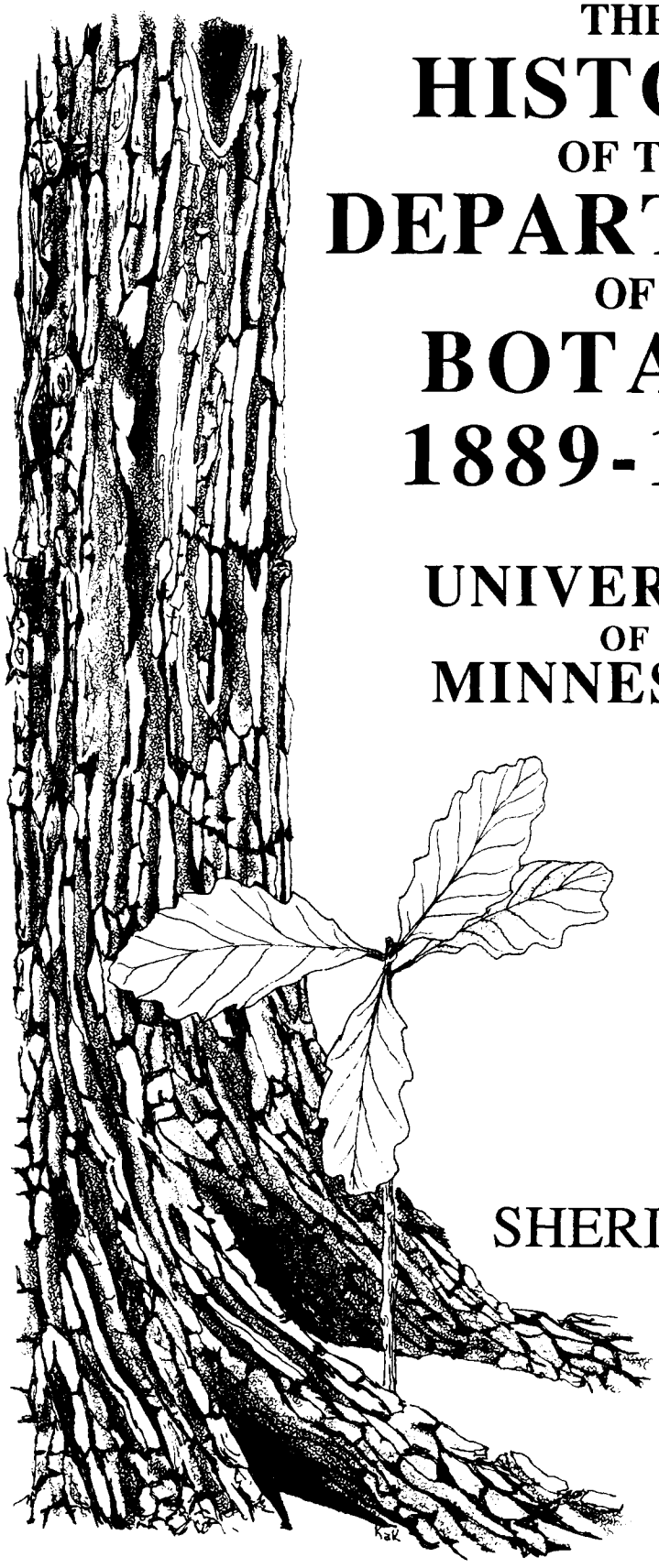

THE HISTORY OF THE DEPARTMENT OF BOTANY 1889-1989

UNIVERSITY OF MINNESOTA

SHERI L. BARTLETT

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Preface

The history that follows is the result of months of research into the lives and work of the Botany Department's faculty members and administrators. The one-hundred year overview focuses on the Department as a whole, and the decisions that Department leaders made to move the field of botany at the University of Minnesota forward in a dynamic and purposeful manner. However, this is not an effort to prove that the Department's history was linear, moving forward in a pre-determined, organized fashion at every moment. Rather I have attempted to demonstrate the complexities of the personalities and situations that shaped the growth of the Department and made it the unique and exciting research center that it is today.

There are a number of recurring themes from 1889 to 1989. Perhaps the issue that occupied the thoughts of Department members the most was the problem of space. From the beginning the Department suffered from less than ideal facilities, and the issue was not successfully resolved until the construction of the Biological Sciences Center on the St. Paul campus in 1972. Also the Department continually confronted the question of where its administrative and physical home should be--whether the Department should be located on the Minneapolis or St. Paul campus, and whether its administrative and research affiliations should rest with the College of Liberal Arts (formerly the College of Science, Literature and the Arts), the College of Agriculture, or some other area. Eventually these questions were resolved in 1965 when the Department joined the newly established College of Biological Sciences (CBS). In 1988, The Department of Botany was renamed the Department of Plant Biology, and Irwin Rubenstein from the Department of Genetics and Cell Biology became Plant Biology's new head. The Department now has administrative ties to both the College of Biological Sciences and the College of Agriculture.

I have tried to recognize the accomplishments and individuality of the Botany Department's faculty while striving to describe the Department as one entity. For a non-scientist this task was especially difficult, and I am indebted to many of the faculty for their helpful suggestions and patience in explaining their particular scientific endeavors.

The most rewarding part of completing a project is the moment when the author gets to thank all those who put time and energy into making this history a success. Matt Sobek and Jeff Pilz enabled me to work at home on my own time by loaning me their computers for the summer. Brad Larson took an ordinary manuscript and with his computer skills made it an attractive and easily readable book. Jeffrey Browne offered support, encouragement, and during the final stages of production put his desk-top publishing expertise at my disposal. The

secretarial staff of the Department of Plant Biology, especially Ellen Harnisch, Lori Nicol and Joni Suda kept everything running smoothly.

There are many people who contributed their time to assist me with research, or provided photographs, documents and other memorabilia from their private collections. Professor Thomas Morley saved all of his department meeting minutes over the years, thus making my task much easier. William A. Reiners, Donald B. Lawrence and Chris Cole granted me oral interviews, the transcripts of which are held in the University of Minnesota Archives. Jean McIntosh kept extraordinarily good records during her forty years as Department secretary and maintained scrapbooks as well that offered captivating stories and information about many scientists. Penelope Krosch and Lois Hendrickson in the University of Minnesota Archives located many an obscure document and also edited the final manuscript. Janice Kragness offered valuable criticisms, helped me to choose photographs and listened to many tales about people and plants she did not know. Kristine Kirkeby, graphic artist in the College of Biological Sciences, educated me on the intricacies of production and drew a wonderful "Hodag" (see Chapter One). Last but certainly not least, I would like to thank Irwin Rubenstein, who gave me the opportunity to meet some amazing botanists in the past and the present, and whose enthusiasm and energy for this project never failed.

While it is an oft-used cliche, it is nonetheless true that without the memories, documents, photographs and love for history that C. Otto Rosendahl, Ernst C. Abbe and Donald B. Lawrence possess, this project could never have been completed. From the outset of the research, I was impressed with the appreciation for history that I found in all of the Department members, but I am convinced that if botany had not been their first love, Professors Rosendahl, Abbe and Lawrence would have made fine historians. This book is dedicated to these three scientists, who are scholars in the true sense of the word.

Chapter One: 1889-1916

Beginnings

The Department of Botany has its origins in the hiring of Conway MacMillan in 1887. Prior to that year instruction in botany rested with Professor C.W. Hall, who was primarily a geologist and later dean of the College of Engineering, Metallurgy and Mechanic Arts. In 1887 the Executive Committee of the Board of Regents gave Hall permission to hire an instructor in botany for an annual salary of $300; that instructor was Conway MacMillan.[1]

In 1887 there were only thirty-four faculty members at the University; most of them, including MacMillan, reported directly to the Board of Regents in the absence of formal divisions and departments. When MacMillan was hired, his responsibilities included both the instruction of botany and the collecting of specimens for Minnesota's Geological and Natural History Survey. In 1890 the University appointed him State Botanist of the Geological Survey which brought MacMillan's income for both teaching and collecting to $1800 per year.[2]

In 1888 the Board of Regents created a College of Agriculture and a College of Medicine. Botany instruction was crucial to both of the new areas, and botanists developed classes designed for students of horticulture, grain farming and pharmacy. Several of the early botanists at the University had dual appointments in botany and pharmacy; C.A. Ballard, an instructor in 1893 and 1894, taught pharmaceutical

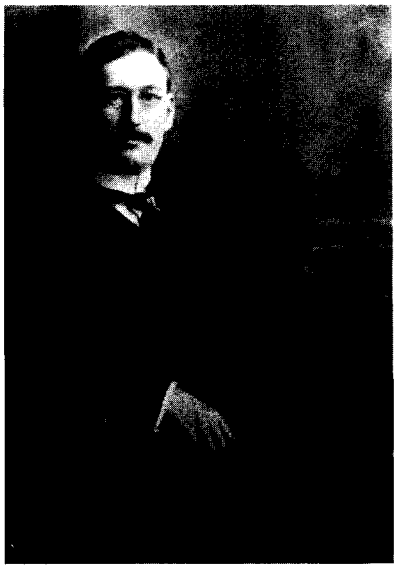
Sitting, left to right: Henry Nachtrieb, Conway MacMillan, Josephine Tilden, Unknown botanist. Standing, left to right: Professor Oestlund, Professor Lee, A.P. Anderson, student from Upsala. Gull Lake Expedition at Long Lake, Minnesota (1893).

botany, as did Frederic Butters and E.M. Freeman, both hired at the turn of the century.[3]

Several requisitions for equipment and furniture, and the reappointment of MacMillan as Instructor in Botany document 1889 as the year that the Department itself became an entity.[4] The University also established its first inland biological station at Gull Lake, Minnesota, in 1889 owing to the persistence of MacMillan, Professor Nachtrieb from Zoology and Professor Oestlund from Entomology. Funded by ex-Governor Pillsbury and the Northern Milling Company, the biological station gave the Department its first publicity in local news accounts.[5]

The facilities the University provided for botanical research and instruction were less than ideal. While the Experiment Station administered by the College of Agriculture was located in St. Paul--where "seed rooms No. 1 and 2 in the barn [were set aside] for the work of the Entomologist and Botanist"--other rooms allocated to botany were located on the Minneapolis campus in the medical school and in Pillsbury Hall, which was built in 1889. Responding to pressure over the scattered workplace and the lack of a proper greenhouse, the Regents authorized the building of a $4,400 "plant house" at the St. Paul Experiment Station in 1888.[6]

The Department owed much of its development in the first few years to the leadership and administrative talents of Conway MacMillan. Constantly pushing for increased funding for equipment and personnel, MacMillan was often a thorn in the regents' side. As Professor Rosendahl once remarked, "he was a rather temperamental man," yet his tenacity resulted in the hiring of approximately fifteen new instructors and professors during his tenure as Department chairman.



Conway MacMillan (1900).

Conway MacMillan was born in Michigan in 1867. As a boy he and his family moved to Lincoln, Nebraska, where he earned his Bachelor's degree at the age of eighteen and his Master's degree a year later. He went on to study at The Johns Hopkins University before joining the faculty at the University of Minnesota in 1887. Shortly after his appointment as Instructor, MacMillan took a leave of absence to continue his graduate studies at Harvard.[7] He did not earn his Ph.D. but instead returned to Minnesota and worked with C.W. Hall and Professor Nachtrieb to expand

teaching and research in geology, zoology and botany. The Regents appointed MacMillan full professor and Department chairman in 1891.[8]

The term "gentleman scholar" is apt for MacMillan. His ability to write descriptive prose and his eloquent speech were admired and envied by colleagues and students; in fact it is rumored that he dictated Minnesota Plant Life in just six weeks, with no revisions.[9] MacMillan's willingness to take on new projects in the interest of furthering both science and human relationships left its mark on the Department long after he resigned from the University to take a job in commercial advertising in 1906.

One of the people MacMillan encouraged as a student and later as a colleague was Josephine Tilden. Tilden was born in Davenport, Iowa, in 1869, but her parents soon moved with her to Minnesota. She earned both her Bachelor's and Master's degrees from the University before her 1895 appointment as the institution's first woman scientist.[10] In later years Tilden recalled what it was like to be a student in MacMillan's freshman botany course: "We all feared the man, and cringed at being called on in class." But one day he brought a kitten to class which he had rescued from in front of the Zoology Building. Rhetorically he asked the class who would give it a home as he walked over to Miss Tilden and plunked it in her lap. That was the beginning of a fruitful professional relationship and friendship that carried them to the Pacific coast, among other places.[11]

Josephine Tilden (1926).

The Seaside Station

Tilden's career in phycology prompted her to explore the Pacific Coast in search of specimens and areas for research. Explaining the combination of factors that led her into the study of algae, Tilden remarked:

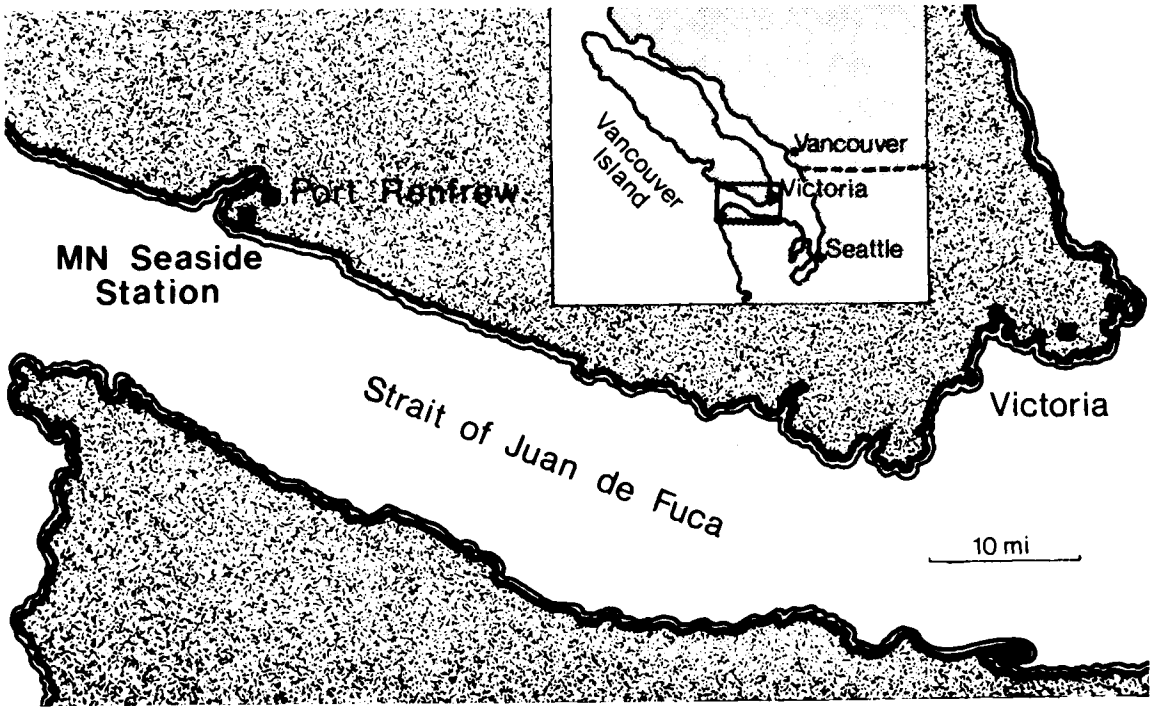
> While still an undergraduate, Professor MacMillan and President Northrop suggested that I prepare to continue work in the field of algae. A University position would be given me if I would promise to stay at least five years after graduation, in order that the University could afford to purchase the necessary works on algae and start a herbarium. I finally promised. They asked for a plan of work that I thought I could carry out. Because Pacific algae had been little studied and because, accompanied by my mother I could work on the shores of most of the countries, I chose 'The algae of the Pacific Ocean, especially the southern portion.' Opposed at first, I finally got my way.[12]

In 1900, travelling by canoe and asking questions of ships' captains, Tilden discovered a largely uninhabited and

undeveloped bit of coastline in British Columbia that provided an abundance of algae and tidal pools. A local family, the Bairds, donated a tract of land adjoining what later became known as Botanical Beach, and Tilden made arrangements for the building of a biological research station. Using a great deal of her own finances and with the enthusiastic support of MacMillan, Tilden saw the completion of the Minnesota Seaside Station in 1900. The Botany Department's experiences at the Minnesota Seaside Station exemplified what was adventurous and new in the field of botany at the beginning of the twentieth century, and the research and teaching that was part of the Seaside experience was an important part of the Botany Department's mission in its early years.[13]

From 1901 to 1906 the Department of Botany operated the Seaside Station, with Tilden continuing to provide funding while MacMillan wrote articles for Victoria's Daily Colonist and Minnesota newspapers promoting the research opportunities for secondary school teachers and students at the Station. In an article for the Minnesota Alumni Weekly MacMillan described the site in his elegant prose.

> The exact situation of the Station is on a little cove at the entrance of the Straits of Fuca, nearly opposite Cape Flattery, just outside the picturesque harbor of Port Renfrew and about 60 miles north of the city of Victoria. The west shore of Vancouver Island is described in the old books of travel as a 'stern and rock-bound coast' and it does, indeed, seem a perilous one for navigation. During much of the year there is mist and fog to conceal the reefs and ledges, and it has been the scene of many a tragedy of the sea since the old days



Minnesota Seaside Station near Vancouver, B.C. Map courtesy of the James Ford Bell Museum of Natural History.

> of Drake and Ferrelo, and of the quest for the Northwest passage....When the Straits are flashing with the breeze the picture of ocean, shore, forest and mountain is one of the most beautiful in the world, rivalling the Bay of Naples or the Adriatic and almost equalling the matchless Peruvian coast and the sea-front of Ecuador.[14]

Between 25 and 30 professors and students journeyed to the Seaside Station by train every summer to study geology, algology, zoology, taxonomy and lichenology. Several world renowned scientists participated in the lecture series, including Professor K. Yendo of the University of Tokyo. Students worked from 8 a.m. to noon and from 2 p.m. to 6 p.m. with optional lectures at noon and in the evening. The schedule was rigorous, but for most of the students the advantages of being outside in a living laboratory seemed to outweigh the difficulties of long hours spent collecting and studying specimens.[15]

In addition to the hours of research and teaching that occurred at the Station, faculty and students worked hard at enjoying themselves. Professors Fred Butters, C. Otto Rosendahl and Ned Huff led a number of strenuous hiking trips, including one along the width of Vancouver Island, a trek of over fifty miles, through densely forested terrain.[16] Plays and storytelling were part of many evening's agenda, and toward the end of the summer's work an annual formal dinner was served, complete with after-dinner dancing. On another dancing occasion, the lighter side of MacMillan's personality was illuminated. According to a student, "Professor MacMillan was dressed up as a fashionable lady--low neck and short sleeves, swell bonnet, etc.--Never saw anyone who could equal him in being ridiculous."[17]

Rituals of various kinds were important to the morale of faculty and students on expeditions, and the Seaside Station was the site for two interesting ceremonies. For several summers, adventurous folk participated in "Hodag Worship." The "Hodag" was a creature of lumberjack lore, created by Eugene Shepard of Wisconsin in the late nineteenth century.[18] At the Seaside Station, Professors Rosendahl, Butters and MacMillan adapted the myth of the Hodag and developed a ritual centered around it. Butters became the "high priest," and he explained to the others that eating food for the Hodag was the only way to placate the wild beast. Butters apparently consumed many a delicious meal as proxy for the Hodag. The records of the Hodag ceremony still exist, and one evening at the Seaside Station, Butters wrote the following proclamation.

> 1. Then C. Otto Rosendahl did take a shingle of cedar wood and did make unto himself a Hodag.
> 2. Which was in the likeness of nothing which is in the heaven above or the earth beneath or the waters under the earth;
> 3. And setting the Hodag upon a stick the camp did bow down unto it and serve it, and from that day was the whole camp greatly prospered.
> 4. And it came to pass in the third year of Hodaggery that the Hodag developed a wonderful appetite,

5. And one Butters, a Gopher, being commissioned to eat for the Hodag, all men did marvel greatly there at.[19]

Another ritual of great importance was the Order of Energids, a ceremony created by MacMillan to teach "the profound and fundamental truths of cytology." Under MacMillan's direction, the faculty created "Port Renfrew Nucleus No. 1." In 1901 the Seaside Station group elected the following officers to the Nucleus: "Centrosomes of the North and South, Professors C.A. Ballard and Francis Ramaley; Wardens of the Astrospheres, Misses Josephine E. Tilden and Caroline M. Crosby; Karyoplast, Mr. Harold L. Lyon; Warden of the Nuclear Membrane, Professor Raymond Osburn; and Cytoplast, Professor Conway MacMillan."

According to MacMillan,

> The initiation was held on a stormy night in a circular cavern at the mouth of which the surf was thundering and even the more blase 'joiners' of the party agreed that the ceremony...was most impressive.[20]

Alice Misz, a student who participated in Seaside activities during the summer of 1906, wrote lengthy letters back to her mother in Minnesota about her experiences. It is clear from her correspondence that her six-week stay was the most unforgettable experience of her life both from an academic and personal point of view. She probably would have agreed with MacMillan when he wrote, "...the Marine Station is a most important adjunct of the department."[21]

The research done at the station

Hodag Worship at the Seaside Station (c. 1900).

provided many of the building blocks of Tilden's career in algology, but unfortunately the University did not see the continuance of the Seaside Station as a useful endeavor. Unwilling to maintain a station that was part of Canadian territory, the Board of Regents voted on May 2, 1907, to discontinue its already tenuous affiliation with the Seaside Station, ordering the Botany Department to "return at once any apparatus, books or other property of the University that may have been taken to the Minnesota Seaside Station at Vancouver, B.C."[22] Tilden attempted to manage the financial and other burdens of the station on her own for another year but eventually gave up the fight. The legacy of the Seaside Station was two volumes of articles published in 1901 and 1906. Named for the palm tree-like kelp that grew in the intertidal zone near the station, Postelsia was "The Year Book of the Minnesota Seaside Station." Volume one contained seven articles from the evening lectures, including

Botanists at the Seaside Station during the summer of 1906.

K. Yendo's "Uses of Marine Algae in Japan;" F. Ramaley's "Remarks on the Distribution of Plants in Colorado, East of the Divide;" and Tilden's "Algae Collecting in the Hawaiian Islands." Volume two also contained seven articles but all recorded botanical and geological features of areas mainly adjacent to the station. These included Rosendahl's "Observations on Plant Distribution in Renfrew District of Vancouver Island;" Butters's "The Conifers of Vancouver Island;" and C.W. Hall's "Some Geological Features of the Minnesota Seaside Station."[23]

The Herbarium

Perhaps most significant for the growth of the taxonomic interests of the Department was the approval given by the Executive Committee of the Board of Regents on May 27, 1889, to put $500 toward the "purchase of the Sandberg Herbarium for the Department of Botany." John Sandberg, a Swede who spent his later years in Minnesota, had built an extensive collection of plant specimens through years of collecting in the Rocky Mountain states and through exchanges with botanists in nearly every country of the world. His herbarium of 6,000 specimens was rumored to be the largest private collection in existence, and it was the first of many impressive acquisitions for the Department of Botany in its first twenty years.[24]

The expansion and upkeep of the Department's herbarium was a source of

financial worries for Department chairmen throughout the years. As one administrator noted, the Herbarium "has to run the gauntlet of several committees as well as the legislature," and deans and presidents never appeared to understand the importance of the Herbarium to the Department's research and teaching. Nonetheless, by 1914 the Department had a Herbarium containing approximately 400,000 specimens, having acquired the Congdon collection of 9,000 California plant specimens and the Holway collection of plant rusts in 1913; in 1917 they added the Moyer Herbarium of 5,000 specimens.[25]

Herbarium sample from Sandberg Collection (1887).

The importance of the Herbarium in the early years is demonstrated by the sheer amount of correspondence devoted to answering requests for the exchange of plant specimens or to answering questions from lay people and scientists about particular plants. The Department exchanged specimens with the New Mexico College of Agriculture and Mechanic Arts, the Smithsonian Institution, the University of Wisconsin and the New York Botanical Garden, to name just a few.

MacMillan Retires

The Department's success in the early years is also apparent in work of alumni who earned their degrees at Minnesota. Rosendahl and Tilden both received their Bachelor's and Master's degrees from the University, and Butters earned his Bachelor's at Minnesota. Others took their degrees in Botany and pursued successful careers elsewhere. Francis Ramaley, the Department's first Ph.D. in 1898, (and the University's eleventh), went on to become head of the Department of Botany at the University of Colorado. Edmund P. Sheldon earned his bachelor's degree in 1894, stayed on as an instructor for two years, and then went to Oregon as a special field agent for the Division of Botany of the U.S. Department of Agriculture. By 1904 Sheldon was State Superintendent of Forestry and in charge of Oregon's forestry exhibit at the St. Louis World's Fair. Shortly thereafter he helped to launch the Oregon State Academy of Sciences (OSAS) and served as its president for a number of years.[26] Other students easily found jobs as secondary school teachers, as

instructors and professors at other universities, and some took jobs in industry.

In 1906 the Department's first administration ended when MacMillan retired at age 39 from the University to pursue a career in advertising with a Pennsylvania company. While the salary--three times the amount he was earning at the University--was no doubt a strong encouragement for leaving, MacMillan's struggles with the Board of Regents for departmental funding probably contributed to his departure.[27] Harold Lyon, an assistant professor in the department at the time of MacMillan's retirement, took over administrative responsibilities for one year, to be replaced by Frederic E. Clements from the University of Nebraska.

Clements was a meticulous administrator with a knack for the accounting and bookkeeping side of his duties. Many botanists from other institutions expressed reservations about Clements when asked to recommend him for the position of department chairman; one wrote that he seemed "rather sure of his own ability and position" and that his attention to details could be obsessive.[28] As it turned out their fears about Clements's rigidity proved to be well-founded; nonetheless, his administration had several successes.

One of Clements's first tasks was to present the case for maintaining two separate departments of botany at the University. By 1908 botanical research and instruction was directed from two units, the Department of Botany within the College of Science, Literature and Arts (SLA), and the Department of Agricultural Botany within the College of Agriculture in St. Paul. After hearing testimony from both sides--with Clements and President Northrop arguing for the Botany Department's continued incorporation into SLA--the Board of Regents decided to maintain the separation between the two areas of botany, and the Department of Agricultural Botany was incorporated into the newly created Division of Vegetable Pathology and Botany. E.M. Freeman, a former student of Conway MacMillan, was appointed head of this division in August, 1907. Though somewhat confusing to follow, these developments are important to note in light of decisions that the Department of Botany made during the 1920s (see below).[29]

One of the innovations that Clements brought with him was the "Sem. Bot.," short for Seminarium Botanicum, a ritualistic learning experience for the advanced graduate

Sem. Bot. ritual. Frederic Clements seated at top of picture, extreme left; Fred Butters presiding at the center (c. 1910).

students and interested faculty. Alternately meeting in "convocation" and "chapter," the members presented their research results for discussion and critique. Like the Order of Energids at the Seaside Station, the Sem. Bot. offered students a mysterious and ceremonial way to become better acquainted with faculty members and to present their own ideas.[30] Sometime after 1914 the Botany Department disbanded the formal Sem. Bot., though departmental seminars for graduate students and faculty continued.

The years of Clements's administration proved fruitful for the Department. By 1915 the permanent faculty had grown to six with a number of part-time instructors and graduate assistants. Besides Clements, the faculty included Professors Josephine Tilden and C. O. Rosendahl, and Assistant Professors Ned Huff, Fred Butters and Herbert Bergman. Course offerings had expanded as well; by 1914 the department offered General and Advanced Botany, Physiology and Ecology, Fungi, Flowering Plants, Advanced Ecology, Plant Physiology and one of Tilden's experimental courses, Industrial Botany--an economic botany course far ahead of its day.[31] Industrial Botany was a forerunner to the Department's popular courses Plants Useful to Man and Plants and Humans.

While Tilden's work exemplified what was exotic in the Department with her trips to the South Seas, Hawaii and Vancouver, her course on Industrial Botany also exemplified the important ties that botanical work had to economic growth and development in the early twentieth century. Industrial Botany developed out of her interest in exploring the economic and nutritional significance of algae, and of seaweed in particular. The course offered students the chance to make "practical" use of their knowledge of plants and to better understand the relationship of humans to their natural environment. Unfortunately Tilden's forthright style and desire that every student excel in research pursuits often put her at odds with both students and faculty. In 1913 Clements asked Rosendahl to intervene on his behalf to try to convince Tilden of the necessity of making her course more appealing to the average student. It is not clear whether they were able to make their point successfully; the matter was closed after they agreed "that she will feel that it is too much of a personal interference in her work."[32]

Others in the department were also drawn into the political and economic implications of botanical work during the years of the United States's pre-World War I expansion overseas. Harold Lyon left the University in 1907 for the Hawaiian Sugar Planter's Association. In December of the same year Rosendahl was given an enticing offer to do research in the Department of Agriculture in Cuba. According to J.D. Rose, Rosendahl could secure a two-year appointment to complete "investigations in tobacco and sugar cane and other plants in their economic relations."[33] Though

Rosendahl turned down the offer, others chose to collaborate with industry, making money from their botanical knowledge. One such man was Alexander P. Anderson, a student of MacMillan's, who patented the process for puffing wheat and rice. Anderson sold his patent to the Quaker Oat Company and received royalties on his invention that made him quite wealthy.[34]

Others in the Department demonstrated a love for the outdoors and adventure that took them mountain climbing, island hopping and to desert exploration. Fred Butters and his friend E.W.D. Holway --who donated his rust collection and library to the Department--explored the Selkirk Mountains in Canada, among other pursuits. Butters's phytogeographic research in the Selkirks provided the material for his Ph.D. thesis which he completed in 1917. Butters's work, like Rosendahl's, was primarily taxonomic, and according to Ernst C. Abbe, "he had an especial liking for ferns."[35] Together with Rosendahl, Butters wrote a study guide and book about Minnesota trees and shrubs published by the University of Minnesota Press, a popular resource for both scholars and lay people.

William S. Cooper, who joined the department in 1915 at the invitation of Clements, was another explorer of the extremes in nature. His Ph.D. thesis research on the vegetation history of Isle Royale in Lake Superior--done as a graduate student at the University of Chicago--prepared him for his later classical studies on revegetation of deglaciated landscape at Glacier Bay, Alaska. Later in his career he moved on to the glacial history of the Anoka Sand Plain. Finally, Cooper found himself on the west coast, studying the active development of coastal sand dunes.[36]

Cooper and other ecologists on the staff flourished under Clements's administration, though Cooper felt suppressed by Clements's overbearing personality. An ecologist himself, Clements saw to it that this aspect of the Department received primary attention. Often the difficulties in securing funding illuminated the tensions inherent in the Department's various research interests. While Clements was interested in developing ecology and plant physiology, Rosendahl and Butters tried to promote herbarium and library acquisitions. A letter from Clements to Rosendahl in 1914 illustrates their dilemma:

> As to what you say about ecological instruments, I think perhaps we can go a little more softly on these next year, in order to secure some physiological apparatus which we need badly. You and Professor Butters will both recognize that instruments and apparatus are to ecology and physiology what the library and herbarium are to taxonomy.[37]

Early Publications

Intra-departmental conflicts were not the only source of anxiety for faculty in the early years. Pressure to pursue research and publication began as the scientific community sought to professionalize and specialize. (For example, from 1900 to approximately

1925, natural scientists organized a number of professional associations. These included the Carnegie Institution of Washington (1902), the Botanical Society of America (1906), the Ecological Society of America (1915), and the National Association of Academies of Science (1926)). As Rosendahl's turn for a sabbatical came around in 1914, Clements urged him to take advantage of the opportunity to further his research. Rosendahl protested that with his growing family he could not afford to take his leave at that time and suggested to Clements that he offer the opportunity to Ned Huff or Butters, both of whom were trying to finish their Ph.D.s. Clements's reply to Rosendahl describes the University administration's commitment to making Minnesota a viable and important research institution.

> With the definite administrative policy that the future is to belong to those members of the faculty who are genuinely productive in the research field, it seems imperative that we should not skip a single year of this advantage.[38]

In spite of the difficulties inherent in the creation of a new department, faculty in Botany produced a number of significant and well-received publications in its first 27 years. In 1892 MacMillan's Minnesota Metaspermae was in print, soon to be followed in 1894 by Minnesota Botanical Studies, funded through the Geological and Natural History Survey. In 1913 volume four of the Studies was published along with the third edition of Guide to Spring Flowers; a Guide to Autumn Flowers, Field and Garden; and Minnesota Trees and Shrubs. In addition Rosendahl noted in his 1913 report of the Botanical Survey that the edition of Clements's Minnesota Mushrooms (1910) "had been exhausted," with more requests coming in daily. From 1903 to 1908 the two most requested publications next to Minnesota Mushrooms were E.M. Freeman's Minnesota Plant Diseases and the first edition of Guide to Spring Flowers.

Almost all of these works had been collaborative efforts of two or more faculty members, and Rocky Mountain Flowers, also published in 1913, was a joint effort of Clements and his wife, Edith Schwartz Clements. Josephine Tilden, one of the most prolific writers among the faculty, published some twenty works by 1915, including the popular Minnesota Algae and a series on South Pacific algae.

The Greenhouse

In addition to the publications of the faculty, another often neglected marker of the progress of the Department was the ever-growing demands put on the greenhouse. In 1889 the first "plant house" had been built in Minneapolis, taking up eighteen feet of space in the boiler and engine house. In a letter to Rosendahl on May 8, 1905, MacMillan noted that "we got away from the Board of Control and were handed $10,000.00 for a new plant house." By 1913 even that space proved to be too small and a wing was added to the existing structure after much debate over

exactly where it should be constructed. The effort on the part of the contractors to economize meant that although "the new greenhouse wing is progressing nicely...it doesn't look as big as it ought to be, and doesn't seem to fit onto the end quite as easily as it should."[39]

In spite of its awkward appearance, the addition made the greenhouse next to

quoted phrase of Rosendahl's demonstrates his opinion of the new plant laboratory: "Well, that was theoretically a very nice thing, but in the winter time...greenhouses have a tendency to drip, and it wasn't very good for your notebooks and your books or your drawings when that performance was on."[40]

The Clements administration came to

Botany greenhouse adjoining heating plant (c. 1905).

Sanford Hall more accessible to both students and faculty especially during the Clements administration; recognizing the value of "hands-on" experience, he equipped the greenhouse with tables so students could work with plants around them. An oft-

a stormy end during the 1916-1917 school year. Correspondence from members of the Department to Dean J.B. Johnston reflects the tension that had been building for the previous ten years. Faculty members accused Clements of administrative

incompetence and of putting too much of the Department's resources and energy toward the development of the ecology program. Though Dean Johnston urged cooperation and assisted in discussions between Clements and the faculty, peace could not be made.[41]

Clements resigned from his position and left the University in early 1917 and was replaced temporarily by Rosendahl, who would serve many times as emergency chair of the Department over the next few years.

Botany greenhouse equipped with tables for students' labs.

NOTES

1. Minutes of the Executive Committee, Board of Regents, University of Minnesota (March 17 and April 29, 1887; June 4, 1888; May 6, June 3, June 7, 1889); Minutes of the Board of Regents (February 28, March 6 and April 26, 1888; September 16, 1890; December 22, 1891; May 3, 1892); Ernst C. Abbe, "An Informal History of the Department of Botany, University of Minnesota, 1887-1950," unpublished manuscript, pp. 1-2; C.O. Rosendahl, "History of the Department," unpublished manuscript, pp. 1-3, University of Minnesota Archives (hereafter UMA) Department of Botany papers.

2. The University was a "confederation" of four colleges in the 1880s that included the College of Science, Literature and the Arts (SLA); the College of Mechanic Arts; the College of Agriculture; and the College of Law (not yet established), University of Minnesota Catalogue for the Year 1886-87, UMA. Minutes of the Board of Regents, (September 16 and December 2, 1890).

3. Ibid., (February 28, March 6, and April 26, 1888); Rosendahl, "History of the Department," pp. 4, 6; Department of Plant Pathology and Botany, Aurora Sporealis, p. 1.

4. Minutes of the Executive Committee of the Board of Regents, (May 6, June 3, and June 7, 1889).

5. Papers of the Department of Botany are held in the University of Minnesota Archives; however, some papers remain in the possession of the Department of Plant Biology, University of Minnesota, St. Paul. On Gull Lake see anonymous news clipping, "An Island Station," 1889, in Department of Plant Biology scrapbook.

6. Minutes of the Executive Committee, Board of Regents, (April 5 and August 4, 1888).

7. "Memorandum Concerning The Conway MacMillan Memorial Research Fellowship in Botany, Charles J. Brand, 1902, Founder," UMA, MacMillan biographical file; Rosendahl, pp. 2-3.

8. Minutes of the Board of Regents, (December 22, 1891).

9. Rosendahl, p. 10.

10. Josephine E. Tilden's biographical information can be obtained from the UMA, Tilden biographical file. See also Mary Asmus, "Women Scientists at Minnesota: Long Skirts and Muddy Paths," Update (University of Minnesota) Fall, 1975.

11. Anonymous, Lake Wales News, Florida, approximately 1956, Tilden biographical file, UMA.

12. Josephine E. Tilden, "Report to President Guy Stanton Ford," undated, Tilden biographical file, UMA.

13. R. Bruce Scott, "Seaside Station Found Botanical Beach Fantastic Study Area," The Daily Colonist, (July 15, 1973):5-7 and 15; Janet Pelley, "The Minnesota Seaside Station," James Ford Bell Museum of Natural History Imprint vol. 2 (Spring 1985):5-7.

14. Conway MacMillan, "The Minnesota Seaside Station," The Minnesota Alumni Weekly, vol. 1, no. 2, (1901):8.

15. Ibid., p. 10; "Annual Announcement, Minnesota Seaside Station On the Straits of Juan de Fuca," 1905 and 1906, Department of Plant Biology papers; Letters of Alice Misz, July-August, 1906, Department of Plant Biology papers. There were other advantages to summers at the Seaside Station. The Seaside experience provided opportunities for women that were seldom found elsewhere. Expecting to do research and study as well as participate in outdoor activities such as hiking and swimming, many female students looked forward to the chance to test their independence. In the "Annual Announcements," the section on clothing reveals not only the fashion of the day but is also an interesting commentary on the relationships between women. Among the items required were "one pair of heavy-soled, ten inch high bicycle shoes with hobnails [for climbing purposes]," a "bathing suit with high neck and long sleeves," and a "short skirt (about twelve inches from the ground)." Women were told: "'Good' clothes are not even desirable since the work is rough and one must be ready at all times during the day or evening for a tramp over the rocks or through the woods. Much of the restfulness comes from the absence of 'competitive dressing.'" "Annual Announcement," 1905, pp. 10-11.

16. Rosendahl, p. 25.

17. Alice Misz to her mother, August 8, 1906.

18. Shepard was known for his humorous stories and practical jokes. Recounting Paul Bunyan folktales for friends and family, Shepard's monster apparently did much to popularize Oneida County, Wisconsin. The story of the Hodag comes from Luke Sylvester Kearney, The Hodag and Other Tales of the Logging Camps, (Madison: Democrat Printing Company, 1928). The opening of his tale reveals the origins of the creature: "Far up in the north woods, among the silvery lakes, there once was a region of tall, swaying pine and evergreen. The people who inhabited this region were sturdy woodsmen type, men who lived hard and loved the great outdoors with its primitive life, close to nature.

"The chief beast of burden in this land of primeval timber was the humble ox. Slowly and patiently, treading heavily through the growth of underbrush, over great carpets of pine needles, he conveyed the huge logs out of the forest to a convenient landing place at the side of some stream.

"His drivers represented several nationalities, so the patient ox had to accustom himself to the different characteristics of his various drivers. Life for him was truly one of oppression. It would be a difficult task to know which of the two, the driver or the ox, had the larger amount of gray matter. In most instances, a close observer would have said the latter was favored.

"The manner of driving the ox was with considerable persuasion, and at the point of a three and one half foot goad stick. At that time, there was no restriction by legislatures regarding the length of the stick. The ox skinner was noted for his unlimited vocabulary, which consisted of a smattering of the English language together with the extensive use of the profane. The poor ox, not being related to Balaam's ass, had no defense.

"So, on each succeeding winter, there were ox skinners of Irish, French and Scandinavian, depending upon the nationality of the man who happened to be the driver at that time. Each, in his turn, goaded and cursed in his native tongue, using the blasphemy characteristic of his nationality. The hide of the ox was reputed to be proof against the elements, but not invulnerable against the profanity of the several drivers. 'Curses come home to roost', and 'a constant dripping will wear away stone.' Such was the case of the ox, whose life under favorable conditions, did not usually exceed six years. Thus, merciful Providence intervened and took him from his toil.

"The customary burial ceremony of the ox was cremation, so a huge pile of brush was usually gathered and the remains of the ox placed carefully in the center. The belief of those sturdy woodsmen was that seven years of continuous fire was necessary to exterminate the profanity which had accumulated in the body of the ox during his life. Accordingly, the brush pile was very frequently replenished, the fire at times leaping high, while at other times, it smoldered fitfully.

"It was at the end of the seventh year of the cremation of an ox which had led an unusually hard life that an event was to happen, which would cast its shadow upon every man who witnessed it. As the fire died down, there slowly issued from the great pile of ashes, a mystical animal, later to be known as the hodag.

"On this particular day, just at twilight, Eugene Shepherd [sic], a naturalist of the north woods, taking his customary quiet stroll into the forest, strode down a favorite trail, breathing the fragrance of the tall pines and hemlocks. Suddenly, he became aware of an unusual odor in the air, which aroused his curiosity. On looking further through the depths of the foliage, he discovered a strange creature, so unlike anything he had ever seen before, that it was beyond description. Though a student of woodlore and of both prehistoric and other wild animals, Mr. Shepherd could not classify the monstrosity, which was gazing at him with glowing, green eyes and sniffing from nostrils of flaming hue.

"The animal's back resembled that of a dinosaur, and his tail, which extended to an enormous length, had a spearlike end. Sharp spines, one and a half feet apart, lined the spinal column. The legs were short and massive and the claws were thick curved, denoting great strength. The broad, furrowed forehead was covered with coarse, shaggy hair and bore two large horns. From the broad, muscular mouth, sharp, glistening white teeth protruded...." (Kearney, pp. 9-12).

For a biographical sketch of Eugene Shepard see Wisconsin State Historical Society, Dictionary of Wisconsin Biography, (1960), p. 325.

19. This excerpt from Hodag worship was scrawled on the back of an envelope and titled "Postelsians, Chapter III." For information on Postelsia, see the Seaside Station below.

20. MacMillan, "The Minnesota Seaside Station," p. 10.

21. Ibid.

22. Minutes of the Board of Regents, (May 2, 1907):49.

23. University of Minnesota, Postelsia: The Year Book of the Minnesota Seaside Station (St. Paul: The Pioneer Press, 1901 & 1906).

24. Minutes of the Executive Committee, Board of Regents, (May 27, 1889); biographical information on John Sandberg from the Department of Botany papers, UMA.

25. UMA, Department of Botany papers, files 3 and 4, 1913 and 1914. See also Rosendahl, pp. 15, 16. On Moyer collection, see President W. L. Burton to Rosendahl (October 30, 1917), and Amos Moyer to Burton, (October 21, 1917), UMA Department of Botany papers.

26. Biographical information on Butters, Rosendahl and Tilden from UMA biographical files; Information on Ramaley from Abbe, "An Informal History of the Department of Botany, p. 3, and Rosendahl, "History of the Department," p. 4; Brian O'Brian, "Whatever Happened to Edmund P. Sheldon?" Forest World 29 (Winter, 1988):28-33; Richard T. Read, "In Pursuit of Professionalism: The Oregon State Academy of Sciences, 1905-1914," Oregon Historical Quarterly 90, no. 2 (Summer, 1989):169-170.

27. Rosendahl, p. 7.

28. Francis Ramaley to Rosendahl, (April 18, 1907), UMA Department of Botany papers. According to Don Lawrence, Clements wanted to be titled "Head," but the faculty would not agree to the change.

29. For the early history of the Division of Plant Pathology and Botany at the University, see their "The First Decade--1907-1917," Aurora Sporealis, UMA, Plant Pathology file. Aurora Sporealis opens with biographical information on E.M. Freeman.

30. Sem. Bot., UMA Department of Botany papers.

31. UMA Department of Botany papers, file 4, 1914.

32. Frederic Clements to Rosendahl, (December 4, 1913); Rosendahl to Clements, (December 13, 1913), UMA Department of Botany papers.

33. J.D. Rose to Rosendahl, (December 17, 1907), UMA Department of Botany papers.

34. For information on Anderson's rice puffer, see Mary Ann Nord, "Bright Ideas: Food Shot from Guns," Roots (Minnesota Historical Society) 10(2):14-18; Rosendahl, pp. 5-6; According to the "Memorandum Concerning the Conway MacMillan Memorial Research Fellowship in Botany," MacMillan "originated the idea of 'popping' other grains as popcorn is popped. His experiments were adaptable, rice proving the most successful cereal to use. He induced Dr. Alexander P. Anderson, whom he had engaged to return to the Department of Botany as assistant professor, to continue experimentation in this field. Later Anderson patented the process he had perfected on MacMillan's foundation research, and sold the patent rights and his own services to the Quaker Oats Company of Chicago. Neither Professor MacMillan nor the Department of Botany were credited with their contributions...."

35. Abbe, p. 5, and comments of Donald B. Lawrence, August, 1989.

36. Donald B. Lawrence, "Memorial to William Skinner Cooper, 1884-1978," Geological Society of America, March 1980:2-3, UMA.

37. Clements to Rosendahl, (January 6, 1914), UMA Department of Botany papers.

38. Ibid., (January 11, 1914).

39. MacMillan to Rosendahl, (May 8, 1905), and Rosendahl to Clements, (October 14, 1913), UMA Department of Botany papers.

40. Rosendahl, pp. 7-8.

41. J.B. Johnston to Botany staff, (September 29, 1916), Department of Plant Biology papers.

Chapter Two: 1917-1935

During the remainder of 1917, the Department searched for a replacement for Clements. Those recommended by the faculty included E.J. Durand from the University of Missouri, Gilbert Smith from the University of Wisconsin and B.O. Dodge from Columbia. The faculty hoped that one of these men would be chairman of the Department and would take responsibility for the course in elementary botany. The Department also sought a plant physiologist; B.M. Duggar from the Missouri Botanical Garden and Lee I. Knight at the University of Chicago were recommended to the dean as candidates. By the beginning of the next school year the Botany Department had hired Durand--a mycologist--and Knight, and the running of the department appeared to proceed peacefully.

World War I

From 1917 to 1920 the Department was shaped and guided by the demands of World War I. Many of the male assistants, instructors and even some of the professors left to serve in the military, and the problems of maintaining a workforce faced the Botany Department as well as others throughout the nation. Herbert Bergman, assistant pro-

Botany staff in 1917. Back row left to right: Lois Clark, Vinnie Pease, Paul Harvey, Josephine Tilden, William Cooper, Clarence Bausman; front row left to right: C.O Rosendahl, Fred Butters, E.W.D. Holway, Ned Huff.

fessor, resigned in 1917 to join the war effort and W.S. Cooper took a one-year leave to assist the YMCA. One of Cooper's other duties was to advise citizens on problems associated with their liberty gardens. Many universities adjusted by training senior undergraduates to assist in the labs and supervise work in the freshman-level courses. Others reluctantly began to recruit and prepare women who were already in graduate degree programs.

While well-trained women were often available they were seldom wanted at the large universities. Francis Ramaley at the University of Colorado often wrote to Rosendahl enquiring if the Botany Department had any young men available for teaching and laboratory assistants. Knowing Ramaley's insistence on having a man for positions in the lab, Rosendahl once wrote:

> I notice in a recent number of Science that you are still looking for an instructor in Botany or Zoology, and that you are still convinced that you ought to have a man for the position. If you were not so profoundly prejudiced against women, I could get you a first class instructor in botany with a Ph.D. degree.[1]

Rosendahl continued to recommend women to Ramaley; Ramaley's reply after the recommendation of Minnesotan Virginia Pease is an interesting commentary on the times.

> December 4, 1919
>
> I have your letter in regard to Miss Pease but I do not see how I can use another woman at the present time. There are many things about a laboratory that a man is so much useful for [sic]. I am constantly thinking of the difference between matters as they are now and as they were in former years when I have always had at least one good man instructor. The women whom I have now are all that could be desired in women but they are not men![2]

The Botany Department was remarkably progressive during the 1920s and 1930s in terms of its hiring and recommendations of women for assistant and instructor positions, though rarely did women appear as candidates for tenure-track faculty positions.

In addition to the problems in recruitment and retention of trained faculty and assistants, research and equipment was also altered by the war. Rosendahl cooperated with the Red Cross in the testing and collection of sphagnum moss specimens that were to be used as an alternative to cotton in surgical dressings. Unfortunately the moss beds of Minnesota proved to be unsuitable in the long run; the moss was too brittle and had a low absorbency rating. The University also sold many of its instruments containing platinum and a number of its microscopes to the federal government to aid in the war effort.[3]

The war brought new opportunities along with the hardships, however. The need for the practical application of the sciences meant changes in University curricula, and economic botany courses became a commonplace offering to students. Tilden recognized that because of the war there would be an even greater demand for Industrial Botany, and she encouraged the Business Office, the deans and Rosendahl to

prepare themselves for increases in enrollment. But the positive aspects of larger enrollments were outweighed by the problems of space and equipment. In August, 1917, Tilden wrote to G.H. Hayes in the Business Office:

> My experience in Summer School was thoroughly mortifying. Fifteen students presented themselves to take my advance work and I had barely equipment for three. I was obliged to tell Dean Johnston and Dean Jackson that unless I can offer my graduate students the material and equipment that they are furnished in all other graduate departments of similar rank, I prefer to refuse to receive such students.[4]

Space Problems

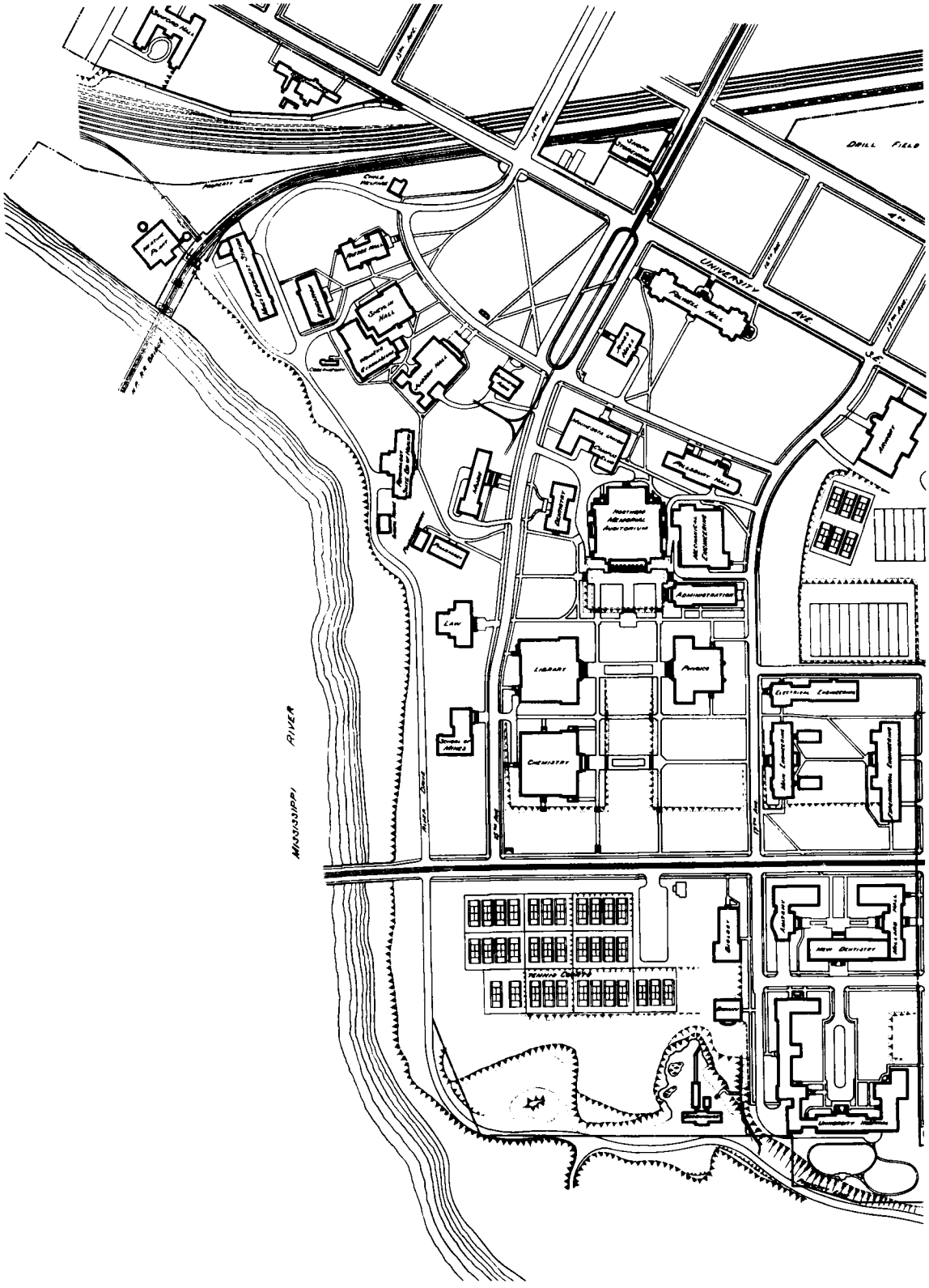
While equipment shortages were common to all scientific departments at the University because of the war, the physical space the Botany Department occupied during this time was particularly troublesome. Scattered throughout the Zoology Building and Pillsbury Hall in Minneapolis, the Department was squeezed into ever-smaller facilities, with its herbarium and greenhouse virtually unaccessible to most of the faculty. In 1920 the Department undertook a survey to ascertain what conditions prevailed at other universities in the hope that the University administration would see the necessity of providing better facilities for the Botany Department. In a letter to Professor Newcombe at the University of Michigan, Durand wrote:

> Our splendid botanical library is practically inaccessible to the students and the herbarium is located in a sub-basement where it is both too cold and too dark to do sustained work. Our greenhouse is 1/4 mile away from the laboratories where the elementary work is conducted and over 1/2 mile from the building where most of the advanced and graduate work is being carried on.[5]

The conditions in the herbarium were the most problematic. Faculty feared that the sub-basement in the Zoology Building would flood, ruining the collection altogether. Aside from that ever-present danger, the "cold, dampness, an excessive amount of dirt, almost no sunlight, no ventilation, rats, mice, etc.," made the herbarium a health hazard as well as an undesirable place to work. These conditions caused one assistant, Clarence Bausman, to resign in October, 1920.[6]

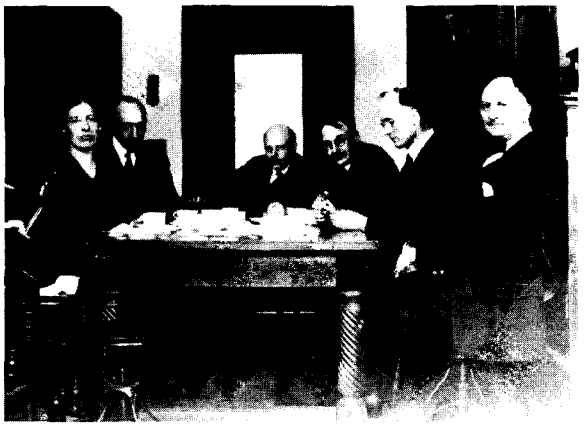
The status of the department provoked Rosendahl to write to President L.D. Coffman in November of that year. Noting that Mr. Holway would soon be returning from a collecting trip in South America and would need space to work, Rosendahl proclaimed that "the fact of the matter is that the Department of Botany is gradually being strangled. Its future is in the balance. If the University of Minnesota is to retain a Department of Botany some permanent quarters must be provided without delay."[7] Not until 1926 did the faculty get their new quarters, and it was the arrival of J. Arthur Harris that set the process in motion.

By 1921, Durand was incapacitated by cancer and unable to continue in his position as chairman of the Department. Rosendahl stepped in again as interim chairman until it was decided to offer Lee



Map of Minneapolis Campus, University of Minnesota (c. 1931)

Knight the position in the summer of 1921. Unfortunately, Knight was also overcome by illness a few months later, and a new leader had to be found. After the problems with Clements and the illnesses of the next two Department chairs, the faculty of the Botany Department despaired of ever finding the right person to fill the position. Indeed the search for a new chief was fraught with difficulties and painful realizations, as the faculty came to terms with the fact that few people were willing to come to Minnesota under existing conditions in the Department.



Staff in 1920. From left to right: Vinnie Pease, C.O. Rosendahl, Fred Butters, Professor Thomson, Ned Huff, E.J. Durand.

Jack Schramm from Cornell visited the Department and declined an offer, and the possibility of securing R.B. Harvey from the School of Agriculture was proposed in 1922. By May of 1923 it appeared that Dr. Duggar from the Missouri Botanical Garden (who had been considered previously at the time that Knight was chosen as physiologist) was the finalist for the position, but he apparently declined the final offer as well.[8]

The faculty was not unanimous in its desire to acquire a new chairman of the Department from another university or botanical garden. In a letter to Rosendahl in November of 1922, Tilden expressed her conviction that a new person should be hired and "tried out" before given the chairmanship.[9] But the practice of bringing in a man as both professor and chairman that had begun with Clements continued. J. Arthur Harris, a biometrician and sometime botanist and physiologist, was hired from the Carnegie Institution of Washington's Station for Experimental Evolution at Cold Springs Harbor in the autumn of 1923.[10]

Prior to Harris's arrival, the Department had been embroiled in a dispute over the administration of two units, the Division of Plant Pathology and Botany in St. Paul, and the Department of Botany on the Minneapolis campus (see Chapter 1). Problems arose over the instruction of plant physiology and questions were raised over which department was to have the responsibility for administrative duties and the teaching of it. After a series of meetings the faculty decided it would not be wise or feasible to create a separate department for plant physiology; the Botany Department agreed to let Dr. Knight divide his time between teaching in Botany and working in physiology at the Experiment Station. Remaining members of the physiology staff would be primarily placed at the Experiment Station as part of the Botany and Plant Pathology Department.[11]

This effort to cooperate under awkward circumstances was repeated successfully over the next few decades, though there were many difficult decisions that made cooperation a challenge. From the beginning the Department of Botany was tied by its very nature to the School of Agriculture, and at various points Botany turned to its colleagues on the Farm Campus for assistance. For example, when it came time to search for Durand and Knight's replacement, Josephine Tilden proposed that R.B. Harvey would make a good chairman.

R.B. Harvey was an important link in the chain that connected the Department to the St. Paul campus. Like Knight, Harvey was one of the physiologists who served half time in the Botany Department and half time on research at the St. Paul Experiment Station. When Knight became ill and resigned from his position in 1923, Harvey was appointed head of the section of Plant Physiology and Agricultural Botany in the Division of Plant Pathology and Botany at the Experiment Station. In 1924 Harvey helped to organize the American Society of Plant Physiologists and was instrumental to the reorganization of the Minnesota Academy of Sciences in 1932.[12] Not all of the faculty of the Botany Department greeted Tilden's recommendation of Harvey for the chairmanship with enthusiasm, and those who opposed the idea continued to work to bring an outside person to the position. In the autumn of 1923, the "opposition" was successful, and J. Arthur Harris was hired.

Botany class preparing spring gardens (c. 1920).

J. Arthur Harris

In June of that year Harris had written to R.A. Gortner in the Division of Agricultural Biochemistry at the University describing his attitude toward research and science at the Carnegie Institution. Harris expressed interest in coming to the University but was also aware of the problems that lay ahead if he chose that path.

> [My] interests do not seem to me incompatible with the undertaking which your wire suggests, providing that the University is prepared to foster a department in which research shall play a dominant role, and in which petty personal interests may be submerged in teamwork and in broad and cordial cooperation of the kind which will make efforts more fruitful for the University and in the long run more to the advantage of the individual members of the department.[13]

The years of the Harris's administration represented a new beginning for the Botany Department, and he worked hard to secure better facilities and pioneering directions in research until the time of his sudden death in 1930.

J. Arthur Harris in 1924.

Harris's success could be measured in many ways, not the least of which was the Botany Department's budget. Total salaries and wages, which had hit a four-year low of $31,600 in 1923, had steadily climbed to $46,100 by 1926, with a proposed budget of $47,030 in 1927.[14] Almost all of the staff and faculty had received a raise within that time, which undoubtedly improved morale. Perhaps the most significant achievement of Harris's administration was the completion of the Botany Building in 1926. After years of inadequate facilities, the Department was finally under one roof, and with a new greenhouse nearby.[15]

Faculty Research

While Harris battled on the administrative front to secure better salaries and working conditions for his colleagues, the rest of faculty continued to pursue their research and teaching. Rosendahl was active during the twenties in the avenue of pollen research. Undertaking a survey of the state of Minnesota in 1922 and 1923, Rosendahl became the state expert on pollen-free areas to which hay-fever sufferers might go to avoid the effects of ragweed pollen. Numerous letters written to the State Board of Health and forwarded on to Rosendahl for reply attest to the demand for his survey results. In 1925 those results still remained unpublished due to a lack of support and funds from the University. State Board of Health Executive

A.J. Chesley urged state officials and legislators from several districts to apportion money for Rosendahl's pollen studies, which were finally published in Minnesota Medicine in 1940.[16]

Josephine Tilden struggled to broaden her studies on the algae of the Pacific through her participation in the annual Pan-Pacific Conferences and with her bold plans for a Minnesota Pacific Expedition in 1924. Because of the University's inland location, research emphases in the sciences did not often provide support for excursions such as an expedition to the Pacific.[17] Also, Tilden had a knack for starting somewhat eclectic projects; despite her reputation in the field of algology, the University was unwilling to put its money or its institutional affiliation behind such ambitious plans. Nonetheless, it appeared that one of Tilden's dreams of research in the Pacific was about to come true.

In 1920, Alexander Hume Ford "conceived the idea of bringing the peoples of the Pacific area into close contact and more and more friendly relations through conferences of their representatives in various fields of thought and action." His idea resulted in the formation of the Pan-Pacific Union, which sponsored conferences with scientists around the world. One of the people he met previous to the Union's creation was Josephine Tilden, a person with a keen interest in the economic and scientific

Josephine Tilden and three scientists arriving in San Francisco on NYK liner "Shinyo Maru" from the third Pan-Pacific Science Congress in Tokyo, December, 1926. Photo courtesy of Minneapolis Public Library.

ramifications of algal research.[18]

In July of 1924, Tilden's party of fifteen scientists, including three zoologists and a physicist, left the University and journeyed to the Hawaiian Islands to study the flora and fauna.[19] From July 31 to August 14, the group attended the Pan-Pacific Food Conservation Conference in Honolulu. Unfortunately, despite a very successful trip in the summer of 1924, the professors involved in the expedition agreed (with the exception of Tilden) that further explorations of this nature would be impossible because of inadequate funding and a supposed lack of "sufficiently trained personnel at this one University." In a letter to Dean Johnston, Harris wrote that this decision was a painful one and that Tilden was "keenly disappointed."[20] In a sharply worded comment she responded:

> I am distinctly not disappointed. I am not allowing myself to be disappointed. Why should I care? I am not to blame for the failure of the plan. I am, however, very sorry that I have gone to so much useless personal expense during the past four years.[21]

As with the Seaside Station, Tilden had staked her own finances and her future research on the proposed expedition, only to discover that the University administration and her own colleagues did not intend to support more extended projects. She continued to research and publish her work on Pacific algae, and in 1935 she undertook another expedition, this time to New Zealand and Australia.

W.S. Cooper found himself in a somewhat difficult position after Clements left. Attempting to build a program in ecology, Cooper perceived that his work was not significant to the Department or valued by the University administration. Yet, Cooper found a place in Harris's administration; indeed, Harris demonstrated his confidence in and appreciation for Cooper's efforts by recommending him for promotion to associate professor in 1924, a promotion he officially received in 1927. In 1925 Cooper's research on glacial ecology won him acclaim from President Calvin Coolidge. One of four members of a committee to establish Glacier Bay National Monument in Alaska, Cooper had paved the way for the project through his botanical research in the area and as chairman of the committee.[22]

Professors Butters and Huff spent the better part of the 1920s reorganizing the elementary course in botany. Devoting 17 to 20 hours per week to undergraduate teaching, the two men rarely had time for their own research. The Department was split in two parts, those who worked with graduate students and did their own research, and those who taught the general course in botany. As Harris put it,

> This lack of continuation lies in part in the fact that the members of the Department who are interested in advanced work are not eager to do elementary teaching, and that those who do elementary teaching can not have much time for the research which they should be carrying along.[23]

In spite of the problems the elementary course created for the research of Butters and Huff, Harris realized that obtaining greater funding and more equipment from the University required the creation of a successful introductory course that was crucial to other departments as well as to his own.

In 1925 Harris sent Dean of Administration F.J. Kelly a report that included statistics on undergraduates for the years 1919 to 1923. During those years 3,933 students had participated in the Department's courses, 608 of those in advanced classes. For fall and winter quarters of 1924-25 there were 1,011 students taking courses, 237 in advanced classes. This was a 28 percent increase in the number of students per quarter, and Harris used the statistics to lobby for a larger budget. In addition it strengthened Harris's case that the Department's courses, especially the elementary ones, were extensively utilized by several other departments within the School of Agriculture and the Medical and Pharmacy schools.[24]

Student's Linnaean Club

While Harris worked to build a Botany Department that met the needs of its own majors as well as the requirements for other degree programs, the students themselves participated in activities that enhanced their understanding of botany as well as providing a setting for social activities. Undergraduate students do not often appear as active participants in the day-to-day affairs of the Department because of the nature of the historical record left behind. Mentioned only in the contexts of increasing enrollments and burdens on faculty time, these students are easy to neglect in a history that naturally calls attention to the achievements of faculty and successful graduate students. But one organization, and several of its members, made a difference in the quality of research and the quality of relationships in the Department.

Beginning in the 1920s with nineteen members, the Student's Linnaean Club started as a women's organization. Open only to undergraduates and dedicated to fostering interest in botany at the University and throughout the state, The Linnaean Club spent the spring of 1925 writing a constitution and choosing a name. The following year officers Evangeline Rundquist, Rebecca McIntyre, Esther Wilson and Helen Foot [Buell] presented Dr. Harris with their constitution for his approval. Dues were set at 50 cents per quarter, and they had a field trip on May 6, 1926, to install new officers and to initiate new members.[25]

On May 20th, the Club had its first speaker, Miss Ethel Mygrant, an assistant in the Department; her speech was entitled "How Men Think of Women in Science." This event was important because it revealed the anxiety many of the women felt over their present and future decisions to pursue a career in science. While the Department was supportive of its women students, the fact

Student's Linnaean Club, 1929. Only nine of the twenty Club members are pictured. Sitting, left to right: Lylah A. Eckwall, Mildred E. Hallberg, Florence Sundquist (Secretary), Fern R. Ward (President), A Leona Wendt. Standing, left to right: Eli Moen, Ethel K. Sullivan, Edythe A. Britton, Alice V. Peterson.

could not be disputed that women were often viewed as ill-prepared and undesirable lab assistants and field workers. The women made a list of the reasons they were not valued in the sciences:

1. Women do not cooperate--tend to be petty and catty.
2. Women think too much of themselves--too sensitive and take too much as personal.
3. Women lack initiative and original ideas. Tire of an idea after an impulsive start.
4. Women haven't the interest--only tentative till they marry.

To combat these perceptions the women vowed to carry on correspondence with other botanical clubs and associations to exchange ideas; to know the "great men connected with botany"; to know the "strong departments" at other universities and the great botanical gardens and herbaria of the world; and to review recent botanical work.[26]

In late 1926 the Club invited Dr. Harris to speak on the subject of "Opportunities for Botany Majors" with a special emphasis on careers for women. He told them there were limited opportunities for women in forestry because of its need for "pure scientists" and its "more technical laboratories." Careers in plant pathology were not recommended because the field positions would be given to men. Women were capable of most lab work, however, because of the perception that "women excel in very carefully manipulated details of the work." Teaching in high school or elementary grades was highly recommended as was "responsible scientific secretaries," though Harris admitted that the latter did not usually pay enough to guarantee economic self-sufficiency.[27] The Club members appreciated Harris's honest approach to the problems they continued to face despite increased opportunities for women in scientific professions.

From its founding the Linnaean Club struggled to find a worthwhile project to which the members could devote their energies; they eventually played a key role in promoting and assisting the effort to preserve Minnesota's Nerstrand Woods near the town of Northfield in Rice County. Prior to that event the Club's activities primarily revolved around faculty and student teas, public lectures given by Club members and faculty, and the recruitment and retention of members. Hovering around twenty members during most years, the Club was a welcome social environment for all of the Botany Department. One year after its inception, the Club initiated its first male members, Etlar Nielson and Pei-Sung Tang.[28]

The Club's 1925 and 1926 secretary, Helen Foot, was one of the Department's outstanding undergraduates during the 1920s. Receiving the Minnesota College Women's Club Scholarship in 1925 and recommended by the Department for other honors, Foot obtained a position with the International Health Board of the Rockefeller Foundation to study the algae that served as a food source for malarious mosquitoes in North Carolina. A student of Tilden's, Foot finished her bachelor's degree in 1926 and later married Murray F. Buell, an adjunct faculty member of the Department in the 1930s (see Chapter three).[29]

Herbarium specimens Hypoxis hirsuta and Linnaea borealis. The Linnaean Club selected the one on the left as their Club flower.

A. Orville Dahl was another successful member of the Linnaean Club, serving as its president in 1932. Dahl was a frequent contributor to the Club's informal seminars and lectures. In June of 1931, the Club faced a dilemma in choosing an official Club flower; Dahl gave a talk on the merits of the yellow star grass, the yellow lady slipper, the bellwort, the yellow pond lily, and the marsh marigold. "After a vote was taken, Hypoxis hirsuta (yellow star grass) was selected. Through some unfortunate error, Linnaea borealis appears on the Club pin instead of the official Hypoxis hirsuta."[30] A student of Rosendahl's studying taxonomy and cytology, Dahl went on to complete his Ph.D. in 1938, served on the faculty of Harvard University, and later returned as a faculty member from 1944 through 1967. He was also chairman of the Department from 1947 to 1957.

Laying of the Botany Building cornerstone, May 27, 1926.

The years 1926 and 1927 were busy ones for the Department. Josephine Tilden was making plans to develop a botanical garden in Hesperides, Florida, with the help of Dr. Harris.[31] John W. Moore, a graduate student and assistant in the Department, was finishing a nine-month collecting trip in Altura Raiatea, Tahiti, during 1927.[32] Moore eventually finished both his master's and Ph.D. degrees in the Department and continued to work as a scientist in the Herbarium during the next forty years.

The laying of the cornerstone on the new Botany Building occurred on May 27, 1926. The building's location immediately south of the Zoology Building was logical, and its proximity to the medical school was not viewed as a problem at the time; however, the Department eventually faced great pressure from the Student Health Service and the growing hospital to relinquish its space. Somewhat ironically then, on that day in 1926, Dean Kelly spoke of the unity of the sciences and the cooperative spirit at the University.

> With the erection of this new building there will be a three-fold banding together within this small plot of ground. There is the medicine on one side, the biology on the other and behind all these will be this building of botany.[33]

Finally, 1926 and 1927 brought two important decisions, the hiring of biochemist George O. Burr and the decision not to bring in a cytologist.

George O. Burr

George O. Burr's arrival in 1928 was not the first time he had been to Minnesota. After receiving his Bachelor's degree from

Hendrix College, Arkansas, in 1916, Burr followed it with a Master's degree in Chemistry and Math from the University of Arkansas in 1920. Working with Professor R.A. Gortner in the Department of Biochemistry at the University of Minnesota, Burr completed his Ph.D. in Biochemistry and Chemistry in 1924. For two summers he had worked with J. Arthur Harris in Utah and Arizona, studying plant distribution and plant saps.[34]

By September of 1924 Burr was at Berkeley working with Herbert M. Evans on Vitamin E studies. Their research demonstrated that Vitamin E was a readily extractable fat soluble substance. Subsequent tests on the physiology of Vitamin E sterility followed, but Evans led the research away from the study of fats, which Burr felt were the key to understanding certain dietary deficiencies.[35]

Burr had become a well-recognized, if controversial, scientist in a short amount of time, and Harris wasted no time trying to bring him back to Minnesota. In September, 1928, after nearly one year of negotiations and planning, Burr was hired as Assistant Professor of Plant Physiology.[36] Much of the departmental correspondence during that year of preparation consists of letters and telegrams between Harris and Burr over the setting up of Burr's rat colony that was necessary for his nutrition research. With the cooperation of C.M. Jackson in Anatomy, the colony was created, though Burr and his wife, Mildred, brought some of their own rats with them from California. In his reminiscences Burr wrote:

> With deep sorrow and high hopes, the Burrs left Berkeley in their Model T Ford roadster with two cages of Long-Evans rats. It was thought they would be less susceptible than the Wistar strain to colds in the rigorous Minnesota climate. On the cold fall nights, our pets were smuggled into hotel rooms under long overcoats.[37]

The Burrs research on vitamin deficiencies and rats produced startling results. Together with his wife Burr announced the revolutionary breakthroughs in 1929 and 1930 "that unsaturated fat was essential, and ... that linoleic acid, and possibly other acids, were active." The results were greeted with skepticism by nutritionists and physiologists, including Herbert Evans, but according to Ralph Holman, Burr's biographer, "... Burr [was] a gentle man, who merely kept working quietly, amassing the evidence."[38]

George O. Burr (c. 1930)

Hiring Burr from Berkeley was one of the more prominent successes of Harris's administration. But for years the Botany Department had been trying to find either the money or the right person to fill a cytology position. Since the creation of the Department, cytology had been taught by Rosendahl who had to "divide his interests between Taxonomy, Cytology and Microscopic Methods to the disadvantage of all of these subjects." In 1924 Dr. Helen Sorokin, originally from the Soviet Union, was appointed as a part-time instructor in cytology. But because her husband was also a professor at the University, and University policy forbade the employing of married couples, she was never considered as a candidate for a full-time professorship.

By March of 1927, however, Karl Sax of the University of Maine and Ralph Cleland of Goucher College had turned down offers of appointments. At the same time, Hamline University offered Sorokin a full-time position. According to Harris, her "acceptance of this will mean that this small neighboring college has actually a better trained Cytologist than we are able to bring to this University." And Harris admitted that Sorokin "probably has as great ability and certainly more thorough training in the field of Cytology than either of the two men whom we considered for professorships in this Department." Tilden lobbied Harris and Dean Johnston on Sorokin's behalf, but it was to no avail. As of 1935 the Department was still without a Cytologist, and Sorokin left the Department for the position at Hamline.[39]

For reasons unknown, early in 1928 Harris considered resigning his position as head of the Department. The rest of the faculty wrote a letter to Dean Johnston urging the University administration to consider what the loss of Harris might mean to both the Department and the University. Having finally acquired a leader who demonstrated "energy, both physical and mental, courage, tact, consideration, justice, [and] unselfishness," the Botany faculty concluded that "it would be impossible to find a finer department leader, and exceedingly difficult to obtain one even approximately so effective."[40] Their campaign to keep Harris was successful; he did not resign but continued to serve the Department until his untimely death two years later when complications set in after an appendectomy.

Departmental records for the period 1930 to 1935 are scant, but the papers of William S. Cooper reveal some of the activities during this period. With Rosendahl as Acting Chairman, the Department set out again to find a replacement for Harris. Rosendahl wrote to H.L. Shantz, president of the University of Arizona, inquiring whether he would be willing to accept the headship of the Botany Department. The offer to Shantz was a cause for some anxiety for Dr. Cooper. Shantz was an ecologist of national reputation, and Cooper felt his own work and his student following would be jeopardized by the addition of Shantz to the

staff. Shantz was not hired, nor was Jack Schramm from Biological Abstracts, and in April, 1931, the Department extended an offer to E.J. Kraus from the University of Chicago.[41]

Kraus could not be persuaded to leave Chicago, and by 1932 the Department decided to cease the outside search for a new head and instead tried to convince Cooper to take the position. In a letter to Cooper, Dean Johnston promised that if he accepted the appointment, the University would try to secure Professor Thompson of Saskatchewan as Cytologist and would arrange help for Cooper in the day-to-day running of the Department. Cooper decided it was in his best interest to decline the offer and suggested that the College of Arts and Sciences transfer Dr. Stakman from the Division of Plant Pathology and Botany at the St. Paul Experiment Station to the Botany Department on the Minneapolis campus.[42] That suggestion ignited a series of tension-filled meetings and letters between deans, department and division heads that was reminiscent of the struggle to find a solution to the problems of plant physiology instruction. This time, however, the School of Agriculture felt it was being compromised by the needs of the Department of Botany.

Dean E.M. Freeman, chief of the Division of Plant Pathology and Botany on the St. Paul campus, wrote to Cooper in July of 1932, to explain his reasons for opposing the transfer of Stakman to the Botany Department. He felt the Botany Department had not considered the larger implications for all of the plant sciences at the University, and that "to move one man from a key position that he already holds to another position even as important as that of the head of the Department of Botany, affects the whole of the plant science activities...and calls for a careful consideration of the whole problem..." Dean Coffey from the University's Department of Agriculture also opposed the move because he did not feel the best interests of the Experiment Station would be served by such a transfer. The matter was eventually dropped, but not before it damaged the fragile relationships between the Botany Department and its sister departments on the St. Paul campus.[43]

Rosendahl Appointed Chairman

The era that began with the leaving of Clements came to a close with the decision in 1935 to end the search for a chairman of the Botany Department. Five years had passed since Harris's death, and the faculty informed Dean Johnston in March that they had had enough of trying to conduct departmental affairs without a leader. Though Rosendahl was reluctant to continue in what had been sporadic, temporary turns as the Department's leader, the staff was pleased to have him as their permanent chairman. They wrote:

> We have realized that Dr. Rosendahl would prefer to relinquish the temporary chairmanship in order to devote as much time as possible to research, and for this reason, we have cooperated with you in an

endeavor to find some one [sic] from another institution to take the position. Having been unsuccessful in our search, we wish you to know that the appointment of Dr. Rosendahl as permanent chairman will be agreeable to us in every way.[44]

C.O. Rosendahl (c. 1940)

NOTES

1. Rosendahl to Francis Ramaley, (November 29, 1919), UMA Department of Botany papers.

2. Francis Ramaley to Rosendahl, (December 4, 1919), UMA Department of Botany papers.

3. For information on World War I and its general impact on the Botany Department, see files 5-8, 1917-19, UMA Department of Botany papers.

4. Tilden to G.H. Hayes, Business Office, (August 22, 1917), UMA Department of Botany papers.

5. Durand to F.C. Newcombe, University of Michigan, (January 12, 1920), UMA Department of Botany papers.

6. Clarence Bausman to Rosendahl, (October 8, 1920), UMA Department of Botany papers.

7. Rosendahl to President L.D. Coffman, (November 15, 1920), Plant Biology papers.

8. Rosendahl to Dean J.B. Johnston, (March 8 and May 9, 1923), Plant Biology papers.

9. Tilden to Rosendahl, (November 10, 1922), Plant Biology papers. Tilden strongly urged that the Department secure R.B. Harvey from the School of Agriculture as head; in the meantime, a cytologist would be hired and tried out. "Later, if everything turns out as we hope it may, the Dean can select the Professor of Cytology as Chairman or Head."

10. In 1917 Harris had been one of the candidates considered by the Department for the position of plant physiologist. At the time William Crocker wrote: "Mr. Harris is really a biometrician and has only lately branched over into plant physiology. His work on osmotic pressure is good work[,] but I am not sure that he has the general grasp of the subject and the knowledge of the accessory subjects necessary to make the most of physiology in a big university such as yours." UMA Department of Botany papers, file 5.

11. See correspondence from Dean E.M. Freeman, College of Agriculture, to Knight, Butters, Rosendahl and Tilden, (May and June, 1921), Plant Biology papers.

12. See Harvey's necrology in Aurora Sporealis; see also J. B. Hanson's History of the American Society of Plant Physiologists (Rockville, MD: American Society of Plant Physiologists, 1989).

13. Harris to Gortner, (June 12, 1923), UMA Department of Botany papers.

14. See the Department budgets for 1923-24, 1924-25, 1925-26, 1926-27, and 1927-28, Plant Biology papers.

15. For information on the greenhouse, see Rosendahl to V.W. Jackson, (June 4, 1924), UMA Department of Botany papers, and J.H. Forsythe, consulting architect to J.B. Johnston, (April 2, 1924), Plant Biology papers; on the Botany Building, see Forsythe to Johnston (above) and Harris to W.C. Stevens, University of Kansas, (August 21, 1925), UMA Department of Botany papers.

16. C.O. Rosendahl, R.V. Ellis and A.O. Dahl, "Air-Borne Pollen in the Twin Cities Area with Reference to Hay Fever," Minnesota Medicine 23 (1940):619-635. According to Donald B. Lawrence, A. Orville Dahl and Scientist Agnes Hansen deserve much of the credit for the final publication of the hayfever studies.

17. On inland universities, see Tilden to Alexander Hume Ford, Pan-Pacific Union, (November 21, 1924), Plant Biology papers.

18. J.B. Johnston, "The Work of the Pan-Pacific Union," an essay within "The Minnesota Pacific Expedition Chronological History, 1924," p. 16, Plant Biology papers.

19. Members of the party included Dr. Henry A. Erikson, chair of the Physics Department; Dr. Royal N. Champman, zoology; Dr. and Mrs. J.B. Johnston, zoology; Dr. Ross A. Gortner, head of the division of Biochemistry; Dr. J. Arthur Harris, chair of Botany; William A. Hoffmann, entomology; Dr. Shirley P. Miller, anatomy; Josephine E. Tilden, botany; five assistants. See "The Minnesota Pacific Expedition Chronological History, 1924," unpublished manuscript, p. 21, Plant Biology papers.

20. Harris to Dean Johnston, (November 24, 1924), Plant Biology papers.

21. Tilden to Harris, (November 28, 1924), Plant Biology papers.

22. Harris to J.B. Johnston, (April 15, 1925), Plant Biology papers.

23. For the status of the Department as of 1924, see "Memorandum of Status of Department of Botany of the University of Minnesota, as of January 1, 1924." On the elementary course, see pp. 2-3 of report, Plant Biology papers.

24. Harris to F.J. Kelly, (February 4, 1925) and attached report, UMA Department of Botany papers. According to Donald Lawrence, "Harris was an early convert to the importance of statistics to scientific research, and his sense of humor endeared him to all. On one occasion when he was showing off the new Botany Building to a group of Minnesota legislators, he showed them a room full of calculating machines. When a legislator asked him what use botanists had for calculators he replied that they were needed to produce square roots."

25. SLC minutes, April 27, 1926; For a summation of the first 15 years of Linnaean Club activities, see "Linnaean Memory Log," Student's Linnaean Club papers, UMA.

26. SLC minutes, (May 20, 1926), SLC papers, UMA, file 2.

27. SLC minutes, (November 16, 1926), SLC papers, UMA, file 2.

28. SLC "Memory Log," p. 2, SLC papers, UMA, file 7.

29. Harris to Mrs. Oren, Minnesota College Women's Club Scholarship, (June 15, 1926), UMA Department of Botany papers; other information on Foot from UMA Department of Botany papers, 1925-26.

30. "Linnaean Memory Log," p. 5, SLC papers, file 7.

31. On the Florida Biological Association at Hesperides, Florida, see Tilden to Harris, (April 15, 1926); Harris to Tilden, (April 28, 1926); Tilden to Harris, (May 3, 1926), Plant Biology papers; Tilden's biographical file also contains information on the Association.

32. Moore to Harris, (December 31, 1926); Harris to Moore, (January 25, 1927); Harris to Moore, (January 26, 1927); Moore to Harris, (February 18, 1927); Harris to Moore, (March 23, 1927), Plant Biology papers.

33. Anonymous news clipping, (May 27, 1926), Plant Biology scrapbook.

34. Some biographical information on Burr is contained in a letter from Burr to Harris, (January 2, 1927), Plant Biology papers.

35. For an excellent biographical sketch of Burr and a summary of his research, see Ralph T. Holman, "George O. Burr and the Discovery of Essential Fatty Acids," Journal of Nutrition 118 (1988):535-540.

36. For the preliminary offer to Burr, see Burr to Harris, (November 4, 1926); Harris to Burr, (December 3, 1926); Burr to Harris, (December 9, 1926), all in Plant Biology papers.

37. Holman, p. 536.

38. Ibid., p. 537.

39. On Karl Sax, see Sax to Harris, (January 23, 1927) and Harris to Sax, (February 15, 1927), Plant Biology papers. On Sorokin, see Tilden to Harris, (March 19, 1927), and Harris to J.B. Johnston, (March 22, 1927), UMA, Department of Botany papers.

40. Botany faculty to J.B. Johnston, (February 15, 1928), papers of William S. Cooper, UMA.

41. See the papers of William S. Cooper, (January and February, 1931), UMA.

42. Johnston to Cooper, (April 19, 1932); Cooper to Johnston, (April 19, 1932) [telegram], papers of William Cooper, UMA.

43. W.C. Coffey to Cooper, (June 24, 1932); E.M. Freeman to Cooper, (July 5, 1932), and other corroborating correspondence, (June and July, 1932), Cooper papers, UMA.

44. Department faculty to J.B. Johnston, (March 5, 1935), Cooper papers, UMA.

Chapter Three: 1936-1954

During the years of the Great Depression and World War II, the Botany Department, like other University departments, faced retrenched budgets, decreasing enrollments and, during the war, a lack of qualified male faculty. Despite these hardships, the war years demonstrated the need for more sophisticated and efficient defense technology; thus chemistry, engineering and physics led the way into the post-war era. The natural sciences also had a part to play in the post-war scientific and technological revolution. Biology and the plant sciences contributed to the study of genetics and nutrition; they also played a major role in agricultural advancements and the development of new pharmaceutical, medicinal and industrial products.

The Botany Department underwent a complete transformation during this era. By 1945 Rosendahl, Tilden and Huff had retired, and Fred Butters died in October of that year. A generation of scientists and explorers was gone, and as new people entered the Department from 1935 to 1950, the character of the Department changed. The objects and goals of research changed too, from an emphasis on taxonomy and systematics to more specialized emphases on plant physiology and biochemistry, with increased cooperation between zoology and botany. Some of the problems the first generation encountered remained, however, especially the problem of adequate space.

Tilden's Trip Around the World

As the 1934-35 academic year opened, Josephine Tilden and ten graduate students left for a seven-month trip to New Zealand and Australia. Overseas Tilden collected specimens of algae for the Department's herbarium while giving frequent lectures on the nutritional properties and potential economic benefits of seaweed and kelp. Marine algae, she explained, was a good source of vitamins A, B, C, and D, and was helpful in preventing iodine deficiency. And with a great deal of foresight she predicted that the contamination of waters in harbors by oil from ships would be a growing environmental hazard.[1]

In the time before the party's departure, however, Tilden faced opposition from the University administration and Rosendahl. Not sharing the view that the journey would improve the quality of the students' dissertations, Rosendahl felt that the trip was compromising the students' financial situations and professional careers. Several students had written to Rosendahl in August after not receiving instructions from Tilden; they wondered if she would be able to raise the funds necessary for the journey. Tilden expected them to give up their teaching assistantships to accompany her and to contribute $1,000 each for expedition expenses; in turn Lawrence Jones, Arthur Nash, Irl Warnock, L.A. Doore, Thomas T. Earle and Paul J. Philson would receive a unique opportunity to study abroad.[2]

In her usual determined manner Tilden proceeded with her plans and much to the surprise of all, the party left in September,

1934. Along the way she sent cartons of specimens back to the Department and recorded the results of her phycological research for later publication and distribution to other algologists. Australian and New Zealand curators of museums, university botanists and biologists, and government dignitaries were intrigued with the American visitors, and they greeted the party with much fanfare. Upon the group's return, the painstaking task of drawing and photographing the 785 different species of algae for a series of articles commenced.

To her own amazement Tilden discovered upon her return that she was due to retire in 1937. When the time came she gathered her notes and books--packed in over 1000 cartons--and left for Florida. She and other retired University of Minnesota faculty members founded the "Golden Bough Colony," at Hesperides, near Lake Wales. Long a member of the Florida Biological Association, Tilden felt the tropical environment an excellent one for continuing her research and writing. By the early '50s, she was at work on nine different books and living in a fire-proof house stacked full with algal specimens and a lifetime's worth of books and notes. She died in 1957.

While Conway MacMillan and J. Arthur Harris had been supportive of many of Tilden's more ambitious research projects, Rosendahl did not share their enthusiasm. Often the mediator between the University administration and Tilden, Rosendahl felt she was too stubborn, too eccentric and not trustworthy. After her retirement, Tilden returned during one summer to collect some of the books and other paraphernalia she had left behind. Rosendahl worried that she might try to take algal specimens from the Herbarium and posted a guard to ensure its safety. The growing animosity between Rosendahl and Tilden had unfortunate repercussions on the future hiring of women in the Department.

During and immediately after World War I, the Department took a progressive stance in the hiring of women and welcomed female students into the graduate program. But by the late twenties it was obvious that female graduates with Ph.D.s were unable to find positions at universities. If they found jobs at all it was in secondary school teaching or in temporary, one-year positions as research and laboratory assistants. Because of this, and possibly because of Rosendahl's difficulties with Tilden, he discussed the following policy with R.F. Daubenmire at the University of Idaho in 1938.

> While the department has no definite rule against the employment of women assistants it has been our policy for the last ten years to appoint men only. We have felt it best not to deviate from the policy by making exceptions to it in special cases, and I am pretty sure the department will follow the same course in this particular instance also. Of course, it can be argued that it is an unfair practice, but in the light of past experience I feel we are justified in continuing it. As you probably know, two of our women Ph.D's are still without permanent appointment, and I am convinced that it would have been better not to have encouraged them to go after the degree in the first place. In the process of getting their degrees they got out of touch with the teaching situation at their level and it has become impossible for them to break into it again.[3]

It was not until the late 1940s that women appeared again as degree candidates and teaching assistants and not until 1970 that the

Department recommended a woman for an assistant professorship.[4] Yet there were a number of successful women who served the Department as laboratory technicians and scientists during the 1930s and 1940s.

Women in the Department

Perhaps the person with the longest tenure as "Junior Scientist and Instructor in Botany," was Agnes Hansen. Collecting pollen for Rosendahl's and later A. Orville Dahl's pollen experiments, as well as providing the daily "pollen count" for the Minneapolis Star and Tribune, Hansen was one of 61 members of the local chapter of Sigma Delta Epsilon, a scientific sorority for graduate women. In 1949 she was elected National Treasurer of the organization and attended many conferences of the American Association for the Advancement of Science (AAAS).[5]

Agnes Hansen collecting pollen for analysis in 1950.

Other women civil servants during this and later periods of the Department's history deserve special mention. Jean McIntosh, who earned her Bachelor's degree from the University in 1942 (in Botany), continued to put her botanical knowledge and secretarial skills to use, serving as the Department's secretary from 1944 to 1983. Wilma Monserud, artist and photographer, and Audrey Engels, photographer, prepared illustrations for course manuals and scientific publications.

Olga Lakela instructs Ardis Peterson on plant mountings, 1952.

The Department often opened its doors to women scientists from other campuses of the University as well as national and international universities. Olga Lakela, a professor of botany at the University's campus in Duluth was a frequent visitor to the Herbarium and a well-known expert on the flora of northeastern Minnesota. Traveling by floatplane to some of Minnesota's most remote places, Lakela's

Margaret Oldenburg showing some of the botanical specimens she collected on Melville Island, 1946.

taxonomic interests centered primarily on weeds.[6] She had collected almost 14,000 specimens by 1952, many of which she donated to the Minneapolis Botany Department's Herbarium. In 1959 she published The Flora of Cook and St. Louis Counties, Minnesota.

Margaret Oldenburg was an amateur botanist/explorer who had some rather harrowing adventures in the Arctic. A former University of Minnesota catalogue librarian, who was inspired to travel in the Arctic after reading Laurence Allen Nixon's Vagabond Voyaging, Oldenburg did a great deal of collecting for the Botany Department at the urging of Ernst Abbe. Using her private funds to finance her travel, she made many trips during the 1940s and 1950s to the Arctic Circle and beyond, journeying to Aklavik, Winter Harbor and Melville Island. Her voyage to Melville Island in 1945 prompted Ernst Abbe to thank the Canadian Pacific Airlines, which assisted in her travels.

> The scientific significance of this trip to Melville Island is based on the fact that in the famous [Capt. Robert Edwin] Parry [sic] expedition of the last century scientific specimens of the greatest importance were obtained. These are so poorly represented in the research collections of the western hemisphere that our scientists have been severely hampered through lack of adequate study material. Thus it is that Miss Oldenburg's opportunity to collect in the classical and inaccessible localities from which she has just returned is of fundamental importance to science.[7]

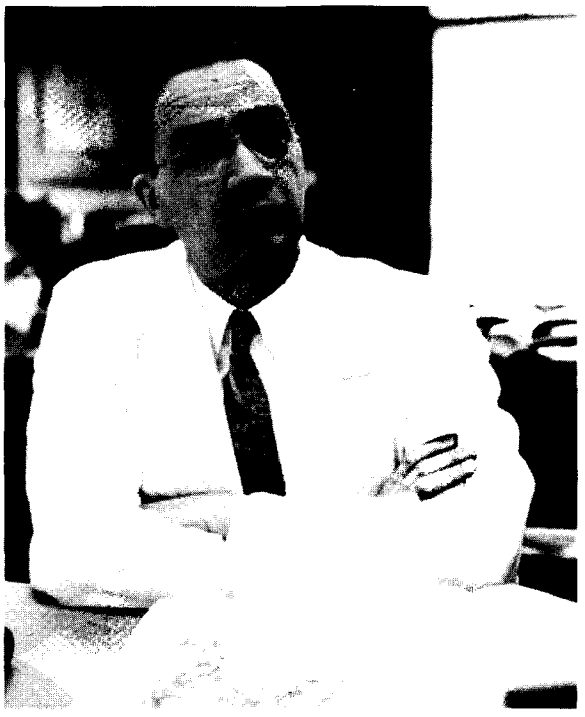
Verona Conway in her office in the Botany Building, 1946.

Another woman who significantly influenced the Department was Dr. Verona M. Conway. A member of the faculty at the University of Sheffield in England, she joined the Department during 1945 and 1946 to study peat bogs and the effects that topography,

drainage and mineral inflow had on their development. Doctor Conway was the winner of the first Virginia C. Gildersleeve International Fellowship and had previously spent part of a year with the Botany Department on a fellowship from Girton College. When the war broke out she returned to England and drove an ambulance during the London blitz, but six years later she was back in the Department studying with Dr. Cooper.

New Hires

Several promising young faculty members were hired in the 1930s. Doctor Ernst C. Abbe joined the Department in 1935. Abbe received his Ph.D. from Harvard in 1934, having previously taken B.S. and M.S. degrees from Cornell. An accomplished scholar in morphology, cytology, genetics and phytogeography, Abbe was hired as an Instructor to develop the Department's cytology and cytogenetics programs. As was mentioned above, the cytology position had been vacant since the Department began, and it was with appreciation and pleasure that the faculty welcomed Abbe to the University.[8]



Ernst C. Abbe (c. 1940)

Laurence S. Moyer came to the Department as an instructor in plant physiology during 1936. Like Abbe he had completed advanced work at Cornell, earning his Ph.D. from there in 1933. By 1938 he was an assistant professor, teaching both physiology and cytology. A former National Research Council Fellow and Yale Sterling Fellow, Moyer published over twenty articles by 1940 and from all indications had a brilliant career ahead of him.[9]

Upon Tilden's retirement, the Department decided to create an instructorship in ecology, rather than try to fill the place of Miss Tilden with another phycologist. In May of 1937, Donald B. Lawrence was hired. Lawrence was an ecologist with a Ph.D. in plant physiology from The Johns Hopkins University and was a long-time admirer of the work of William S. Cooper. While Lawrence had done research on the climate and vegetation of the Columbia River Gorge in Oregon, Cooper soon kindled Lawrence's interest in Alaska's glaciers and vegetation.[10]

An Era of Conservation Efforts Begins

Lawrence's appointment provided for the continuation and extension to the southern Hemisphere (Chile and New Zealand) of a tradition of ecological exploration of deglaciated

Elizabeth and Don Lawrence with Loowit, September, 1948.

terrain begun by Cooper. There began also a vigorous commitment to the preservation of local areas for research and the conservation of plants through the Minnesota Academy of Science and, beginning in 1959, the Nature Conservancy. Rosendahl, Huff, Butters and Cooper had been active for years on various conservation and preservation projects. Rosendahl had served on a number of such committees, and he was director of the Superior National Forest Recreation Association in the 1920s. Cooper discovered Minnesota's Cedar Creek Bog and Lake from an airplane in 1930 and later worked to develop the area for research with the assistance of the Minnesota Academy of Science. And during the early years of the Cedar Creek Natural History Area's development, Don Lawrence and his wife Elizabeth presented 130 acres of land to the Academy for inclusion in the Cedar Creek Forest.[11] Finally, the Department played a major role in creating and maintaining the University's biological station at Lake Itasca, Minnesota. While a comprehensive history of Itasca has already been written by A.C. Hodson, a few details concerning the development of Itasca Biological Station are important to mention in light of the Botany Department's growth in the 1930s and 1940s.[12]

Lake Itasca State Park had been used by the Division of Forestry since 1907, but it was not until 1935 that an actual biological summer station was proposed by the members of the Plant Science Group (including Rosendahl, A.A. Granovsky from Entomology and Dean E.M. Freeman from the Department of Agriculture). The University had a long history of unfavorable decisions regarding the staffing, funding and equipping of biological stations, and for this reason Dean Freeman urged the united efforts of many departments to get the biological station underway. In a letter to Rosendahl in March 1935, Freeman wrote:

> What I have in mind is that we should develop first a tentative general outline for the establishment of some regular session for nature study work and for research in forest and field biology, and next, that we call together a group of the divisions and departments and individuals who may be interested. This will resolve itself into a proposal for these people to start on a venture in which they will have to take some risk. It will be quite obvious that we wouldn't be able to get, at least at first, any considerable or perhaps any direct financial support. We shall have to develop a setup which will be sufficiently attractive to make a large enough registration to support such a biological station. To do this, I am figuring that we will have to take in nature study students who can be taught in larger numbers and whose fees would more than pay for their instruction. We could also, of course, get fees from students in any advanced group. The members of the staff cooperating to develop this school would perhaps at first have to take a chance on the amount of remuneration.[13]

In its first session, August 1935, the Itasca Biological Station had 17 students and five instructors. Representing five departments,

C.O. Rosendahl with his Advanced Taxonomy class, Lake Itasca, 1939.

the instructors served without remuneration and with a spirit of cooperation that was quite impressive. The Botany Department sent Instructor Martin Grant to teach during the first year; the following summer, when 51 students were present, Professors Josephine Tilden and Ned Huff, together with Instructors Henry Oosting and Martin Grant, represented the Botany Department. Cooperating departments, other than Botany, included Zoology, Forestry, Plant Pathology and Botany, Entomology, and Economic Zoology. The Station operated successfully every summer until 1943 when it was closed for two years due to wartime retrenchment measures at the University.

Several people deserve mention in connection with the Itasca Biological Station. While they were never part of the permanent Botany staff, they served for years as visiting instructors and lecturers at the summer station, becoming lifetime friends of Department members. Murray Fife Buell had taken his Master's and Ph.D. degrees from the University of Minnesota (in 1934 and 1935, respectively), while also meeting his future wife, Helen Foot. Buell was a scholar of both morphology and ecology, and he soon found a position on the faculty of the University of North Carolina. Eventually he made his way to Rutgers, the State University of New Jersey.

Buell and his wife spent nearly every summer from 1937 through 1950 at Itasca teaching ecology while enjoying the company of the Rosendahls and the Lawrences. Richard Evans, a bryologist from the University of Wisconsin-Madison, was also a frequent participant in Itasca summer work, along with many of the Botany Department's recent Ph.D. graduates and others in the degree programs who received some of their first teaching experiences at Itasca. Clearly it was an important avenue for research, field work and

Helen F. and Murray Buell, 1940.

for the development of close personal ties among the many scientists who chose to spend their summers in northern Minnesota.

Along with the establishment of Cedar Creek Natural History Area and Lake Itasca Biological Station, the Botany Department also participated in the effort to preserve Nerstrand Woods in southern Minnesota during the 1930s and 1940s. In the mid-1930s, Rosendahl was one of several botanists to urge legislators and community leaders to set aside the woods as a state park. Rosendahl explained to the Kenyon Junior Chamber of Commerce that Nerstrand Woods was a "haven of plants," representing the southern boundary of some rare northern plants and animals, while "form[ing] a remnant and in fact an outpost of the original great [sugar maple/basswood] timbered area of central-southern Minnesota that the early explorers called the "Big Woods.'"[14]

In 1938 the Minnesota Academy of Science together with faculty from Carleton College, St. Olaf College and the Botany Department lobbied the state legislature to approve a bill to make the woods a state park. It was not until 1945, however, that action was taken on the measure. The Student's Linnaean Club of the Botany Department also played an important role in the attempt to preserve Nerstrand Woods. Since its inception the Club had been looking for a project, and in 1939 they found one that was worthy of years of hard work. Having visited the woods on numerous occasions, the group decided to become actively involved in its future. Many of the Club members assisted in plant identification and in collecting specimens for the Department herbarium, thus aiding the successful effort to convince legislators of the woods' botanical importance.[15]

Depression and War

The Great Depression and World War II left their mark on the Department, as they did on the rest of the world. Cutbacks in staff and funding were widespread at the University during the Depression, although some departments benefitted from the Works Progress Administration. The Botany Department hired a number of clerical and laboratory assistants through the W.P.A. during the 1930s and 1940s, alleviating some of the strain on their budget.

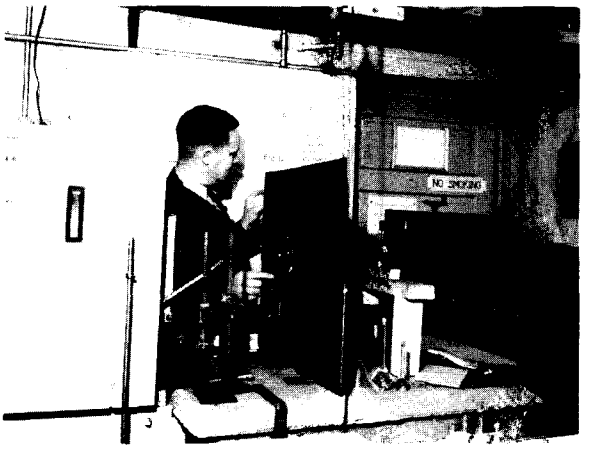
World War II affected the Department in similar ways to World War I with graduate students and some faculty members leaving to serve in the military. Others pursued research that benefitted the war effort. Laurence Moyer did some research on the electrical dewatering of clay for the U.S. Bureau of Mines while George Burr worked on a project studying the use of fats in the army diet.[16] Through his studies on fat Burr also discovered a process for converting various oils into ones with "quick-drying properties" similar to those found in Chinese tung oil. The war made tung oil difficult to obtain, and Burr's discovery enabled the United States to produce its own oil for varnishes, shellacs and lacquers.[17] Donald Lawrence left in 1942 for the Army Air Corps where he taught meteorology, and the reading of maps, charts and aerial photos to aviation cadets. Later he served as an intelligence officer

with the Arctic, Desert, Tropic Information Service in New York City and Florida.[18]

The war was brought home to the Department early in the summer of 1942 with the death of the promising scholar Laurence Moyer. Appointed Special Adviser to Division C of the National Defense Research Committee in May of that year, Moyer served for three weeks before his death as a passenger on one of two Navy blimps that collided off the New Jersey coast on the evening of June 8, 1942. In a tribute to him, members of the Botany Department wrote:

> Professor Moyer's tragic death has brought to an untimely close a scientific career that was already a brilliant one and that gave promise of even greater achievement. In the comparatively short time since he began his investigations as a National Research Fellow he had published numerous papers on electrokinetics, including electro-osmosis, streaming potentials and eletrophoresis. In this field his researches were internationally known, and he was invited to take part in numerous symposia.[19]

The plant physiology program experienced a number of changes prior to Moyer's death. C. Stacy French from the University of Chicago was hired in 1941 and worked on a government-sponsored penicillin research project from 1942 through 1944; he served as a replacement for Moyer in the plant physiology program until he moved to the Carnegie Institute at Stanford in 1947. In 1936 Elmer S. Miller, a 1932 Ph.D. graduate of the University of Minnesota, joined the physiology staff and worked closely with George Burr. Together they published two articles on the essential fatty acids and on fat metabolism.[20] Miller served the Botany Department and physiology program until his sudden death in June, 1941.



Elmer S. Miller in his laboratory (c. 1940).

George Burr continued his nutrition research, but in February of 1940 he broadened his departmental affiliations with the acceptance of a two-thirds appointment in the Department of Physiology within the Medical School. Burr continued to direct and administer the plant physiology program in the Botany Department under a one-third time appointment. The "physiology group" as it was known, maintained its research facilities in the Botany Building and was largely administered through the Botany Department.[21]

With the shifting of Burr's responsibilities, the Botany Department required a new faculty member to fill his two-thirds vacancy. Rosendahl did not recommend the appointment of another physiologist, however. Adhering to the goal of "bringing in promising young men to train into the various major lines of work,"[22] the Department decided to hire a taxonomist. Dr. Carl W. Sharsmith, a recent Ph.D. graduate from the University of California, joined the Department in September, 1940; he was placed in charge of the course in elementary taxonomy and assisted with the

courses in general botany and elementary morphology.[23]

One of the innovations that Sharsmith and the Department introduced during the war years was the course "Plants Useful To Man," which was later modified to a more anthropological format by Don Lawrence and illustrated with thousands of his slides taken on many trips. Plants Useful to Man came under the heading "Economic Botany" and served to introduce students to plants having economic and resource importance. These included "rubbers, oils, fibers, edible products, etc., with special attention to those of current strategic importance."[24] While Josephine Tilden had struggled unsuccessfully to interest both the University administration and students in Industrial Botany, Plants Useful to Man proved to be a popular addition to the Department's curriculum.

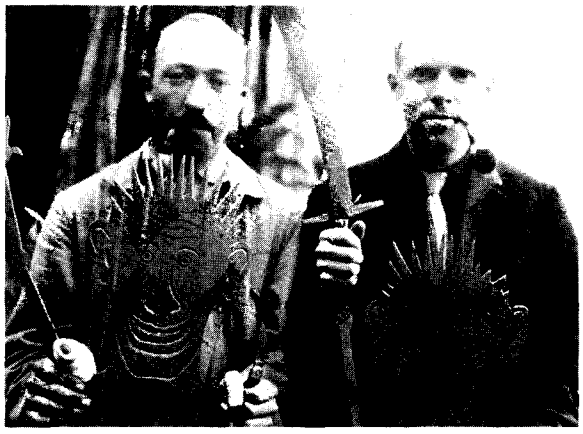
A. Orville Dahl, 1953.

The 1940s were a time of unprecedented change in the Botany Department. Beginning in 1944 with Rosendahl's retirement, a wave of hiring, resignations and other retirements followed. After 43 years on the faculty, Rosendahl looked forward to spending his retirement doing research on interglacial plants and writing a study of the flora of Minnesota. In 1945 he was honored by the American College of Allergists for his work on hayfever-causing plants. A. Orville Dahl, a former student of Rosendahl, was hired as his replacement in late 1944. Carrying on the work of pollen analysis, Dahl and his able assistant Agnes Hansen also took over some of the responsibility for the cytology courses. In 1947 Dahl became the Department chairman, and he served in that capacity until 1957.

Ned Huff examines specimens used in his Minnesota Plant Life extension class, 1945.

In the spring of 1945 Ned Huff retired after many years of service in the elementary and general botany courses. One of the best teachers the Department ever had, Huff contributed to both the University and the community with his popular extension class on Minnesota plant life. Offered from 1935 to

1945, the course's legacy was a collection of 3,000 lantern slides, many of them hand-colored, that Huff produced.[25] Huff's replacement, Rolla M. Tryon, Jr., a Harvard Ph.D. graduate, joined the Department in September, 1945. Tryon was a taxonomist and immediately assumed responsibility for the course in general botany. In 1947 Tryon was appointed Herbarium Curator, setting a precedence for stricter and more efficient management of the Department's plant collection.[26]



Before: C.O. Rosendahl and Fred Butters with Hodag carvings, 1900. After: C.O. Rosendahl and Fred Butters in 1940.

In August of 1945 the Department endured yet another departure, but this one was more painful than the leaving of Rosendahl and Huff. Fred Butters died, ending a lifetime of adventurous exploration of the plant world. In his honor the Department established the "Frederic King Butters Memorial Fund;"[27] its purpose was "to support research on the Ferns, through acquisition of basic materials, by publication of scholarly works or through such other expenditures as may be deemed appropriate by the committee administering the Fund." Shortly after his death the Geographic Board of Canada honored Butters and the work he had done in the Selkirks by naming the highest peak in the Battle Range "Mt. Butters."[28]

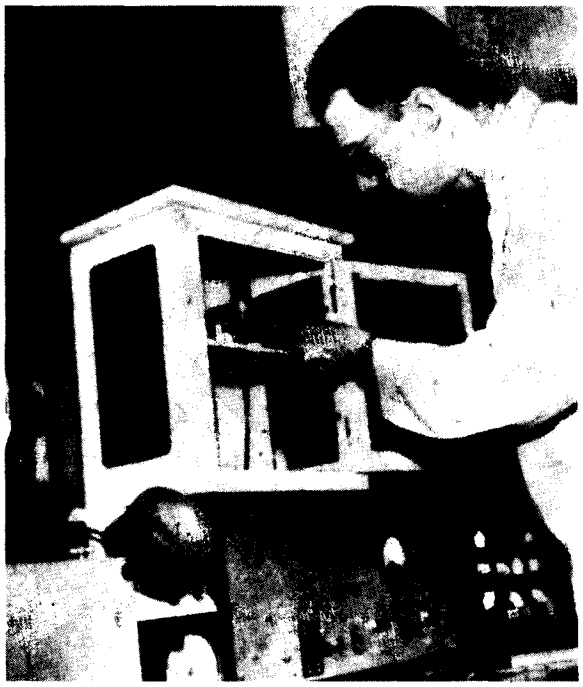
While Department Chairman Ernst Abbe communicated news of Butters`s death to Department members and the rest of the scientific community, research and teaching continued. Together with Dr. Alfred O. Nier in the Department of Physics, George Burr pioneered in the use of carbon 13 to study the basic chemistry of animal and plant life. Growing vegetables using heavy carbon dioxide, scientists then fed the plants to animals which were eventually destroyed and analyzed. Nier's construction of a thermal diffusion apparatus made the experiments possible, and the growth of the heavy carbon plants was under the direction of Burr. The scientists constructed much of the equipment necessary for these experiments out of war surplus items, such as a B-17 bomber and parts of fighter planes. The University paid $60,000 for the surplus stock, and in addition to the parts for Nier's and Burr's experiments, the Botany Department acquired microscopes which are still in use.[29]

War surpluses outfitted this laboratory for a botany class.

Brown and Frenkel Hired

In April, 1946, Burr was named to supervise research work for the Hawaiian Sugar Planters' Association, and he resigned from the University. (Soon after his departure for Hawaii, Burr discovered the C-4 photosynthetic pathway). Burr's position was filled by Allan H. Brown from the University of Chicago who joined the Botany Department in late 1946. Brown had been conducting research at the Fels Laboratory of the University of Chicago on the early products of photosynthetic CO_2 fixation with Hans Gaffron and E.W. Fager, utilizing radioactive CO_2 (labelled with C-14). In December of 1947, Brown, Gaffron and Fager presented the results of their work at the annual meeting of the American Association for the Advancement of Science which proved to be an important contribution toward the eventual identification of the first product of CO_2 fixation in photosynthesis.[30] Also they had discovered that plants used carbon dioxide in two different ways, for their own respiration and for the photosynthetic process. The discovery made the front page of the New York Times, and scientists believed the research might "pave the road to the creation of synthetic foods in great abundance out of carbon dioxide and water by the use of only solar energy."[31]

When Brown arrived at the University of Minnesota he continued research with A.O. Nier initiated by George Burr. This led to important work on isotope discrimination in photosynthesis and the construction of a mass spectrometer which could monitor photosynthesis and respiration simultaneously. It was the first time that correct measurements



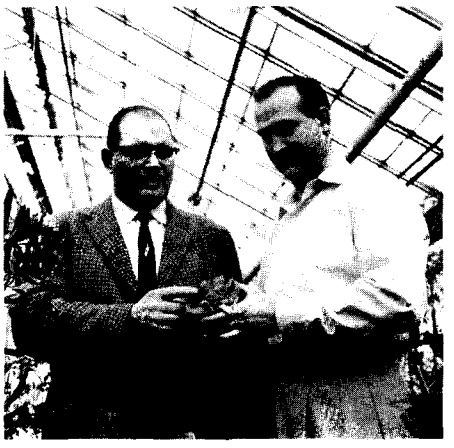
Allan H. Brown slides a plant sample containing radioactive carbon into a Geiger counter, 1948.

of respiratory gas exchanges were made with algae, leaves, and isolated chloroplasts while they were carrying out photosynthetic gas exchanges.

Not only Allan Brown, but also Albert Frenkel made significant contributions to the knowledge of photosynthesis. Hired in 1947, Frenkel came to the Botany Department from the University of Rochester and initially worked on the photosynthetic metabolism of molecular hydrogen in algae. In 1954, while on sabbatical at Fritz Lipmann's laboratory in Boston, he discovered the anaerobic photosynthetic formation of ATP (adenosine triphosphate) by isolated "chromatophores" (thylakoids), isolated from the photosynthetic bacterium: Rhodospirillum rubrum. Returning to Minnesota, he continued to study photophosphorylation and photosynthetic electron transport in bacterial systems and the formation of free radicals in photosynthesis.[32]

Albert Frenkel in his laboratory, 1953.

With the physiology program again on solid ground, Department faculty turned their attention to the elementary courses. In October of 1947 Rolla Tryon accepted a position at the Missouri Botanical Garden, thus leaving the course in general botany and the recently created course in general biology (team-taught by Botany and Zoology) in a state of uncertainty. Harlan P. Banks from Acadia University in Nova Scotia had been hired earlier in the year, and he soon had responsibility for both courses.[33] Unfortunately Banks only stayed with the Department for two years, and for the next few years the Department created a series of temporary appointments to keep the elementary courses going.[34] Tryon's resignation also affected the Herbarium. When Tryon left, the Department lost an administrator as well as a taxonomist. His replacement was Gerald B. Ownbey, formerly of the Missouri



Gerald Ownbey and Robert McLeester in the greenhouse, 1959.

Botanical Garden, whose research in the 1940s centered around the cytotaxonomy of the plant genera Corydalis and Argemone.[35]

In his 1951 report on the Herbarium, Ownbey stated that the University's collection was ranked twelfth in the country, and most of those larger collections were either at privately endowed research institutions or government supported.[36] By 1953 the Department's herbarium contained over 473,000 specimens, with a recent accession of 15,640 specimens from the Missouri Botanical Garden.[37] To ensure that the Department would remain a major research institution in taxonomy, Ownbey concluded that a one million specimen goal was a reasonable minimum.[38] Unfortunately, University support for the Herbarium was not something that had changed in the 60 years since the Department's founding. Funding for herbarium cases, for future purchases of specimens and for staff to maintain the collection was never readily forthcoming from deans and administrators.

The Department Outgrows Its Facilities

Prior to the construction of the Botany Building, space needs became acute, and much of J. Arthur Harris's administrative time was devoted to securing better facilities. Similarly, Professors Abbe and Dahl worked closely with Dean T.R. McConnell in the 1940s to provide more space for the growing Department. In a letter to McConnell in September of 1945, Abbe noted that not only had the Department outgrown the Botany Building, but also the greenhouses and other outdoor garden areas were inadequate to the large demands placed on them by student and faculty research projects.[39]

In 1947 newly appointed Chairman Dahl estimated that the Department required an additional 40,000 square feet of operating space to ease the tight quarters, but the University was unable to provide the funds.[40] Requests by the Department for larger facilities continued to elicit little response, and in 1948, the University proposed the building of a Students' Health Service and additions to the hospital. This proposed Health Service angered Dahl who determined that, despite the University's promises, only 30 to 40 feet would be left behind the Botany Building's south wall after construction, thus leaving no room for expansion. In addition, the construction of the Health Service meant the destruction of the botanical gardens.[41]

While other University departments undoubtedly encountered problems with their facilities as they progressed into the twentieth century, the difficulties the Botany Department had were particularly acute. Needing space for laboratory research, facilities for housing a large herbarium and the usual array of faculty offices and classrooms, the Botany Department always found it impossible to secure adequate space for all of its activities. In addition the faculty required gardens and greenhouses for the growing of plants from a wide range of climates and soils; therefore, the Department's space needs were not limited to the confines of one building. As the Medical School and hospital expanded around the Botany Building, the Department's location became prohibitive to future growth. Unfortunately it was not until

1972 that the Department's needs were finally met in the construction of the Biological Sciences Center on the St. Paul campus.

Thomas Morley in 1971.

During 1949 and 1950 the Department continued to add faculty members. Thomas Morley was suggested as a candidate for the vacant position in taxonomy, and he joined the faculty in the autumn of 1949 as an Instructor in botany. Morley came from the University of California and soon took over most of the instruction in the taxonomy courses. The General Botany and General Biology courses continued to be a source of consternation and confusion, however, until the hiring of John W. Hall in 1950.

Hall's primary research area was paleobotany; he used coal balls to study fossilized plants.[42] While Hall managed and taught the course in General Botany, the General Biology course remained problematic. In June, 1950, Ross Moir was offered an instructorship to teach the Botany half of General Biology after Botany and Zoology were unable to come to an agreement on an individual to teach both halves of the course; Moir also taught the course Plants Useful to Man. A number of people taught in the General Biology sequence during the 1940s and 1950s, including Norman H. Russell, John Pelton, Rudolf Schuster, Patricia Rand, George Yerganian and Lloyd Hulbert.

William S. Cooper Retires

This era of tremendous growth and development ended with the retirement of William S. Cooper in 1951. He left the University for his newly constructed home in Boulder, Colorado; he spent summers at his mountain property at the base of Long's Peak and continued to pursue his scientific interests. As of 1953 Cooper was preparing for publication his study of the geomorphological characteristics of the coastal sand dunes of Oregon and Washington, while using his leisure time to garden.

In a letter written to a graduate student of Murray Buell's at Rutgers University in 1953, Cooper described how he became interested in ecology.

> At the age of nine, when I was living in Detroit, my sister gave me a card game entitled Wild Flowers,' played like the old game of authors. Four cards represented four plants belonging to the same family and the cards had pictures and names on them. Instead of playing the game, I took the cards into the vacant lot next door and tried to identify the weeds.[43]

William S. Cooper (c. 1970).

Cooper was as interested in geology and especially in geomorphology, glaciology, and glacial geology as he was in botany. He built his very successful course in Field Ecology on this combination of interests. Cooper had embarked on a series of expeditions to Glacier Bay in 1916 to study glacial recession and the development of vegetation; they were followed by other trips in 1921, 1929 and 1935. His pioneering efforts in long-term censusing of individual plants and population changes on glacial till uncovered by ice were an important contribution that brought precision and respectability to the developing field of ecology. In the course of that work,

> [he] laid out a series of permanent plots a meter square in places of known age, based on maps and sketches that had been made by John Muir and others....it's those plots that we've kept track of ever since then--right up until last summer [1988, with the help of Mark Noble, Ian Worley and Suzanne Murray]. They're the oldest [repetitively] studied plots of vegetation on land deglaciated anywhere in the world.[44]

Cooper considered his 1926 "Fundamentals of Vegetational Change," based on research done at Isle Royale, and at Glacier Bay, Alaska, one of his most important contributions to strengthening the foundations of ecology. Certainly his research adjacent to Alaskan glaciers inspired the work of Don Lawrence and many others. While Cooper was modest about his accomplishments, the Botany Department's ecology program owed much of its success to his 36 years of excellent teaching and research. After enjoying 25 years of active retirement, Cooper died in 1978.[45]

Conclusion

It is difficult to convey the sense of excitement and uncertainty that accompanied the Department's transformation from 1935 to the early 1950s. George Burr, Allan Brown, and Albert Frenkel were probably the most well-known members of the Department during this time; their studies on nutrition and photosynthesis gave the Botany Department and physiology programs national attention. The departure and arrival of faculty members also firmly established the curatorship and efficient management of the herbarium and brought two adept administrators to the chairmanship, Ernst Abbe and A. Orville Dahl. Finally, the efforts to preserve various areas of Minnesota for state parks and future research facilities made Department members important advocates for

the conservation of the State's natural resources during the 1930s and 1940s.

Department of Botany, 1953. Front row, left to right: C.O. Rosendahl, A. Orville Dahl; Second row, Ned Huff, John W. Moore, Allan H. Brown, Lloyd C. Hulbert, Charles P. Whittingham; Third Row: A. Vincent Weber, Joseph Novak, Helen Habermann, Rose Marie Savelkoul, Jean McIntosh, Richard L. Pierce, James Vermilya; Fourth Row: Agnes Hansen, Signe J. Maley, Wilma Monserud, John W. Hall, Thomas Morley, Donald B. Lawrence, Howard Ehrlich, Obaidur Rahman; Fifth Row: Francis L. McGuire, Robert C. McLeester, Leslie Plasil, E. Dan Cappel, Gilbert A. Leisman, Joanne Schlenk, Ernst C. Abbe, John R. Rowley, Otto L. Stein.

NOTES

1. Anonymous news clipping, Tilden biographical file, UMA. Anonymous, Christchurch Star, New Zealand, March 4, 1935, and Anonymous, New Zealand Herald, March 9, 1935, Tilden biographical file, UMA.

2. T.T. Earle to Rosendahl and Rosendahl to Earle, (September, 1934 through March 1935), UMA Department of Botany papers.

3. Rosendahl to R.F. Daubenmire, (January 18, 1938); Rosendahl to Milton Hopkins, (February 23, 1937), UMA Department of Botany papers.

4. The first woman to be recommended for an assistant professorship since Tilden's departure was Mary E. Burke. The Department meeting minutes state: "It was agreed that MEB's position will remain committed to Biol 1-2 for the present and an attempt should be made to increase her position to full-time Asst. Prof. if possible, or to a 75% appointment as Asst. Prof. if necessary. Hail to Women's Lib!" Staff meeting minutes, (December 3, 1970), Plant Biology papers.

5. Virginia Brainard, "Ladies, Labs and Loves," Minneapolis Star and Tribune, (September 24, 1950), Plant Biology scrapbook; see also, Dahl to T.R. McConnell, (January 9, 1949), UMA Department of Botany Papers.

6. Carl T. Rowan, "Woman Botanist Rushes Into Bogs Where Bears Fear to Tread," Minneapolis Sunday Tribune, (March 23, 1952).

7. Abbe to Director, Canadian Pacific Airlines, (August 17, 1945), UMA Department of Botany papers.

8. Rosendahl to Dean G.S. Ford, (January 7, 1936), UMA Department of Botany papers.

9. University of Minnesota, Graduate School, "Recommendation to Appointment on the Teaching Faculty of the Graduate School;" Moyer to Rosendahl, (June 17 and July 3, 1936); R.A. Gortner to O.M. Tucker, University of Missouri, (November 13, 1937), all UMA Department of Botany papers.

10. Donald B. Lawrence, "Autobiography," (unpublished ms in possession of the author).

11. See the excellent History of the Cedar Creek Natural History Area, by A.C. Hodson for information on Cooper and Lawrence (University of Minnesota Field Biology Program, Occasional Papers No. 2, 1985).

12. A.C. Hodson, History of the Lake Itasca Biology Sessions (Minneapolis: University of Minnesota Printing Department, 1979).

13. E.M. Freeman to Rosendahl, (March 18, 1935), UMA Department of Botany papers.

14. Rosendahl to Mr. Adolph Charlson, (August 31, 1934), UMA Department of Botany papers.

15. R. Bruce Ledin, "Nerstrand Woods," SLC Memory Log, pp. 18-23.

16. Memo on "Defense Preparedness Program," Department minutes, (January 7, 1942), Plant Biology papers.

17. Leonard G. Wilson, Medical Revolution in Minnesota, p. 402.

18. Donald B. Lawrence, "Autobiography."

19. Anonymous memorial to Moyer, undated, Plant Biology papers.

20. George Burr, M.M. Burr and E.S. Miller, "On the Fatty Acids Essential in Nutrition III," Journal of Biological Chemistry, 97(1) 1932; George Burr and E.S. Miller, "Photoelectric Spectrophotometry applied to Studies in Fat Metabolism," Proc. Soc. Exp. Biol. and Med., 36 (1979):726-9.

21. Burr to Rosendahl, (February 21, 1940); Rosendahl to A.O. Dahl, (April 11, 1940), both UMA Department of Botany papers.

22. Rosendahl to A.O. Dahl, (April 11, 1940), UMA Department of Botany papers.

23. Rosendahl to George Baitsell, Sigma Xi, (April 8, 1943); Rosendahl to Sharsmith, (June 22, 1940), both UMA Department of Botany papers.

24. Rosendahl to Dean McConnell, (January 4, 1943), UMA Department of Botany papers.

25. Gladys Wodd, "Plant Life Extension Class Spurs Knowledge of Nature," St. Paul Pioneer Press Dispatch, (May 4, 1945), Plant Biology scrapbook.

26. Abbe to G.S. Bryan, University of Wisconsin, (March 11, 1946), UMA Department of Botany papers; copy of advertisement for Science, approximately 1947, Plant Biology papers.

27. Department meeting minutes, (October 30, 1945), Plant Biology papers.

28. Ernst Abbe, "Frederic King Butters, 1878-1945," Rhodora vol. 50 (June, 1948):136.

29. "Heavy Carbon Aids Study of Life Processes," "U to Grow 'Heavy Carbon' Plants," "U Scientists Study Life Chemistry," and "Carbon 13 Employed as Tracer in Living Tissues," a four-part series by the University of Minnesota Daily, (February, 1946), Plant Biology scrapbook; "War Surplus Aids Science at 'U'," Minneapolis Daily Times, (October 14, 1946), Plant Biology scrapbook.

30. "Minnesota U Scientist Tackles Plant Food Mystery," St. Paul Pioneer Press Dispatch, (March 21, 1948), Plant Biology scrapbook; Dahl to G.A. Thiel, regarding Botany research projects, (February 10, 1948), UMA Department of Botany papers.

31. William L. Laurence, "New Discovery Offers Clue to the Synthesizing of Food," New York Times, (December 29, 1947), pages 1 and 24, Plant Biology scrapbook. I am indebted to Albert Frenkel for information about Brown's contributions to understanding the photosynthetic process.

32. Dahl to G.A. Thiel regarding faculty research (February 10, 1948), UMA Departmetn of Botany papers. Comments of Albert Frenkel, (August and September, 1989).

33. Dahl to T.R. McConnell regarding Brown, Banks and Frenkel, (January 30, 1948), UMA Department of Botany papers.

34. Banks left for Cornell early in 1949.

35. Dahl to G.A. Thiel, (February 10, 1948), UMA Department of Botany papers.

36. "Annual Report of Herbarium, July 1, 1950 to June 30, 1951," UMA Department of Botany papers.

37. "Third Annual Report of Herbarium Activities, 1952-1953," UMA Department of Botany papers.

38. Ibid. See also, Anonymous, "U Botany Herbarium Has 474,000 Specimens, The Minnesotan, December 1953, page 7.

39. Abbe to McConnell, (September 6, 1945), UMA Department of Botany papers.

40. Dahl to Roy Lund, Physical Plant, (December 4, 1947), UMA Department of Botany papers.

41. Dahl to T.R. McConnell, (June 17, 1948); Allan H. Brown to Roy Lund, Physical Plant, (August 2, 1948); Brown to Dean J.W. Buchta, (August 11, 1948); all UMA Department of Botany papers.

42. Phil Hoyer, "Fossilized Plant Specimens Aid Paleobotany Research," Minnesota Daily, (January 26, 1951), Plant Biology scrapbook.

43. Cooper to Jack McCormick, (February 28, 1953), papers of Donald B. Lawrence.

44. Interview with Donald B. Lawrence, (August 11, 1989), UMA Department of Botany papers. James White, ed., The Population Structure of Vegetation, (Dordrecht: Dr. W. Junk Publishers, 1985), p. 59.

45. Donald B. Lawrence, "William Skinner Cooper, (1884-1978)," Ecology Bulletin, 60(1) 1979:18-19, UMA.

Chapter Four: 1955-1973

In a 1964 article in the journal Nature, R.D. Preston commented on the state of the botanical sciences around the world. He wrote:

> It is something of a paradox that, at a time when the learned journals dealing with the plant sciences are struggling to cope with the demand for the publication of an increasing flow of high-class contributions, when botanists are bombarded by a growing complex of review articles and 'Recent Advances' and when thousands of botanists can gather at a Congress devoted to innumerable discussions of developments in their subject which are often spectacular, there is still felt in many quarters a profound disquiet concerning both the support at present being given to botany and the prospects for the future....in most parts of the world...botany is invariably, of the scientific disciplines, the one to receive the least support either by way of research facilities or of new buildings and--much the more important--to be the least well provided with students of the requisite quality in the requisite numbers.[1]

Preston continued with an analysis of the reasons for the neglect of botany, attributing many of the problems to the "undue modesty" of botanists who fail to educate the community and other scientists about botany's contributions to science, and specifically to its continued importance to the study of medicine and to industry.

Preston's observations confirmed those of the Botany Department faculty and served as a summation of the difficulties they had experienced up to the mid-1960s. The article also prophesied a time of greater trials ahead as the Department struggled to find its place in a changing University structure. The period from approximately 1955 to 1973, when the Department moved into its new quarters in the Biological Sciences Center, was a time of stressful maturation, and the Botany faculty faced a number of complex decisions as they participated in the reorganization of the sciences at the University.

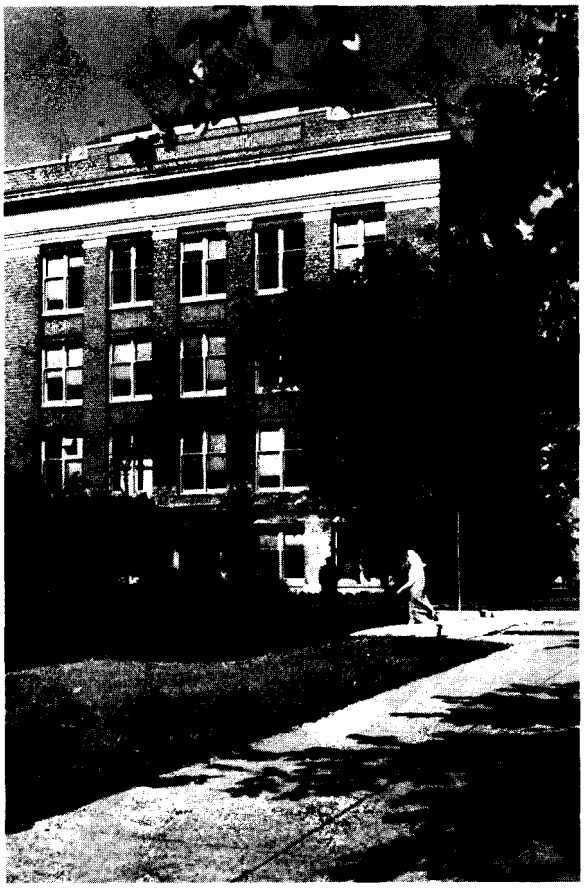
At the risk of grossly oversimplifying the issues, it could be said that the Department had essentially two dilemmas facing its members. The first issue on the table was the relationship of Botany to the rest of the University's scientific community. Botany had always been closely linked with the biological sciences in Minneapolis, while also sharing teaching, research and information with its colleagues in agriculture and plant pathology on the St. Paul campus. Department members and faculty in other departments began to raise questions about the administrative and research affiliations of the Botany Department and wondered if a reorganization of those connections were in order.

The second, and perhaps more important issue confronting the Department was the ever-present problem of space. In a 1947 report to the central administration, A. Orville Dahl had put forward a proposal outlining the acute need for approximately 43,000 square feet of additional space; the administration forced a compromise and recognized the need for only 22,500 square feet of space. No action was taken on either

recommendation, however, and by the mid-1950s the problems had grown worse.[2] Eventually Botany and Zoology developed plans for a new Life Sciences Building on the Minneapolis campus, and this chapter will describe the outcome of those efforts.

The College of Biological Sciences

The 1965 reorganization of the life sciences into the College of Biological Sciences was a gradual process that began in the early 1950s. For a number of years Zoology and Botany had jointly taught a series of classes that were loosely described as General Biology, but the ultimate responsibility for the course was a continuing source of administrative difficulties. One of the chief problems was staffing; few people wanted to join either department if their hiring meant they would devote most of their energies to the General Biology courses. In 1958 the Joint Committee on Biology recommended the adoption of a sequential General Biology course that would replace a Natural Science sequence. It was to be a "fully integrated, non-departmental, Biology course acceptable in content to Botany, Zoology, the Medical School, the Institute of Agriculture, and the Institute of Technology." [3] This course was an important symbol of the close working relationship that existed between the two departments, and its implementation followed soon after the recommendation from faculty in both departments that space needs could be alleviated by constructing a connecting link between the Botany and Zoology buildings.[4]



The Botany Building, built in 1926, on the Minneapolis Campus.

Thoughts of reorganizing the biological sciences (or life sciences, as they were frequently called) also stemmed from the departure of the Department of Physics from SLA and its subsequent incorporation into the Institute of Technology in 1956.[5] Though many Botany Department faculty members, among others, viewed with apprehension the incorporation of Physics into the Institute of Technology, some people expressed the opinion that all of the sciences should move with Physics into IT.[6] Originally this idea of abandoning SLA altogether was abhorrent to the Botany faculty, but over time, and with increased

frustration over the central administration's moves to prevent the expansion of the Department's facilities, the Botany Department faculty proposed a number of options for leaving SLA.

After a lengthy meeting on January 4, 1960, the faculty gave Chairman Allan H. Brown permission

> to further explore the possibility of the Botany Department becoming a part of a division of science in the Institute of Technology to be renamed the Institute of Science and Technology; and that he discuss this matter with Deans Blegen, Spilhaus and McDiarmid as soon as possible.[7]

After further discussions and exploration of the proposed change, the Botany faculty concluded that the new institute should include the following departments: Anthropology, Astronomy, Biophysics, Botany, Chemistry, Geology, Mathematics, Physics, Zoology and the Museum of Natural History.[8] In October of 1961, the Department discussed options for the administrative structure of the Institute of Science and voted for their preferences. First was an Institute of Science with its own dean; second was an Institute of Science and Technology with a combined dean; and third was some "subdivisional unification" of the sciences within SLA.[9]

In the long run this exploration of the future of the sciences at the University did not produce an Institute of Science. However, the eventual establishment of the College of Biological Sciences was the direct result of several departments' deliberations over the Institute of Science. In fact, it may have been Botany Department faculty who first gave voice to the possibility of the unification of the biological sciences under one administrative structure, called the Institute of Biological Sciences.[10]

Early in 1963, President Wilson established the Committee to Review the Status and Development of the Biological Science Departments at the University. Allan H. Brown (and later A. Orville Dahl) served on the committee along with eleven other faculty members representing the Institute of Agriculture, the Institute of Technology, the Medical School, the College of Liberal Arts (CLA) and representatives from central administration.[11] Their recommendations and deliberations eventually culminated in the establishment of the College of Biological Sciences (CBS) in 1964. In 1965 Richard Caldecott was appointed Dean of the new College, and the departments of Agricultural Biochemistry, Botany, and Zoology, along with the Museum of Natural History and the Dight Institute for Human Genetics joined CBS. In addition, the College created two new departments, Genetics and Cell Biology in 1965, and the Department of Ecology and Behavioral Biology in 1967.[12]

Incorporation into CBS did not solve the Botany Department's space needs; while the reorganization issue and the space question were inextricably linked, administrative reorganization was not in itself a cure for cramped facilities. The Department did eventually move to a new building on the

St. Paul campus, but that outcome, like the issue of reorganization, had a complex history.

The Life Sciences Building

In the early 1950s the Department, together with Zoology and the central administration, explored several options for solving the space problem. Among the suggestions was a proposed new building west of the Health Service or a connecting link between Botany and Zoology. By February of 1957, the administration had approved an addition for the Health Service and proposed that two floors be reserved for the Botany Department. While this seemed a good idea at first, Health Service administrators made it clear that the space allocated to Botany would be temporary until the Department made other arrangements.[13]

These events transpired in an atmosphere of overall growth at the University. What is now known as the West Bank campus was in the early planning stages, and the administration sought advice from deans and department heads on the optimal use of the area. Botany Department Chairman Allan Brown recognized that any department moving to the new campus would, of course, receive a new building; thus Botany put a great deal of energy into studying this particular option, before deciding that separating itself from Zoology would do more harm than good.[14]

In October, 1957, Department members evaluated their options and decided they had the best chance of obtaining funds for a connecting link rather than a new building, but that did not stop them from trying to gain support for a Life Sciences Building on the Minneapolis campus. Proposed sites for the new building included space south of Coffman Union or south of Comstock Hall; more ambitious was the plan to build a "science campus" on the Armory site.[15]

The Life Sciences Building envisioned by the Botany and Zoology departments was to have included these two departments along with a third, and not yet existing department, the Department of Biophysics.[16] In April, 1958, Professor

Botany greenhouse along River Road, 1956.

Minnich from Zoology met with Dean McDiarmid and informed him that Zoology estimated a need of 80,000 square feet of additional space by 1970 and that this need could not be met with an addition to the existing Zoology Building. At the same meeting Minnich voiced approval of the plan to locate Zoology and Botany in a Life Sciences Building; unfortunately President Morrill decided that it was not possible to include a Life Sciences Building in the 1959-1960 legislative request.[17]

By 1962 it was clear to Botany Department faculty that plans for a Life Sciences Building on the Minneapolis campus were in jeopardy. In February of that year Botany Professor Kenneth Skjegstad recorded in the staff meeting minutes that "the President was reported as not being altogether certain of the correctness of his decision to give top priority to the Life Sciences Building and as desiring more background information." [18] Shortly thereafter the Department reevaluated its options and decided to explore the possibility of moving to St. Paul.

For several years, the option of leaving the Minneapolis campus altogether lingered at the back of many a Department member's mind but only as a last resort. Faculty worried that they would lose their autonomy by relocating to the St. Paul campus and were concerned that they would be immediately absorbed into the Institute of Agriculture.[19] By 1965, however, the drawbacks of moving to St. Paul were outweighed by the advantages; the administration clearly was not in support of a Life Sciences Building on the Minneapolis campus, and the Department hoped that the newly appointed Dean of the College of Biological Sciences, Richard Caldecott, would take action to alleviate their space problems. Chairman Ernst Abbe spent several months working to convince his colleagues that relocating to St. Paul would be in the best interests of all concerned, and on February 16, 1965, the Department faculty sent the following letter to President Wilson.

> The undersigned members of the Department of Botany respectfully request your active support in our decision to seek establishment of the St. Paul Campus. Such a move would be consonant with the concept of a Twin Cities Campus, since the Department would hope to retain adequate teaching facilities on the present Minneapolis site.
>
> It has become increasingly apparent to us that the Department's undergraduate and graduate teaching and its research are becoming hampered by lack of space. It is now clear that the required space is more readily available on the St. Paul Campus. Moreover, many of the services we provide to other departments and to the public would be considerably improved by the proposed change of location. We feel that such a move might enable the Department to contribute more effectively, in most respects, to the long term objectives of the University and of the College of Biological Sciences. Drawbacks to this move, we believe, will be outweighed by the advantages and may in time disappear....[20]

While this letter was not, in itself, a catalyst for the changes that culminated in the construction of the St. Paul Biological Sciences Center, it was an important marker

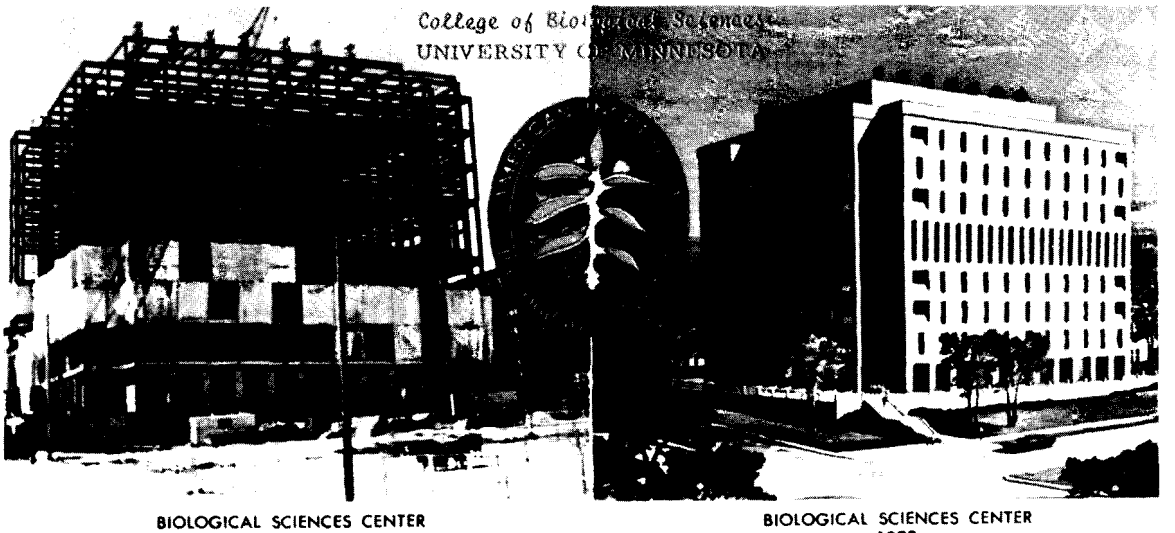
of the distance the Botany Department had traveled in its quest for a more favorable administrative structure and for better facilities. Once the faculty decided to proceed with a move to St. Paul, Dean Caldecott lobbied administrators and legislators to ensure the successful completion of the Biological Sciences Center.

Moving the Herbarium

During the next few years, Department members continued to make plans for their future, and they faced another crisis when it appeared the Herbarium and the systematists in the Department might be left on the Minneapolis campus when the other areas moved to St. Paul. Space was allocated to Botany without the Herbarium, and the Department was to share the Biological Sciences Center with several other departments. The original building plans called for a seven-floor structure at a cost of $8.8 million; in order to accommodate the Herbarium an eighth floor would need to be constructed. Ernst Abbe requested the faculty's thoughts in writing about the Herbarium, and the reply of Thomas Morley is representative of the kind of the responses Abbe received.

> My first concern is for the breadth of area representation in the Department. Removing any segment diminishes the Department in its diversification and therefore in the breadth of experience of its staff and students. The enrichment of wide contacts is decreased by that much. I know it is good for me to rub shoulders with cytologists, for example, and I like to think it is good for them to have taxonomists around.[21]

The physical integrity of the Department had been an issue of importance to botanists at the University since the Department's creation. Despite the appeal of new facilities in St. Paul, faculty members were so opposed to moving without the Herbarium that one of them suggested recommending against the



BIOLOGICAL SCIENCES CENTER
1971

BIOLOGICAL SCIENCES CENTER
1972

Architect's drawing of the Biological Sciences Center.

transfer of the Department if it meant leaving the Herbarium.[22]

Fortunately, the Department had an advocate in the state legislature. Senator Popp, chairman of the Legislative Building Commission, received his training in Pharmacy at the University of Wisconsin and recognized the importance of the Herbarium to the Botany Department. In February, 1969, Senator Popp and his wife were killed in an auto accident; as a memorial to him, the Legislative Building Commission decided to accept his recommendation of an additional one million dollars to construct the eighth floor of the Center. In December, 1972, the Department and the Herbarium moved into their new home on the St. Paul campus.[23]

Dean Caldecott with Murray and Helen F. Buell, at Biological Sciences Center dedication, April, 1973.

Undoubtedly the dedication in April, 1973, was the occasion for some reflection by senior staff members who had participated in the transformation of botany at the University since the mid-1940s. Yet the organization of CBS and the move to St. Paul are only part of the history of the Department during this period. Along with deliberations over those changes, the Department carried out the day-to-day activities of teaching and research, while working to expand its program offerings.

Program Development

During the 1950s the Botany Department enjoyed national attention for its physiology program due to the research on photosynthesis of Albert Frenkel and Allan H. Brown. In a report outlining the future needs of the Department, the staff estimated that by 1970, they would require an additional two positions in plant physiology in order to strengthen an already impressive area of research. Along with physiology, the Department wished to expand the ecology program, to further develop its cytology and palynology areas, and to create a new position in experimental morphogenesis.[24] Though the road to these goals was strewn with obstacles, the Department achieved most of its desired growth and development by the time they moved into their new facilities.

In the early 1950s, both the ecology and phycology areas were in need of additional staff. Josephine Tilden retired in 1937, followed by William Cooper in 1951; lack of funds and other more pressing areas of development meant that the Department made no provisions initially to fill either position. By 1953 Department members agreed that they should try to hire an ecologist or a phycologist, or a combination of the two. Algologist Richard E. Norris

joined the staff in 1955, teaching in both phycology and general biology until his resignation in 1962.

Richard Norris (c. 1955).

Norris planned to take a sabbatical during the 1963-64 academic year, and prior to his resignation, the Department formed a committee to make a decision regarding his replacement. At their first meeting, the committee discussed a number of options, including the addition of temporary staff in an area other than phycology. Palynology, mycology and genetics were three of the areas suggested as needing attention, but the committee felt it could not make those judgments without input from the entire staff.[25] Nonetheless, their deliberations helped to clarify some of the issues involved in replacing Norris and were undoubtedly useful when he resigned in December, 1963. Rather than pursuing the option of strengthening a different area, the staff decided to recruit another phycologist. Allan J. Brook from Edinburgh joined the staff in 1964 to teach elementary and advanced phycology. Brook went on to head the newly formed Department of Ecology and Behavioral Biology in 1967.[26] He maintained his affiliation with the Botany Department as a member of the Graduate Faculty, advising graduate students and continuing his research on phytoplankton and water quality.[27]

The ecology program also underwent a number of changes during the 1950s and

Allan J. Brook (c. 1965).

1960s. Many people served as instructors over the years, including Lloyd Hulbert, William Martin, Patricia Rand, Bonnie Marotta and Hagdis Tschunko; they assisted Don Lawrence while the Department explored the possibility of making two senior staff appointments, one in ecology and the other in mycology. Chairman Allan Brown even approached the Department of Plant Pathology and Botany in St. Paul with a proposal for a joint appointment in mycology, but Plant Pathology did not express interest in the arrangement.[28] Eventually, in 1964, Ecologist William A. Reiners joined the Department as a temporary instructor while Don Lawrence was on sabbatical. The administration provided an additional $8,000 for an assistant professor position in December, 1964, and the senior staff voted unanimously to offer Reiners the position. Unfortunately he left the Department in 1967 for Dartmouth College's Biology Department, but not before spending part of that summer in a very productive trip to Glacier Bay, with Don and Lib Lawrence.[29]

While the staff tried to iron out the difficulties in the ecology and phycology areas, another Department committee made recommendations on the physiology positions. Allan Brown, who had served the Department as chairman from 1957 to 1962, resigned from the University and went to the University of Pennsylvania in 1963. His departure meant the loss of a prominent physiologist as well as an efficient

Thomas Soulen in his laboratory.

administrator, and Ernst Abbe succeeded him in the latter position. During the 1960s the Department hired several plant physiologists, all of whom are still with the Department. Thomas K. Soulen arrived in 1964, continuing with his research on enzymes of nitrogen metabolism and their relationship to development. Soulen has taught Plant Metabolism for many years and also put his lecturing talents to the test when the University began televising the General Biology course. From 1984 to 1988, Soulen served as Department head. Shortly after his arrival at the University, Soulen was joined by two more physiologists, Douglas C. Pratt from Carleton College and Willard L. Koukkari from the University of Connecticut (in 1966 and 1968, respectively).[30]

Both Pratt and Koukkari shared an interest in phytochrome research. Along with the plant pigment phytochrome, Pratt pursued spectroscopic studies of animal visual pigments while also studying the natural occurrence and distribution of photosynthetic

Douglas Pratt (c. 1985).

W.L. Koukkari, Steve Gantt and Bernard Phinney, 1987. Photo courtesy of Albert Frenkel.

bacteria in Minnesota's wetlands. During the 1980s he investigated the potential of emergent aquatic vegetation, particularly Typha spp., as a source of biomass energy and as an agent for nutrient removal from wastewater. Prior to his arrival in Minnesota, Koukkari worked with William S. Hillman at Brookhaven National Laboratory on the physiology of phytochrome. Having studied the role of this pigment in photomorphogenesis and plant development, Koukkari continued his research in the Botany Department, focusing more on the timing mechanisms of organisms.[31]

General Biology was another area that received much attention in the 1960s. The Department hired Eville Gorham from the University of Toronto in November, 1961; his primary responsibility was to the General Biology course. Gorham was a limnologist and ecologist who also served as Department head from 1967 to 1971. In the spring of 1965, Gorham received an offer from another institution, and it appeared he would resign. His impending resignation resulted in a number of changes in the Department's General Biology course, which were implemented even after Gorham decided to stay in the Department. The staff made an important decision to rotate the responsibility for General Biology, each Department member volunteering for 3-year periods of service in that course.[32]

Eville Gorham

The rotation of the General Biology course meant the end of a long series of temporary instructorships and put one of the Department's most important introductory

courses on more stable ground. In 1970 the Department made two more appointments to the course; former Ph.D. student Robert Bland along with Mary E. Burke joined the Department. Both were promoted to assistant professor the following year.[33] Professor Burke's promotion was cause for much fanfare in the Department; she was the first woman to attain the rank of assistant professor since Tilden's retirement.

Ed Cushing, 1981.

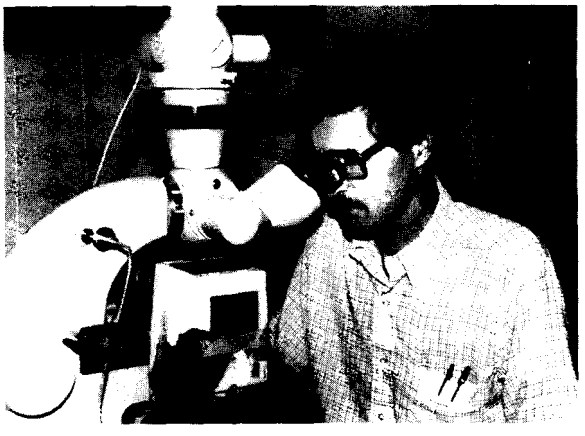
At the same time that the Department reorganized the General Biology course, they also recommended a permanent position for Ed Cushing, who was a temporary visitor in Department during the winter of 1965. Cushing was a palynologist, filling in for both A. Orville Dahl and Don Lawrence on occasion, and in 1966 he held a postdoctoral fellowship at the University of North Wales. Chairman Abbe found it difficult to convince the administration of the need for a second palynologist, and Cushing's appointment to the permanent staff was not made until January of 1967.[34] The timing of his appointment was fortuitous; late in 1967 A. Orville Dahl resigned from the University to become director of the Morris Arboretum at the University of Pennsylvania.[35]

Dahl had taught a number of the cytology courses over the years in addition to palynology, and his leaving prompted the hiring of Cytologist D.A. Stetler from the University of California, Berkeley. Stetler was especially interested in studying chloroplast development, and he helped to strengthen the Department's broader area of developmental biology. Eventually the Department's hiring of new staff would be strongly influenced by the emphasis on developmental biology, thus it is worth taking a few moments to describe the evolution of that area during the 1960s.[36]

Cell Biologist William P. Cunningham was probably the first appointee hired with the intent of actively building a developmental biology program. Ernst Abbe worked for years to build a solid cytology and morphology program, and he continued to research aspects of the development of floral anatomy and morphology in the 1960s. Cunningham joined the staff in 1965 but transferred to the Department of Genetics and Cell Biology in 1967 to continue his research on the electron microscopy of cell membranes.[37] Like Brook, Cunningham maintained his affiliation with the Department as a member of the Graduate Faculty.

The next few years were difficult ones for developmental biology; Stetler only stayed two years before leaving for

Dartmouth College. In 1969, Terry L. Shininger arrived from Stanford University but left the Department for a postdoctoral position at Harvard University two years later.[38] In spite of these losses, however, developmental biology continued to grow, and the Department created a position in experimental morphogenesis in 1969. David McLaughlin, a postdoctoral fellow in Copenhagen, joined the Department in the fall of 1969 and soon began teaching developmental biology and morphogenesis.[39] His research focused on the environmental control of development in mushrooms and on the ultrastructure and cytochemistry of the basidium and basidiospore. In 1974, McLaughlin coauthored An Atlas of Fungal Ultrastructure with A. Beckett and I.B. Heath. During the 1970s he began to apply ultrastructural data to questions in fungal evolution and to study the mushroom flora of Minnesota.



David McLaughlin

There were two other important appointments made during the period 1955 to 1970, one of which resulted in a crucial turning point in the history of the Herbarium. The first of these appointments was the transfer of Herbert Jonas from the Department of Pharmacognosy to the Department of Botany in 1968. A few years previous to his transfer, the Department recommended Jonas's appointment to the Graduate Faculty of Botany, thus he was well acquainted with the Botany faculty. His expertise in the areas of mineral nutrition, chemotaxonomy and isotopes considerably strengthened the physiology program.[40] Jonas played an important role when the Department moved to St. Paul; he was appointed head of the Department's building committee and saw to it that space and organizational needs were met.

The second appointment followed the 1969 retirement of the Department's long-time Herbarium scientist, John W. Moore. Moore had served as an assistant to Herbarium Curators Tryon and Ownbey, and prior to that, he had almost complete responsibility for the collections. His was a Civil Service position, and when he retired, the Department formed a committee of three (Ownbey, Morley and Cushing) to assess the future needs of the Herbarium. The committee recommended two new positions: a Civil Service position for a person with a Master's degree and trained in taxonomy to assist the Curator; and an academic position for "a trained taxonomist holding a Ph.D.,

preferably a specialist in lichens or mosses."[41] In the fall of 1970, Clifford Wetmore from Wartburg College in Iowa, joined the Department, thus filling the academic position. (The Civil Service position was subsequently redefined and not filled until 1986 when Anita Cholewa arrived as Collections Manager.[42]) By 1986, Wetmore had built up an extensive lichen collection--the only of its kind to be completely computerized. Over the years he has received a number of grants from the National Park Service to survey and study lichens in the National Park system.[43]

Clifford Wetmore

The hiring of Clifford Wetmore marks the end of a period of departmental reorganization that was connected to the more general reorganization of the sciences at the University. In addition, with the anticipation of better facilities in St. Paul, the Department could successfully recruit new professors to developing fields. Concomitant with the efforts to bring in promising young faculty members, the senior staff deliberated the question of departmental leadership during the 1960s. The question of a chairman versus a head of the Department was raised after the organization of the College of Biological Sciences, and Dean Caldecott solicited opinions from the Department faculty. Their concerns, and the outcome of these administrative questions, is the subject of the last part of this chapter.[44]

The Headship

J. Arthur Harris had been the first and only Department head, and many felt his administration to be one of the most effective and successful in the history of the Department. After his death, the Department searched for five years to bring a new head of the Department in from another institution. Hampered by University retrenchment, the search was unsuccessful, and C. Otto Rosendahl accepted the chairmanship of the Department in 1935. Quietly the issue of headship disappeared, to be logically revived with the reorganization of the Botany Department into CBS.

Dean Caldecott received a mixed response from Department faculty when he broached the idea of a headship. Several worried that a head would become a despot, would appoint new faculty members without the consent of the Department as a whole or would make other snap decisions to the detriment of the Department. At the same time, most faculty recognized the need for secure and predictable leadership. The records indicate that older Department

members favored the continuance of the chairmanship in the interest of democratic decision making, while newer faculty felt a change to a headship would be more efficient, practical and professional.[45]

Early in 1967 the Dean made the decision to appoint a head rather than a chairman, though under the stipulated guidelines, the Department was asked to recommend two candidates for the five-year position.[46] Eville Gorham was subsequently appointed, and in 1971, Albert Frenkel succeeded him. Originally the Dean intended for the head to be recruited from outside the Department, but further retrenchment at the University made a search impossible. The era that began under the leadership of A. Orville Dahl ended, therefore, with the appointment of Albert Frenkel.

This chapter has focused extensively on the administrative restructuring of the Department along with the resolution of the Department's long-standing space problems. But before closing this era's history, it is important to recognize the achievements of the graduate students. They contributed to the Department's administrative changes, too, by securing the right to attend staff meetings and to evaluate their professors. On January 22, 1969, Eville Gorham welcomed newly elected graduate student representatives Robert D. Bland and Lee S. Jahnke to their first faculty meeting. And in 1970 Botany faculty agreed to have all of their courses evaluated regularly by students, with the results openly available in the Department office.[47]

Albert Frenkel and Dr. Wayne Frye (University of California, Department of Paleontology), 1985. Photo courtesy of Albert Frenkel.

NOTES

1. R.D. Preston, "The Future of Botany," Nature, no. 4953 (October 3, 1964):12-13.

2. Botany Department staff meeting minutes, (May 28, 1952), Plant Biology papers. This chapter relies heavily on the Department meeting minutes as a source (hereafter, "Minutes").

3. Minutes, (October 30, 1958).

4. Nelson Spratt (Zoology) had suggested as early as 1954 that a connecting structure could be built between Botany and Zoology; at the same time he proposed the integration of the two departments in one way--the implementation of the General Biology course. Minutes, (April 9, 1954).

5. On the Physics Department see Minutes, (September 29, 1955, and January 5, 1956).

6. Minutes, (January 5, 1956).

7. Minutes, (January 4, 1960).

8. Minutes, (June 20, 1960).

9. Minutes, (October 26, 1961).

10. Minutes, (January 20, 1962).

11. Ernst Abbe to Dean McDiarmid, (February 19, 1963), Plant Biology papers; Minutes, (October 9, 1963).

12. College of Biological Sciences, "CBS History in Brief," (undated), Plant Biology papers.

13. Minutes, (May 28, 1952; April 9, 1954 and February 21, 1957).

14. Minutes, (October 10, 1957).

15. Minutes, (October 10 and 24, 1957).

16. Minutes, (February 27, 1958, and November 22, 1960).

17. Minutes, (April 3 and April 24, 1958).

18. Minutes, (February 3, 1962).

19. Ibid., see especially the motion introduced by Dr. Ownbey regarding a move to St. Paul, (January 8, 1959); see also Minutes, (October 11, 1962).

20. Botany Department faculty to President O. Meredith Wilson, (February 16, 1969), Plant Biology papers.

21. "Justification for Physical Integrity of the Botany Department Including the Herbarium and Its Staff," (January 6, 1966), Plant Biology papers.

22. Ibid., Gerald Ownbey commented: "If the Botany Department moves to the St. Paul campus, it would in my opinion be a serious mistake if transfer of the herbarium were not provided for at the same time. The arguments for moving the herbarium

are fully as cogent as for the moving of any other unit of the department. On the other hand, it would be very short-sighted if facilities provided on the St. Paul campus were in any way inferior to those which we presently enjoy. In fact, I would personally strongly recommend against its transfer under such circumstances."

23. Information on the planning of the Biological Sciences Center is from Donald B. Lawrence, phone interviews with Gerald Ownbey and Ernst Abbe, (September 19, 1989); Lawrence, phone interview with Minnesota State Legislative Reference Librarian Jan LeSuer, (September 20, 1989); Lawrence, phone interview with Richard Caldecott, (September 19, 1989); Lawrence, phone interview with Minnesota State Senator Earl Renneke, (September 20, 1989).

24. Minutes, (January 15, 1959), and attached report; see also "Botany Department," (item II. Projected staff additions by 1970), 1963, Plant Biology papers.

25. "Interim Report of the Committee on the Norris Budget Item," (October 8, 1962) Plant Biology papers.

26. Minutes, (August 5, 1963, and September 30, 1964); "CBS History in Brief."

27. "The Nature and Future of the Botany Department," p. 4, (approximately 1967), Plant Biology papers.

28. Minutes, (October 2, 1958).

29. W.A. Reiners, I.A. Worley, and D.B. Lawrence, "Plant Diversity in a Chronosequence at Glacier Bay, Alaska," Ecology 52 (1971):55-69. Minutes, (November 20, 1963; December 23, 1964; and May 3, 1967).

30. For information on Koukkari, see Minutes, (January 10, and February 7, 1968).

31. Comments of Douglas Pratt and W.L. Koukkari, (September 20, 1989).

32. Minutes, (October 19, 1961; May 14, 1965; December 9, 1966); "The Nature and Future of the Botany Department."

33. Minutes, (September 3, 1970); see also part I of Botany Department, "Annual Report, 1970-71," p. 1, Plant Biology papers.

34. Minutes, (May 14, 1965; December 9, 1966).

35. Botany Department, "Annual Report, 1966-67," p. 1, Plant Biology papers.

36. "The Nature and Future of the Botany Department," pp. 1-2.

37. Minutes, (September 16, 1965; April 26, 1967); "The Nature and Future of the Botany Department," p. 4.

38. Botany Department, "Annual Report, 1970-71," p. 1.

39. Minutes, (January 10, April 10, and October 30, 1968); see also Botany Department, "Annual Report, 1969-1970," Plant Biology papers.

40. Minutes, (April 28, 1965; June 5, 1968).

41. "Report of the Herbarium Recruitment Committee: Ownbey, Morley, and Cushing," (January 22, 1969)--attached to Minutes for January 22, 1969.

42. Botany Department, "Herbarium Moves into the Future," Botany Bulletin, vol 1., no. 1 (October, 1986):3.

43. Department of Botany, "Herbarium Moves into the Future," Botany Bulletin, p. 4; in 1977 Wetmore received $10,000 from the Park Service to survey the lichens of Voyageurs National Park, Minutes, (October 25, 1977).

44. Briefly stated: The chairman is the representative of the academic staff to the administration and is elected by the faculty of his/her department; the head is the representative of the administration to the staff and is appointed by the dean.

45. See correspondence to Ernst Abbe, (July and August, 1966), file "Chairman vs. Head for Botany," Plant Biology papers.

46. "Rotation of Administrative Leadership in the Botany Department," (October 21, 1966) Plant Biology papers.

47. Minutes, (January 22, 1969); Botany Department, "Annual Report, 1970-71," p. 18.

Epilogue:
The Future of Plant Biology

The Botany Department's move to the St. Paul campus in 1972 resolved, after approximately 80 years, the problems of inadequate space. Able to focus again on the important issues of program and faculty development, the Department spent the 1970s and 1980s in long-range planning and reflection over its future in the plant sciences. This period of strategic planning allowed the Department to find its place within the broader organization of the College of Biological Sciences, and as part of a College-wide mandate, the Department worked to develop the areas of molecular, cellular, organismal and population biology.[1] In addition, in 1978, the Department received the administrative responsibility for the plant physiology graduate program, which was established as a joint program in CBS and the College of Agriculture in 1967.[2] The development and expansion of these areas--plant molecular biology, developmental and cell biology, and the plant physiology program--provided the rationale and driving force behind the Department's (and the College's) hiring and funding decisions in the 1970s and 1980s; in turn this commitment to teaching and research in the basic bio-sciences has set the Department on a solid and productive base for the future.

The history of the plant physiology program is complex, yet its transformation over time is an important part of the long-term connection that existed between the Plant Pathology and Botany Department in the College of Agriculture and the Department of Botany. Beginning in 1926, students were able to complete Ph.D. programs in Plant Physiology under the direction of faculty in various departments, but a more extensive program in plant physiology was contemplated by Plant Pathology and Botany in the autumn of 1962; they created a committee (Professors Kernkamp, Linck and Sudia from Plant Pathology and Botany, and Professors Ernst C. Abbe, Allan H. Brown, Albert Frenkel and Gerald Ownbey from Botany. Ownbey chaired the committee.) to investigate the program's possible components and its probable administrative ties. The committee members agreed to create a graduate program in Agricultural Plant Physiology which would replace Agricultural Botany, under the administration of the Plant Pathology and Botany Department. It was also decided to explore in the future the option of jointly administering the program by two or more departments.[3]

After a few years, an ad hoc committee composed of Plant Pathology, Botany, and Agronomy and Plant Genetics reevaluated the graduate program, and the title Agricultural Plant Physiology was shortened to Plant Physiology. The program continued its ties to the three departments, with its first chair, A.J. Linck, from the Department of Plant Pathology and Botany; subsequent chairs were elected from Agronomy and Plant Genetics, Horticulture

and Botany.[4] In 1978 the Department of Botany accepted administrative responsibility for the Plant Physiology Program. After many decades of debate over the teaching, research and administrative affiliations of plant physiologists and their students, resolving the issue of the program's "home" within the University was an important step forward for the Departments involved in this long process.[5] Today much collaborative research takes place among Agronomy and Plant Genetics, Plant Pathology, Horticulture and Plant Biology faculty, and the spirit of cooperation that exists is apparent in the overall quality of the Plant Physiology Program.[6]

Other areas in the Botany Department received increased attention from Department heads and the administration in the College of Biological Sciences during the 1970s and 1980s. Douglas Pratt and Thomas Soulen (Department heads from 1975-1984 and 1984-1988, respectively) strived to build nationally recognized programs in plant molecular biology and developmental and cell biology. Facing the retirements of Ernst C. Abbe, John W. Hall and Donald B. Lawrence by the mid-1970s, the Department proceeded with long-range planning efforts in those areas.

John W. Hall, 1958.

From the late 1960s, the Department, together with the Zoology Department, worked to develop a program in Developmental Biology, and in 1970 and 1971, faculty from both departments put together a National Institute for the Humanities (NIH) proposal entitled "Cellular Communication in Development." While in the end the proposal was not successfully funded, it led to further discussions about the purpose of the program and the mission of the Department as a whole.[7] Ernst C. Abbe was due to retire in June, 1973, and Department faculty carefully considered their hiring options, inviting comments from faculty in Agronomy and Plant Genetics, Horticulture and Forestry. Eventually everyone reached a consensus, deciding to hire a developmental anatomist who had an experimental approach.[8] In the spring of 1973, Iris D. Charvat (Ph.D. University of California-Santa Barbara) joined the faculty.

Doctor Charvat's was the first of several hirings in the area of developmental

anatomy and cell biology. In the spring of 1974, another developmental anatomist was hired, M. Ann Hirsch, who unfortunately only stayed with the Department for three years. In 1975, a reevaluation of the Developmental Biology area took place, and Chair Pratt worked vigorously to see that an official Developmental Biology Program was launched. At the same time David McLaughlin worked closely with faculty in Genetics and Cell Biology and Zoology to eliminate places where research and teaching among faculty overlapped and assessed the future hiring requirements of the College in general. Together the faculty in the three departments decided in April, 1975, to form a committee to work out the details of a joint Cellular-Developmental Program that would have a strong foundation in molecular biology. The outcome of Pratt's and McLaughlin's work was the hiring in 1976 of Jerry J. Jendrisak and Thomas Guilfoyle. The story of their hiring and their all too brief careers in the Botany Department is worth taking a few moments to recount.

Jendrisak and Guilfoyle were two of the many impressive candidates who applied for the molecular developmental biology position in the winter of 1976. After meeting several of the candidates, Dean Caldecott told Chair Pratt that he was so impressed with the quality of the candidates he would consider hiring two new faculty members rather than one. Later that year, both Jendrisak and Guilfoyle joined the Department, strengthening the molecular biology area and the Plant Physiology Program.[9]

Prior to his arrival in Minnesota, Jendrisak took his Ph.D. at the University of Wisconsin-Madison and then continued his research at the McArdle Laboratory for Cancer Research. With interests in the developmental biochemistry of seed germination, and protein and nucleic acid metabolism during plant cellular differentiation and development, Jendrisak contributed to both the Developmental Biology and Physiology Programs.[10] Thomas Guilfoyle joined the Department from a postdoctoral fellowship at the University of Georgia, previously obtaining his Ph.D. from the University of Illinois. Studying DNA and RNA polymerases, Guilfoyle received several substantial grants in the 1970s from the NIH and the National Science Foundation (NSF).[11]

As is the case with other scientific departments within the academic community, the Botany Department has found it difficult at times to compete with the appeal of positions in industry. The early 1980s was a difficult period for the morale of the Department because it witnessed the departure of several of its key developmental and molecular biologists. In 1981 Jerry Jendrisak left for a job in industry, and his successor, Rod Dale, only stayed with the department for two years before he also left academia. Eventually Thomas Guilfoyle left as well, but instead of accepting an offer from industry, Guilfoyle moved to the

University of Missouri in 1986. According to Tom Soulen, Missouri's "fortuitous legislative funding led to an irresistible offer that the University of Minnesota could not match."[12]

Lest the 1980s be remembered as a time of despair and decline in the Department's Developmental Biology Program, a few other people deserve mention. The loss of Jendrisak, Guilfoyle and Dale did not put a damper on the Department's plant molecular biology emphasis; instead, after a period of University-wide retrenchment, the Department set out once again to hire new faculty. In the 1980s the faculty welcomed developmental and molecular biologists David Biesboer, Susan Wick, Stephen Gantt, Judith Berman and Neil Olszewski to the Botany Department. In addition, when Thomas Morley retired in 1987, the Department hired John Doebley has director of the Herbarium.

Concurrent with the efforts to build a nationally recognized molecular biology program, the Department also faced some changes brought about by the transformation of two departments within the College of Biological Sciences. In 1975, Eville Gorham and Ed Cushing transfered to the Department of Ecology and Behavioral Biology (EBB), while the College's disbanding of the Zoology Department in 1976 forced some alterations in the administration of the General Biology courses. After several years of long-range planning and departmental

Student Steve Sain working on a tissue culture (c. 1985).

"self-studies" the College began to implement some of the recommended changes. For example, within EBB, greater attention was placed on the area of behavioral biology and the teaching of general biology. Within the Botany Department, plant physiology, molecular biology and plant biomass received greater support, while classical taxonomy received less. Ultimately the goal within the College as a whole was to "orient the college's activities toward those research and graduate areas which have the most potential for the future."[13]

Irwin Rubenstein (c. 1985).

The future of the plant sciences in the College was the subject of many discussions for faculty not only in the Botany Department but also in EBB and the Genetics and Cell Biology Department (GCB) during this period. In 1988 and 1989, the Botany Department implemented a number of changes that affected its two sister departments. The Department of Plant Biology received a new leader in November, 1988; Irwin Rubenstein, a plant molecular biologist in GCB since 1970, took over the headship from Thomas Soulen. At the same time the Department became jointly administered by the College of Agriculture and the College of Biological Sciences. Following the course set out toward a more encompassing approach to the science of plants, the Botany Department changed its name to the Department of Plant Biology. In turn the newly named Department welcomed in nine faculty members transferring either completely or as joint appointees from Plant Pathology, Forest Resources, EBB and GCB. One professor, Ed Cushing, rejoined the Department after fourteen years in EBB.

Although these important and far-reaching changes may appear to have happened quickly, it is actually the case that current Department members are witnessing the culmination of years of planning and creative decision-making. Firmly established, well-funded programs in plant physiology and molecular biology had been dreamed of since the 1960s. For example, the Department's close ties with Plant Pathology and the College of Agriculture in general were apparent from its earliest years; therefore, these developments should be viewed as part of a cycle of growth that began many years ago. However, in an atmosphere of continuing exploration and investigation, there are faculty and students who debate the benefits and drawbacks to the Department's current administrative ties and its internal administrative structure. There are also some who question the Department's mission overall, wondering if the emphasis on molecular biology is at the expense of classical systematics and other more traditional approaches to the study of plants. Those debates may be the subject of the Department's next history project.

Today the Department of Plant Biology has some of the most sophisticated facilities in the nation for research on plants from the molecular to the ecosystem level of organization, and those facilities were realized because of years of hard work on the part of faculty and administrators. The space problems that have been so much a part of this history are no longer an issue, and many of the thorny questions of relationships between other departments have been resolved as well. Department members can look forward with enthusiasm to Plant Biology's next hundred years, knowing that the foundation they have built is secure and stable.

Department of Botany, (c. 1987). Front Row, left to right: R. Reddy, LeAnne Carlson, Sandy Hansen, Amy Mundelius, Carolyn Ferrell, Nancy Kleven, Nan Echardt, Nancy Albrecht, Rose Meier, Bob Jacobson, Steve Gantt, Neil Olszewski; Kneeling: Gerald Ownbey, Soon-Ok Cho, Bruna Bucciarelli, Ris Charvat, Judy Blakeman, Dean Dubbe, Dwayne Stenlund, Clifford Wetmore, Thomas Morley, Unknown, Jackie Deneen, Margaret Yeakel; Middle Row: Peg Birse, Rachel Ayetey, Audrey Engels, Chris Cole, Tom Sullivan, Brian Shelley, David McLaughlin, Jeff Olson, Judy Berman, Esther McLaughlin, Eric Boehm, Anita Cholewa, Liza Martinez, Cindy Thurston, Roberta Sladky, Chunsheng Luo, W.L. Koukkari; Back Row: Albert Frenkel, Steve Fifield, Sue Wick, Jim Doubles, Unknown, Dave Biesboer, David Cline, Thomas Soulen, Paul Tessene, Mike Davis, Hershel Ginsburg, Ernst Abbe, Eric Johnson, Doug Pratt.

NOTES

1. Department of Botany, "Self-Survey," (1979):1.

2. Minutes, (May 17, 1967, and November 2, 1978), Plant Biology papers.

3. Minutes, (March 15, and September 19, 1962).

4. W.L. Koukkari and Douglas Pratt were helpful in trying to sort out the chairs of the program and their years of service. The chairs, listed in chronological order, were: Richard Behrens, 1968-1971 (Agronomy); Dale N. Moss, 1971-1973 (Agronomy); Douglas C. Pratt, 1973-1975 (Botany); William A. Brun, 1976-1979 (Agronomy); Jim Ozbun, 1979-1981 (Horticulture); Thomas K. Soulen, 1981-1985 (Botany); Carol Vance, 1985-present (U.S.D.A./Agronomy).

5. Douglas Pratt also pressed for secretarial support for the Physiology Program, so the chair would not have to do everything singlehandedly. According to Pratt, "Dean Caldecott was gratious enough to provide the support, and my successor [William Brun] was the first beneficiary of the change although he was from another department and college."

6. For more information on the administrative reorganization of the Plant Physiology Program, see the College of Biological Sciences, "1979-80 Budget Proposal: Plant Physiology Program," Plant Biology papers.

7. Minutes, (November 19, 1970, and February 10, 1971).

8. Minutes, (November 29, and December 7, 1973).

9. Minutes, (March 14, and March 19, 1976); comments of Irwin Rubenstein, (September, 1989).

10. "Self-Survey," Jendrisak vita.

11. Most impressive among these was Guilfoyle's $135,000 grant from NIH to research the "Regulation of RNA Polymerase During Development," 1977-1980, Department of Botany, "Self-Survey," Guilfoyle vita.

12. Department of Botany, "The Botany Department: 1966-1986," Botany Bulletin, vol. 1, no. 1 (October, 1986):5.

13. College of Biological Sciences, "Program Priorities Statement," (January 4, 1982), Plant Biology papers.

Appendix

Department Chairmen and Heads

Conway MacMillan	Chairman	1889-1907
Frederic E. Clements	Chairman	1907-1916
C. Otto Rosendahl	Acting-Chairman	1917-1920
Elias J. Durand	Chairman	1920-1921
C. Otto Rosendahl	Acting-Chairman	1922-1924
J. Arthur Harris	Head	1924-1930
C. Otto Rosendahl	Acting-Chairman	1930-1934
C. Otto Rosendahl	Chairman	1935-1944
Ernst C. Abbe	Chairman	1944-1947
A. Orville Dahl	Chairman	1947-1957
Allan H. Brown	Chairman	1957-1962
Ernst C. Abbe	Chairman	1962-1967
Eville Gorham	Head	1967-1971
Albert Frenkel	Head	1971-1975
Douglas C. Pratt	Head	1975-1984
Thomas K. Soulen	Head	1984-1988
Irwin Rubenstein	Head	1988-present

At this University a Chairman is considered to serve at the pleasure of faculty of the Department with the acquiescence of the Dean. A Head serves at the pleasure of the Dean of the College with the acquiescence of the faculty.

Tenure-Track Faculty (Year order)

C.W. Hall	1878-1879
Conway MacMillan	1887-1907
E.P. Sheldon	1890-1897
Alexander P. Anderson	1891-1894 and 1898-1899
C.A. Ballard	1893-1894
Francis Ramaley	1894-1897
A.A. Heller	1895-1900
T.V. MacDougal	1895-1899
Josephine E. Tilden	1895-1937
E.M. Freeman	1898-1905
Harold Lyon	1900-1907
W.A. Wheeler	1900-1902
Frederic K. Butters	1901-1945
C. Otto Rosendahl	1901-1944
Ned Huff	1906-1945
Frederic E. Clements	1907-1916
Herbert Bergman	1912-1917
William S. Cooper	1915-1951
Lee I. Knight	1917-1922
E. J. Durand	1918-1922
A.M. Johnson	1918-1923
J. Arthur Harris	1924-1930
George O. Burr	1928-1946
Allan E. Treloar	1928-1940
Ernst C. Abbe	1935-1973
Elmer S. Miller	1936-1941
Laurence Moyer	1936-1942
Donald B. Lawrence	1937-1976
Carl Sharsmith	1940-1946
C. Stacy French	1941-1947
A. Orville Dahl	1944-1967
Rolla M. Tryon	1945-1947
Allan H. Brown	1946-1963
Harlan P. Banks	1947-1949
Albert Frenkel	1947-1989
Gerald Ownbey	1947-1986
Thomas Morley	1949-1987
John W. Hall	1950-1986
Richard E. Norris	1955-1962
Kenneth R. Skjegstad	1960-1966
Eville Gorham	1961-1975
Allan J. Brook	1964-1967
William A. Reiners	1964-1967
Thomas K. Soulen	1964-present
W.P. Cunningham	1965-1967
Jack Van't Hof	1965-1966
Douglas C. Pratt	1966-present
Edward J. Cushing	1967-1975 and 1989-present (J)
David A. Stetler	1967-1969
Herbert Jonas	1968-1985
Willard L. Koukkari	1968-present
David J. McLaughlin	1969-present
Terry L. Shininger	1969-1971
Robert D. Bland	1970-1972

Mary E. Burke	1970-1972
Clifford M. Wetmore	1970-present
Iris D. Charvat	1971-present
Ann M. Hirsch-Kirsha	1974-1977
Thomas J. Guilfoyle	1976-1986
Jerry Jendrisak	1976-1981
David D. Biesboer	1980-present
Florence K. Gleason	1981-present
Roderic M.K. Dale	1983-1984
Sue M. Wick	1985-present
Judith Berman	1986-present
J. Stephen Gantt	1986-present
John F. Doebley	1987-present
Neil E. Olszewski	1987-present
Irwin Rubenstein	1988-present
Robert Brambl	1989-present
Mark L. Brenner	1989-present (J)
John Carter	1989-present (J)
Glenn R. Furnier	1989-present (J)
Burle G. Gengenbach	1989-present (J)
Wesley P. Hackett	1989-present (J)
Patrice A. Morrow	1989-present (J)
Carolyn Silflow	1989-present (J)

(J) Joint appointment with another University of Minnesota department

Faculty (Alpha order)

Ernst C. Abbe	1935-1973
Alexander P. Anderson	1891-1894 and 1898-1899
C.A. Ballard	1893-1894
Harlan P. Banks	1947-1949
Herbert Bergman	1912-1917
Judith Berman	1986-present
David D. Biesboer	1980-present
Robert D. Bland	1970-1972
Robert Brambl	1989-present
Mark L. Brenner	1989-present (J)
Allan J. Brook	1964-1967
Allan H. Brown	1946-1963
Mary E. Burke	1970-1972
George O. Burr	1928-1946
Frederic K. Butters	1901-1945
John Carter	1989-present (J)
Iris D. Charvat	1971-present
Frederic E. Clements	1907-1916
William S. Cooper	1915-1951
W.P. Cunningham	1965-1967
Edward J. Cushing	1967-1975 and 1989-present (J)
A. Orville Dahl	1944-1967
Roderic M.K. Dale	1983-1984
John F. Doebley	1987-present
E. J. Durand	1918-1922
E.M. Freeman	1898-1905
Albert Frenkel	1947-1989

C. Stacy French	1941-1947
Glenn R. Furnier	1989-present (J)
J. Stephen Gantt	1986-present
Burle G. Gengenbach	1989-present (J)
Florence K. Gleason	1981-present
Eville Gorham	1961-1975
Thomas J. Guilfoyle	1976-1986
Wesley P. Hackett	1989-present (J)
C.W. Hall	1878-1879
John W. Hall	1950-1986
J. Arthur Harris	1924-1930
A.A. Heller	1895-1900
Ann M. Hirsch-Kirsha	1974-1977
Ned Huff	1906-1945
Jerry Jendrisak	1976-1981
A.M. Johnson	1918-1923
Herbert Jonas	1968-1985
Lee I. Knight	1917-1922
Willard L. Koukkari	1968-present
Donald B. Lawrence	1937-1976
Harold Lyon	1900-1907
T.V. MacDougal	1895-1899
Conway MacMillan	1887-1907
David J. McLaughlin	1969-present
Elmer S. Miller	1936-1941
Thomas Morley	1949-1987
Patrice A. Morrow	1989-present (J)
Laurence Moyer	1936-1942
Richard E. Norris	1955-1962
Neil E. Olszewski	1987-present
Gerald Ownbey	1947-1986
Douglas C. Pratt	1966-present
Francis Ramaley	1894-1897
William A. Reiners	1964-1967
C. Otto Rosendahl	1901-1944
Irwin Rubenstein	1988-present
Carl Sharsmith	1940-1946
E.P. Sheldon	1890-1897
Terry L. Shininger	1969-1971
Carolyn Silflow	1989-present (J)
Kenneth R. Skjegstad	1960-1966
Thomas K. Soulen	1964-present
David A. Stetler	1967-1969
Josephine E. Tilden	1895-1937
Allan E. Treloar	1928-1940
Rolla M. Tryon	1945-1947
Jack Van't Hof	1965-1966
Clifford M. Wetmore	1970-present
W.A. Wheeler	1900-1902
Sue M. Wick	1985-present

(J) Joint appointment with another University of Minnesota department

Ph.D. DEGREES

NAME	MAJOR	YEAR	ADVISOR
Francis Ramaley	Botany	1898	MacMillan
Bruce Fink	Botany	1900	MacMillan
Harold L. Lyon	Botany	1903	MacMillan
Julius V. Hofmann	Botany	1914	Wentling
John E. Weaver	Botany	1916	Clements
Donald Folsom	Botany	1917	Clements
Frances L. Long	Botany	1917	Clements
Harvey Stallard	Botany	1917	Clements
Herbert F. Bergman	Botany	1918	Clements
Clarence C. Bausman	Botany	1919	Tilden
Lois Clark	Botany	1919	Butters
Arthur M. Johnson	Botany	1919	Rosendahl
Vinnie A. Pease	Botany	1919	Rosendahl
Paul Work	Botany	1921	Knight
Helen Sorokin	Botany	1925	Rosendahl
†Ferdinand H. Steinmetz	Plant Physiol.	1926	Harvey
Frank M. Eaton	Botany	1926	Harvey
Sr Remberta Westkemper	Botany	1929	Tilton
George P. Steinbauer	Botany	1929	Harvey
Vernon Young	Botany	1929	Harris
Louis O. Regeimbal	Plant Physiol.	1930	Harvey
Sr Mary Alice Lamb	Botany	1930	Tilden
Stuart J.R. Dunn	Plant Physiol.	1931	Harvey
Leslie N. Garlough	Botany	1931	Harris/Treloar
Joseph Kittredge	Botany	1931	Cooper
Henry J. Oosting	Botany	1931	Cooper
Abraham D.Stoesz	Botany	1931	Cooper
Helen Foot Buell	Botany	1932	Tilden
Raymond H. Landon	Plant Physiol.	1932	Harvey
Ethel S. Horton	Botany	1932	Rosendahl
Olga Lakela	Botany	1932	Rosendahl
Elmer S. Miller	Botany	1932	Burr
Robert R. Humphrey	Botany	1933	Cooper
John W. Moore	Botany	1933	Rosendahl
Rexford F. Daubenmire	Botany	1935	Cooper
Alfred C. Vogele	Plant Physiol.	1935	Harvey
Murray F. Buell	Botany	1935	Butters
Margaret G. Dudley	Botany	1935	Rosendahl
John W. Fertig	Botany	1935	Burr/Treloar
Robert E. Oltman	Botany	1936	Burr
Etlar L. Nielsen	Botany	1936	Rosendahl
Martin L. Grant	Botany	1936	Rosendahl/Butters
Adolph J. Beber	Plant Physiol.	1937	Burr
Thomas T. Earle	Botany	1937	Butters
Russell C.Artist	Botany	1938	Cooper
A. Orville Dahl	Botany	1938	Rosendahl
Ralph W. Lorenz	Plant Physiol.	1938	Harvey/Schmitz

Richard C. Nelson	Plant Physiol.	1938	Harvey
Arthur Nash	Botany	1938	Tilden
Willis A. Eggler	Botany	1939	Cooper/Lawrence
Jack E. Myers	Botany	1939	Burr
Chernghow Lou	Plant Physiol.	1939	Burr
Arne Norman Wick	Plant Physiol.	1939	Burr
Callistus G. Bifoss	Botany	1939	Cooper/Lawrence
John B. Moyle	Botany	1939	Rosendahl
Lawrence M. Jones	Botany	1940	Burr
George W. Burns	Botany	1941	Rosendahl
John W. Marr	Botany	1941	Cooper
Richard O. Belkengren	Plant Physiol.	1941	Burr
George L. Rygg	Plant Physiol.	1941	Burr
William E. Gordon	Botany	1941	Cooper/Lawrence
Bertil Lennart Johnson	Botany	1943	Rosendahl
John L. Leedy	Botany	1943	Rosendahl
Paul C. Lemon	Botany	1943	Cooper
Glenn S. Rabideau	Botany	1943	Burr
Arthur John Cronquist	Botany	1944	Rosendahl
Frederick B. Johnston	Plant Physiol.	1944	Harvey
Bernard O. Phinney	Botany	1946	Abbe
Alfred Stanley Holt	Botany	1947	French
Don Reloy Jacobs	Botany	1947	Lawrence
Merrill J. Hendrickson	Botany	1948	Brown/Lundberg
Loren D. Potter	Botany	1948	Lawrence
Edwin W. Tisdale	Botany	1948	Cooper
Lincoln Ellison	Botany	1948	Cooper
Richard W. Van Norman	Botany	1950	Brown
Phillip C. Hamm	Plant Physiol.	1950	Landon
Violet M. Koski	Botany	1950	Abbe
Kwan Jen Hsu	Botany	1950	Hayes/Abbe
Norman H. Russell	Botany	1951	Ownbey
John Forrester Pelton	Botany	1951	Lawrence
David W. Bierhorst	Botany	1952	Abbe
George C. Webster	Botany	1952	Frenkel
Joseph Michael Daly	Botany	1952	Brown
Norman E. Krog	Plant Physiol.	1952	Stakman
Paul J. Germann	Botany	1953	Lawrence/Glock
Leonard Horwitz	Botany	1953	Brown
James A. Johnston	Botany	1953	Frenkel
Jean H. Langenheim	Botany	1953	Cooper/Lawrence
Duane Le Tourneau	Plant Physiol.	1954	Hart/Landon
Otto L. Stein	Botany	1954	Abbe
Gilbert A. Leisman	Botany	1955	Lawrence
James P. Blaisdell	Botany	1956	Lawrence
Howard G. Ehrlich	Botany	1956	Dahl
Helen M. Habermann	Botany	1956	Brown
John R. Rowley	Botany	1957	Dahl
A. Vincent Weber	Botany	1957	Abbe
Richard L. Pierce	Botany	1957	Hall, J.W.
David Ross Moir	Botany	1958	Ownbey
Joseph D. Novak	Botany	1958	Johnson/Hall
Kingsley R. Stern	Botany	1959	Morley
Roald A. Peterson	Botany	1959	Lawrence/Martin

Yu-Tseng (Eugene) Hsi	Botany	1960	Ownbey
Douglas C. Pratt	Botany	1960	Frenkel
Norma AlejandroMaloney	Botany	1961	Dahl
Fred B. Abeles	Botany	1963	Brown
Norman J. Norton	Botany	1963	Hall, J.W.
Elizabeth Jerabek Cahoon	Botany	1964	Hall, J.W.
Robert Bruce Kaul	Botany	1964	Abbe
John H. McAndrews	Botany	1964	Lawrence
Konstantine Cost	Botany	1965	Frenkel
Toru Kihara	Botany	1965	Frenkel
Robert C. Melchior	Botany	1965	Hall, J.W.
Richard Lee Meyer	Botany	1965	Brook/Norris
Helen M.B. Cost	Botany	1965	Frenkel
Lawrence C.W. Jensen	Botany	1966	Morley
Brother Robert Staub	Botany	1966	Lawrence
Joseph D. Ives	Botany	1967	Lawrence
Donald F. Oltz Jr.	Botany	1968	Hall, J.W.
Jon E. Sanger	Botany	1968	Gorham
Miles F. Johnson	Botany	1968	Ownbey
Gilbert F. Stallknecht	Plant Physiol.	1968	Mirocha
Ronald H. Hofstetter	Botany	1969	Gorham
Robert Shoemaker	Botany	1969	Hall, J.W.
Bruce E. Haissig	Plant Physiol.	1969	Linck
Larry R. Hawf	Plant Physiol.	1969	Behrens
Simeon K. Imbamba	Plant Physiol.	1969	Moss
M. Ashraf H. Chaudhary	Botany	1970	Frenkel
Dean Richard Evert	Plant Physiol.	1970	Weiser
Leslie H. Fuchigami	Plant Physiol.	1970	Weiser
Lawrence V. Gusta	Plant Physiol.	1970	Weiser
Leland L. Hardman	Plant Physiol.	1970	Brun
Clyde Hurst	Plant Physiol.	1970	Sudia
Ruben Jacobsohn	Plant Physiol.	1970	Behrens
Charles L. Argue	Botany	1971	Dahl/Gorham
Robert D. Bland	Botany	1971	Brook
John D. Jackson	Botany	1971	Ownbey
Narakkat P. Sukumaran	Botany	1971	Weiser
Clayton R. Oslund	Plant Physiol.	1971	Li
Alan E. Comer	Botany	1972	Abbe
Teh-Ning Chu Hwang	Botany	1972	Pratt/Soulen
Robert K. Crookston	Plant Physiol.	1972	Moss
Timothy P. Sullivan	Plant Physiol.	1972	Brun
Bert T. Swanson, Jr.	Plant Physiol.	1972	Weiser
Kerstin O. Griffin	Botany	1973	Cushing
Leland Steward Jahnke	Botany	1973	Frenkel
Philip Alan Jahnke	Botany	1973	McLaughlin
Owihee Park Lee	Plant Physiol.	1973	Linck
Wei-Chin Lin	Plant Physiol.	1973	Nylund
James S. McKenzie	Plant Physiol.	1973	Weiser
Alma V. Schaar Pedeliski	Plant Physiol.	1973	Stadelmann
Jerry Thomas Vigue	Plant Physiol.	1973	Li/Linck
Robert D. Bergad	Botany	1974	Hall, J.W.
Michael G. Carnes	Plant Physiol	1974	Brun/Brenner
Nicholas M. Frey	Plant Physiol	1974	Moss
Sung Gak Hong	Plant Physiol.	1974	Sucoff

Richard R. Johnson	Plant Physiol.	1974	Moss
Eugene George Krenzer, Jr.	Plant Physiol.	1974	Moss
Jean F. Ledent	Plant Physiol.	1974	Moss
Seung Moon Roh	Plant Physiol.	1974	Wilkins
David L. Berquam	Botany	1975	Abbe
Stanley H. Duke	Botany	1975	Koukkari
Eddie B. Robertson	Botany	1975	Hall, J.W.
Albert M. Swain	Botany	1975	Cushing
Donald L. Tilton	Botany	1975	Gorham
Ok Young Lee	Plant Physiol.	1975	Stadelmann
Daryl G. Richardson	Plant Physiol.	1975	Weiser
Roberta K.T. Lammers	Botany	1976	Gorham
Robert S. Rogers	Botany	1976	Cushing
Michael J. Scanlan	Botany	1976	Cushing
Allan James Ciha	Plant Physiol.	1976	Brun
Linda Louise Nustad	Plant Physiol.	1976	Brun
Jiwan Paul Palta	Plant Physiol.	1976	Stadelmann
Milon Fred George	Plant Physiol.	1976	Burke
Kathleen E.K. Baker	Botany	1977	Wright
Sampun Campiranon	Botany	1977	Koukkari
William Ransome Gordon	Plant Physiol.	1977	Koukkari
Johnny Bland	Botany	1978	Abbe
Maura A. Gage	Botany	1978	Gorham
Paul H. Glaser	Botany	1978	Cushing
Martin C. Goffinet	Botany	1978	Abbe
Gregory B. Lie	Botany	1978	Shapiro
Allen Seilheimer	Botany	1978	McLaughlin
Marshall D. Sundberg	Botany	1978	Abbe
Stephana Ae Ja Choong	Plant Physiol.	1978	Stadelmann
Susan G.H. Aiken	Botany	1979	Ownbey
George W. Bolton	Botany	1979	Bolton
Walt W. Lilly	Botany	1979	Charvat
Kenneth Armond Hibberd	Plant Physiol.	1979	Green
Ponpimon S. Suriyajantratong	Plant Physiol.	1979	Brenner
Kwon Sang Yoon	Botany	1980	McLaughlin
James C. Litts	Botany	1980	Jendrisak/Pratt
Herman Carl Wenzler	Plant Physiol.	1980	Brambl
Veta Bonnewell	Botany	1981	Koukkari
Wibisono Soerodikoesoemo	Botany	1981	Hall, J.W.
Hwei-Hwang Chen	Plant Physiol.	1981	Li
Marilyn Griffith	Plant Physiol.	1981	Brown
Orville M. Lindstrom	Plant Physiol.	1981	Carter
Gerald A. Wheeler	Botany	1981	Ownbey
Elizabeth Ann Bray	Plant Physiol.	1982	Brenner
Randall Gene Groat	Plant Physiol.	1982	Vance
Gregory Charles Pratt	Plant Physiol.	1982	Krupa
Linda L. Zurfluh	Botany	1983	Guilfoyle
Blaik Halling	Plant Physiol.	1983	Behrens
Josephine C. Heindl	Plant Physiol.	1983	Brun
James Michael Skuzeki	Plant Physiol.	1983	Jendrisak
Neil Edward Olszewski	Plant Physiol.	1984	Guilfoyle
Mohamed A. Elakkad	Plant Physiol.	1984	Adams
Thomas C. Kosier	Plant Physiol.	1984	Desborough
Jane Adams Smith	Plant Physiol.	1984	Desborough

Jeffrey Lynn Tate	Plant Physiol.	1985	Koukkari
Mich Bradley Hein	Plant Physiol.	1985	Brenner
Stephen Michael Griffith	Plant Physiol.	1986	Jones/Brenner
Gary Lynn Yarrow	Plant Physiol.	1986	Brun
Melvin R. Duvall	Botany	1987	Biesbeor
Kevin John Niemi	Plant Physiol.	1987	Carter
Bruce A. Orman	Plant Physiol.	1987	Desborough
Jeffrey R. Schussler	Plant Physiol.	1987	Brenner
Menq-Jiau Tseng	Plant Physiol.	1987	Li
Michael Paul Anderson	Plant Physiol.	1988	Heichel
Lingyi Deng	Plant Physiol.	1988	Read/Carter
David Ward Gardner	Plant Physiol.	1988	Koukkari/Krupa
Tsai-Yun Lin	Plant Physiol.	1988	Markhart
Sally Mae Newman	Plant Physiol.	1988	Rubenstein
LaVonne M.O. Batalden	Botany	1989	McLaughlin
Chris Cole	Botany	1989	Biesboer

†The College of Agriculture began offering Ph.D. degrees in Plant Physiology in 1926. The program became jointly administered by both the College of Agriculture and the College of Biological Sciences in 1967. In 1978, the Botany Department assumed administrative responsibility for the Plant Physiology Program.

A Note on Fellowships in the Department

In the 1940s and 1950s a number of important sources of funding for the research of graduate students and faculty became available through the establishment of foundation grants and bequests from estates. Most of these funds continue to function in the Department of Plant Biology.

1. After Fred Butters's death in 1945, the Department created the Butters Memorial Fund "to support research on the Ferns, through acquisition of basic materials, by publication of scholarly works or through such other expenditures as may be deemed appropriate by the committee administering the Fund." The fund has evolved into one solely for the use of graduate students.

2. The Conway MacMillan Memorial Research Fellowship in Botany was established in 1946, with a gift of $15,000 from Charles J. Brand, a graduate of the class of 1902. Scholarships of $1,000 and $1,200 were awarded to Ph.D. students in botany.

3. In 1950 and 1951 Junior Hayden bequeathed his large collection of Kodachrome slides of Minnesota plants which has contributed greatly to the effective teaching of taxonomy courses, Minnesota Plant Life, and Plants Useful to Man. The bequest also included money which established the Department's Hayden Fund that has subsidized several of the Department's important publications and acquisitions of slide collections for teaching. The Hayden Fund has also been used for visitors' honoraria, the making of distribution maps, and to defray the cost of travel to meetings for the purpose of presenting scientific papers.

4. The Caroline Crosby Memorial Fellowship was established in 1953. Caroline Crosby was a Master's student of Josephine Tilden early in the century, and money from the fund was awarded to students in botany "to enable them to take instruction at the Lake Itasca Minnesota Biological station or a similar biological station."

5. The Northwest Area Foundation (formerly the Hill Family Foundation) provides support for fundamental research projects at the Cedar Creek Natural History Area. In the 1950s and early 1960s, for example, the Northwest Area Foundation provided support for Dr. Dwain W. Warner, a zoologist, and John Tester, with the Bell Museum of Natural History to study the "Motile Responses of Animals to Radiation Fields and to Other Physical and Biological Factors in the Natural Environment." From 1957-1961, the Foundation assisted a group of scientists under the direction of Donald B. Lawrence with a study on the energy relations of terrestrial ecosystems. "[Their study] focused on two areas--biomass production and water use of various plant communities" (from the Northwest Area Foundation, Newsletter, vol. 5, no. 2 (Spring 1982):2-3).

6. Recently the Department established the John Hall Memorial Research Fund in Evolutionary Plant Science. Made possible by a challenge grant from anonymous donors and responding gifts from friends of John Hall, this fund will award grants of at least $3,000 annually to faculty and permanent professional research staff whose work most closely relates to Organismal Plant Evolutionary Science.

While this is by no means an exhaustive listing of the sources of funding for graduate students and faculty in the Department of Botany/Plant Biology, it does give some indication of the types of support that have been available throughout the Department's first hundred years.

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Most of the sources for this history came from the papers of the Department of Botany which are held in the University of Minnesota Archives, Walter Library. The Department of Plant Biology also possesses papers which will soon be taken to the Archives. The notes make reference to both collections.

In addition to the papers of the Botany/Plant Biology Department, several other collections in the Archives were helpful. These include:

Botany Department Student's Linnaean Club papers
Botany Department Sem. Bot. papers
The William S. Cooper papers
Cedar Creek Natural History Area photograph collection,
courtesy of Donald B. Lawrence

Also useful were the extensive biographical and departmental files (for example, the Plant Pathology and Botany Department file), the Gopher (University of Minnesota yearbook), the Minutes of the Board of Regents and their Executive Committee, and the University Archives photograph collection. Unless otherwise noted, photographs used in the text are in the possession of the University Archives.

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