Erin Prairie, St. Croix County, Wisconsin. Once living with the Irish family, in a predominately Hibernian community, he attended school regularly, and learned English more proficiently, abetted by the fact that he could not resort to Swedish. No doubt he may have temporarily developed a bit of an Irish brogue.

While working in a sawmill during his first winter in the U.S. (1882–1883), Otto describes his leading a "typical workingman's life where we lived together, about fifty men all sleeping in one room. I had a rather nice man for a bed partner, but occasionally on a Monday I would find him wrathy because I used to soak the bed with kerosene before going home to my brother on Saturday evenings." Anyhow, kerosene temporarily subdued the bedbugs.

After working the summer of 1885 on the farm of the Irish family, Otto returned to Stillwater to enter the Lincoln School for a further year of elementary school preparatory to entering the high school. During this period, young Otto earned his board and room as a "porter" at the Daniel Elliott Boarding House at Third and Chestnut Streets. In that era, boarding houses provided economical food and shelter for much of the resident (primarily male) population, as well as for transients. Undoubtedly, Otto performed both menial and some clerical chores, from catering to the boarders' needs, chopping wood, shovelling snow, tending the stoves, and keeping the kerosene lamps full, to fetching supplies and minding the office desk. For most of the summers to come, he worked as a farmhand, or at the St. Croix log boom, or in a lumber mill, performing odd jobs to earn money for clothes and educational needs, and always for his board and room.

Stillwater, during the 1880's was a thriving community of more than 15 000 people. Although the town had important

[2] Moberg depicts the area and the life of its early settlers through the eyes of Karl Oskar Nilsson, his wife, Kristina, and their family and community in the four-part work of fiction, *The Emigrants* (Fawcett Popular Library, New York, NY). While Otto Folin would visit his relatives at Center City, he pioneered on a new frontier, the science of clinical biochemistry.

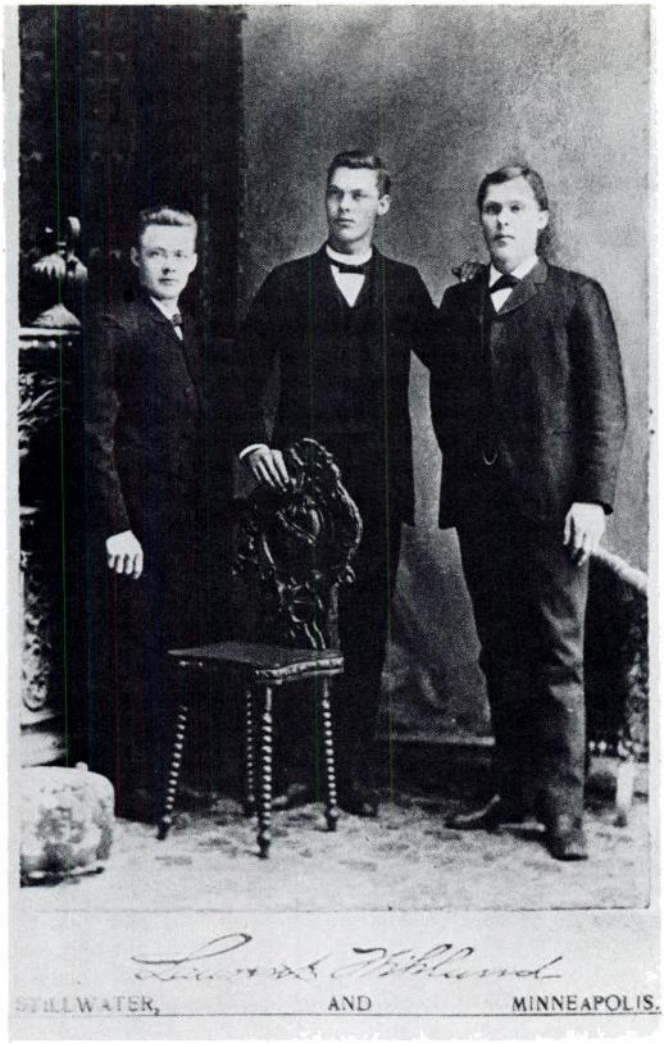

Fig. 2. The three Folin brothers, *circa* 1892, Stillwater, MN
Left to right: Alfred (1862–1933), Otto (1867–1934), and Axel (1854–1940)

industries such as manufacturing threshing machines and housing the Minnesota State Prison, it was the major center in the northwest for lumber. Logs were cut during the winter by crews of hearty lumberjacks in the vast, pristine white-pine forests further north, transported on wagons pulled by teams of horses to landings on the frozen tributaries of the St. Croix river, and in the spring, floated downstream to the river, and then on to the wide, calm area of the "Boom," about two miles north of town. At the great St. Croix Boom, where as many as 600 men worked, the logs were stopped in their downriver course by strings of interconnecting logs tied together, known as "boomers." The logs were identified by notchmarks (brands) and sorted as to owners, then tied and nailed together into rafts. Literally millions of logs were rafted. These fed the many mills in the Stillwater area, but huge rafts 30 feet wide and 600 feet long were towed and floated to the Mississippi, to mills as far downstream as St. Louis.

Sooner or later most of the young men and boys of Stillwater worked at the Boom, including Otto. Men were paid an average of $1.50 for a 10-hour day, and this pay also included meals and a bed in the bunkhouse (*8*). Perhaps it was in the dining room that Otto met Daniel Elliott, who was one of the highly respected cooks of the sturdy meals provided the workers, before he opened his own boarding house, and later became a Stillwater alderman.

Once the lumberjacks finished their stint in the forests, they invaded Stillwater, their pockets stuffed with six months' pay, and their appetites soaring. A city directory for 1884 lists no fewer than 55 saloons there (*9*). Money flowed like the St. Croix to gratify the temptations of the flesh. Stillwater, however, was more a city of virtue than vice. Almost half of its population was foreign born, with Scandinavians, Germans, Canadians, and Irish predominating—a true melting pot. A great many of the native born were children of these immigrants, and well disciplined, frugal, and religious. Money earned both directly and indirectly from the lumbering industry was saved for buying farms, businesses, and homes. Lumbering provided a well-earned stake to launch many a future landowner who had emigrated penniless to the U.S.

Entering high school in 1886 was momentous in Otto's life. Minnesota was the first state to offer free public secondary education—a boon for the children of the poor, particularly those who harbored ambitions to enter a profession (*7*).

The Stillwater High School had a faculty of five, including its principal. Of the six students in Otto's graduating class from the new high school, three, the Batchelder brothers and Otto, would go on to attend the University of Minnesota.

Otto's records do not adequately reflect his remarkable achievements in high school. He began adversely by missing the first month of school because of "inflammatory rheumatism." But he was determined to complete the four-year curriculum in two years, and he did (1886–1888). Despite a somewhat mediocre showing in the non-science courses, as well as in botany and physiology, no doubt partly related to his slow start and his lingering though fast-disappearing language problems, he displayed a flair for mathematics and science. Otto's highest marks were in solid geometry and chemistry, but he also fared well in plane geometry, algebra, and astronomy. This success also reflects well on the solid education that he had received in Sweden. Unfortunately, there is no hint as to who advised or encouraged Otto to go on with his education at the nearby University of Minnesota. Perhaps it was Frank T. Wilson, "Teacher of Sciences," who later became Superintendent of Schools, or Ida Hoyt, the retiring principal, or her successor, Sarah Palmer, Minnesota class of '81, who had friends there whom she visited. Or it could have been Mr. J. H. D. Hutchinson, who had taught Otto some of his mathematics and was an 1884 graduate of that University where his brother was a professor. At any rate, Otto had demonstrated his intellectual capabilities and, financial needs notwithstanding, he was determined to go on in science.

Otto was now 21 years old. He had developed work and study habits that would assure him ultimate success in the long, exhausting academic grind ahead. Otto was 5′11″ tall (180 cm) and would eventually weigh at the most, 165 pounds (75 kg). He had blue eyes and brown hair, a straight nose, a medium-size forehead and mouth, set in an oval face of fair complexion, with very smooth skin.

Although he had been reared under the influence of the Lutheran Church and had received an extra two years of schooling involving a Lutheran minister in Sweden, Otto was neither a churchgoer nor a member of a congregation. Fending for himself did not leave him spare time for social or religious activities, and evidently he suppressed serious considerations of love and marriage. He had long resigned himself to the fact that to become an educated man, he must for the moment lead an austere, disciplined, puritanical life.

At the high school commencement exercises, held in the Stillwater Grand Opera House, each of the six graduates was required to make an oral presentation. Otto's oration was on the evils of capital punishment. Completing high school in two years brought him special recognition in the form of an article published in the *St. Paul and Minneapolis Pioneer Press* (June 1, 1888, p 10).

Otto Folin would flourish at the University of Minnesota, in Minneapolis. President Cyrus Northrup and his predecessor, William Watts Folwell, had assembled a superb fac-

ulty. Otto's class of '92 was small: only 80 students were in his group at graduation, though the enrollment grew to about 1200 during those years. On the entrance examination, Otto's best mark was 90 in English Grammar, but only a 68 in English Composition. His other grades were unremarkable. In the short space of his freshman year, however, Otto would demonstrate not only that he was a bright student, but that science, especially chemistry, was his forte.

Soon, under the cultivation of the gifted teacher of rhetoric and elocution, Maria Sanford, Otto would reveal outstanding reading and writing skills. He would also become one of the school's best debaters. Miss Sanford did much to nurture opportunities in oratory by establishing debating groups and promoting contests. Otto participated as a member of the literary group, the Hermeans.

In chemistry, Otto was encouraged by a young professor, James Albert Dodge, who had recently obtained his doctorate under Bunsen in Heidelberg, Germany, and who held bachelor's and master's degrees from Harvard. Many years later, Otto would pass on to his own students the lessons of his devoted teachers. His scholarly, spirited lectures were usually presented with the help of few notes, punctuated with humor, and filled with overtones of a Swedish accent—in all, unforgettable in style and content.

Fortunately for Otto, tuition at the University was free, and the total annual fee for "incidentals" was five dollars. This cost remained unchanged during the four years he attended. From his summer work as a laborer on a farm, road gang, Boom, or sawmill, Otto could save enough money to buy his clothes and books. At the University he earned his board and room at various odd jobs, including the tending of horses for a local civil engineer and as a night clerk in a St. Paul hotel. Brother Axel was always a buffer for pecuniary emergencies, and Anna and he welcomed Otto to share their home, particularly during the holidays and summers. In his junior year (1890), Otto became a naturalized American citizen, the Batchelder brothers serving as character witnesses. (Incidentally, one of these brothers became a physician, and the other an engineer.) In that year, Otto made lasting friends of two other students who would share his immediate future significantly: the loquacious, suave, intelligent Madeleine Wallin, and the robust, public-spirited George Sikes. The two friends early recognized Otto's intellectual gifts, and his dogged drive to succeed despite his poverty. Madeleine was the daughter of a North Dakota (and later Chief) Justice of the Supreme Court. After two years at Smith College she had transferred to Minnesota. George was a Minnesotan who had learned the printer's trade as a boy. He financed his education at the University by part-time work as a compositor for the *Minneapolis Tribune* and, young as he was, served one term as President of the Minneapolis Typographical Union. He was also a varsity football and baseball player, a good orator, a YMCA officer, and honor student. These two particularly, with the encouragement of Maria Sanford, no doubt, promoted Otto's interest by helping him get elected to the top post on the school newspaper, Managing Editor (Editor-in-Chief) of the *Ariel*. They also served on his editorial staff as contributing editors. This editorship was voted by the student body, and Otto, an independent, won handily, although fraternities and sororities usually mustered the most votes for their own candidates. No pay was involved, though the newspaper during his year of tenure became a "weekly" (each 12 to 15 pages long) rather than a monthly publication: Twenty-four issues were produced in all, financed by advertising and by annual subscription rates of $1.50. While blessed by the University administration, the *Ariel* was entirely produced and marketed by its student board of editors; and it was without faculty or university control. Serving as Managing Editor was assuredly Otto's highest and most satisfying honor at the University. He deservedly became a big-man-on-campus, though a humble one. He was dubbed "Chief" and retained that sobriquet in the years to come. This experience would one day lead him to write thoughtful, polished scientific papers, and as mentioned previously, to edit constructively for the *Journal of Biological Chemistry*.

Otto's academic training in chemistry was thorough, though as a science major he apparently had no courses in physics. His studies in biology were limited to botany; he had no preparation in zoology or animal physiology. In both his junior and senior years he took extra work on Scandinavia. His interest in his own origins and background was no doubt stimulated by hearing the popular Norwegian lecturer and scholar, Professor O. J. Breda. He had previously had some exposure to German in the school in Sweden, but he took two quarters of it as a senior, indicating that he was being well advised to do so, probably by Dodge, to meet needs for graduate study and research in chemistry, a discipline in which German chemists were then preeminent. He took mathematics in his freshman year, but apparently no more. This was supplemented with mechanical drawing, surveying, and astronomy. He had single courses in logic, psychology, and mineralogy. While Otto was well grounded in English literature and languages, he did not develop appreciation for the visual arts or music. He could not carry a tune. He had little experience in the common U.S. sports, though his friend Sikes excelled at them. Intramural sports were minimal in those days, and no facilities for exercise were available. Intercollegiate sports barely existed, with little support from the university or student body. Otto did enjoy cycling on the country roads. Tending horses never engendered in him any great fondness for horseback riding.

In those days of small classes the faculty was well acquainted with their students. The doors were open to those who sought advice and counselling. During his sophomore and junior years Otto took courses in history. It is likely that the very popular Professor Harry Pratt Judson taught one of those courses. So when Judson was named Dean of Undergraduate Studies and Professor of History at the newly opening coeducational University of Chicago in 1892, a number of his admirers would naturally be curious about graduate school opportunities there. The youthful president of The University of Chicago, William Rainey Harper, despite perpetual financial woes, was assembling an extraordinary faculty, with particular stress on graduate studies, research, and publication. Madeleine Wallin, George Sikes, and Otto Folin were among those whose interests were aroused. In fact, Otto noted in his penultimate issue of the *Ariel* that "Sidney A. Kent has donated $150,000 for a chemical laboratory for the Chicago University. About the same time Mr. Rockefeller added $1,000,000 to his former gifts of $1,600,000."

Madeleine and Otto applied both for admission and fellowships; George decided to wait for a year. The number of Minnesota students interested was large enough that they soon talked of forming an alumni group at Chicago. Later, the "Minnesota Delegation" was formed into a club of nine members, with Judson as its mentor.

Meanwhile, at Vassar College, in Poughkeepsie, New York, another Minnesotan, the Canadian-born Laura Churchill Grant, daughter of a St. Paul building contractor, and a mathematics major, had also applied for admission. In this she had also been influenced by a popular faculty member, Myra Reynolds, an English instructor, who had taken a position as Fellow in English at Chicago and would become Head of Foster Hall, the woman's dormitory that was then under construction, and where Laura and Madeleine Wallin would live. Laura would join the Minnesota group and soon befriend the reserved, preoccupied, impecunious chemist from Stillwater. She would penetrate this fragile shell of seeming indifference to women.

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