

AURORA SPOREALIS

75th Anniversary Edition

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Foreword

We are proud of being one of the first departments of Plant Pathology in this country. For 75 years this Department has been an important part of the University of Minnesota, and has served not only the agricultural industry of Minnesota but also has played a key role in all aspects of plant pathology around the world. Many professional plant pathologists, past and present, received their education and in many instances their inspiration from Stakman and others of the faculty. This Department and its graduates have influenced plant pathology in many important ways. We trust that we will be able to continue these accomplishments for another 75 years.

Carol Windels and Carl Eide deserve major credit for gathering and organizing the materials which are included in this anniversary issue. Carol was the person who informed us that 1982 was our 75th anniversary, and it was her enthusiasm and energy and editorial competence that caused it all to happen.

This issue is dedicated to Laura Mae Hamilton as representative of the Old Timers, whose continued interest in the Department has been a source of inspiration to each succeeding generation and whose generous contributions have made this Aurora possible.

D. W. French

Preface

August 1, 1982 marked the seventy-fifth anniversary of the Department of Plant Pathology, University of Minnesota. This special issue of *Aurora Sporealis* is an informal chronicle of the events and personalities that have shaped, and continued to build on, the scientific foundations and traditions of the Department. To this end, articles are included on: each decade from 1907 through 1982, programs within and cooperative projects outside the Department, departmental traditions, graduate student statistics, and current projects. In addition to covering the facts, some authors also have included personal impressions. For the decades 1907-1947, the articles written by E.M. Freeman, J.G. Leach, L. Dosdall, and E.C. Stakman for the fortieth anniversary of the Department (*Aurora*

Sporealis, Volume 23, 1947) are reprinted. Their first-hand recollections of those formative years have an insight and personal charm we thought worth repeating (with some minor abridgements).

During preparation of this issue we were assisted by the office staff, and many graduate students, faculty and staff members who offered advice, prepared photographs, and helped track down numerous details. To these individuals and the authors, we extend our sincere gratitude. We hope that you enjoy reading this special issue of *Aurora Sporealis*, and also ask your indulgence for any errors in fact and judgement.

Carol E. Windels and Carl J. Eide



Dedication

To Laura Mae Hamilton

This historical edition of *Aurora Sporealis* is dedicated to the memory of Laura Mae Hamilton. It is fitting and proper to do this because she typified the friendliness and camaraderie for which the Department is famous; because she, more than any other person, devoted her life unselfishly to the good of the Department; and because she worked to preserve memories of the past as something useful and delightful for the future.

Laura Mae was one of the best known and probably the most loved of anyone who became a part of the Department. Her unofficial jobs included meeting newcomers, which she did with grace and friendliness and an air of assurance that put them at ease. Her spirit of helpfulness included finding housing and household goods, entertaining the lonely and developing friendships never forgotten. When scholars went their separate ways she kept in touch with many of them and shared her news with others through the Old Timers Column in *Aurora*, thereby helping to preserve the spirit of the Department for old timers and for future generations.

Laura would have delighted in helping to write this history and it would have been far better if she had. We like to believe she would be pleased to have it dedicated to her.

Biographical Sketch

Laura Mae Hamilton

Laura Mae Hamilton was born January 30, 1898 in St. Paul, Minnesota. She attended school in Minneapolis and completed two years at the University of Minnesota, majoring in liberal arts. In later years she took courses in German, French and Spanish at the University.

Laura started working as Assistant Clerk in the Office of Cereal Investigations, Bureau of Plant Industry, in January, 1921. E.C. Stakman was her supervisor. Various promotions followed, including Secretary in 1948 and Translator in 1957. She retired January 31, 1968 from the Plant Pest Control Division, ARS, USDA.

One of her official responsibilities was writing the Weekly Rust Summary during the growing season. These reports were models of clear, understandable English which were much admired. They also revealed a thorough and professional understanding of rust epidemiology.

Laura never was an employee of the University of Minnesota, but was a member of the Department by virtue of her job with the Cooperative Rust Laboratory. As such she made the interests of the Department her responsibility whenever she could, without shirking her official duties with the USDA. She was friend and helper to generations of students, both foreign and domestic, and earned their devoted friendships. She provided continuity in many quasi-official projects in the Department, providing a feeling of unity among succeeding generations of Old Timers the world over.

Laura Mae was poised, dignified and urbane, but she had a fine sense of humor. She was one of the great people in plant pathology. After her retirement she suffered with cancer for several years and died May 12, 1972.

Chronology

Department of Plant Pathology, University of Minnesota

ORGANIZATION AND OFFICIAL TITLES

- 1907 (August 1) Established as Division of Vegetable Pathology and Botany, E.M. Freeman, Head.
- 1913 Name changed to Division of Plant Pathology and Botany.
- 1913 Section of Plant Pathology within the Division created, E.C. Stakman, Head.
- 1913 Section of Agricultural Botany and Seed Laboratory created, W.L. Oswald, Head.
- 1919 Section of Applied Plant Physiology created, L.I. Knight, Head.
- 1952 Name changed to Department of Plant Pathology and Botany
- 1963 Name changed to Department of Plant Pathology and Plant Physiology.
- 1966 (November 1) Plant physiology personnel transferred to two other departments in the Institute of Agriculture.
- 1967 (February 10) Name changed to Department of Plant Pathology.

DEPARTMENT AND SECTION HEADS, Plant Pathology only.

- 1907-1940 E.M. Freeman, Division Head
- 1913-19⁴⁰ E.C. Stakman, Head of Section of Plant Pathology
- 1940-1953 E.C. Stakman, Head of Division
- 1953-1961 J.J. Christensen, Head
- 1961-1972 M.F. Kernkamp, Head
- 1972-1977 F.A. Wood, Head; D.W. French, Assistant Head
- 1977-1979 D.W. French, Acting Head
- 1979- D.W. French, Head

STAFF PERSONNEL, Plant Pathology only.

	1913	1923	1933	1943	1953	1963	1973	1983
Professor	1	2	2	2	4	'7	12	8
Associate Professor	0	1	2	0	2	1	2	6
Assistant Professor	1	2	0	6	3	5	2	3
Instructor	2	11	9	3	2	6	0	0
Research Assistant	0	4	15	9	28	30	20	40
Field Foreman	0	1	1	1	1	2	2	2
Supply Officer	0	0	0	0	0	0	1	0
Asst. Administrator	0	0	0	0	0	0	0	1
Clerical	4	4	4	4	4	5	5	6
Extension Pathologist	0	1	1	1	1	1	3	5
Federal Collaborators	1	2	5	7	7	10	9	9

FEDERAL COOPERATION

- 1908-present. Cooperative studies of cereal rusts, principally Puccinia graminis, started and continued with various branches of the USDA. Emphasis has been on resistance, physiologic specialization, epidemiology, barberry eradication.
- 1930-1968. Sugar beet disease investigations, B.P.I.
- 1955-1962. Flax disease investigations.
- 1955-present. Forage Disease investigations.

BUILDINGS OCCUPIED

- 1907 (August) One room in the administration building (Coffey Hall).
- 1908 (April) Half of the third floor and a lecture room in the old horticulture building (now part of the home economics complex).
- 1914 Old Drill hall occupied, after \$10,000 remodeling job. Called the Plant Pathology Building or (unofficially) the Tottering Tower due to vibrations originating in the nearby power plant. This building was demolished in August, 1971.
- 1941 (October 15) New Plant Pathology building occupied. Renamed "Stakman Hall of Plant Pathology" in September, 1973•
- 1960 Gibbs-Nelson greenhouse occupied. About 12,000 square feet.
- 1962 Space occupied in Plant Science, Phase I (now Crops Research).
- 1968 Space occupied in Plant Science, Phase II (now Plant Science).
- 1968 Space occupied in Crop Service building.
- 1972 New Cereal Rust Laboratory and greenhouse facility (federal) occupied.
- 1972 New greenhouse and headhouse east of Stakman Hall occupied.
- 1978 Space occupied in North Hall.
- 1980 Addition* to Stakman Hall approved by the State Legislature. *
Construction due to start May, 1983•

EXPERIMENTAL FIELDS

- 1910-present. Near St. Paul Campus, approximately 30 acres.
- 1957 The University acquired from the federal government an area near Rosemount, Minn., 25 miles from the St. Paul Campus. The Department of Plant Pathology uses about 240 acres. Facilities include an office building, two machine and workshops, two fungicide-insecticide buildings, a pump house for irrigation, and farm equipment for field plot work.

CLASSROOM TEACHING

This is a fairly complete list of significant courses in plant pathology added during 10-year periods. It does not show all those dropped, revised, or continued or expanded under new names.

- 1910 Advanced Plant Pathology
- 1913-22 Mycology, Dendropathology, Plant Disease Control, Graduate Pathology, Bacterial Diseases of Plants, Diseases of Field Crops, Diseases of Fruit and Vegetable Crops, Methods, History and Plant Pathology, Principles of Plant Pathology, Seminar
- 1923-32 Pathological Histology, Diseases of Forage and Fiber Crops, Insects in Relation to Plant Disease, Genetics of Plant Pathogens
- 1933-42 Physiology of Plant Pathogens
- 1943-52 Virus Diseases, Ecology of Plant Pathogens
- 1953-62 None added
- 1963-72 Plant Nematology, Host-Parasite Relations
- 1973- Plant Disease Diagnosis, Clinical Plant Pathology, Air Pollution and Plant Disease. New Curriculum in Plant Health Technology offered.
- 1975-82 Agricultural Systems Analysis; Teaching Experience; Professional Experience; Introductory Plant Pathology; Abiotic Diseases; Epidemiology; Host Parasite Population Genetics; Research in Mycology; Algae and Parasitic Seed Plants in Plant Disease; New Ph.D. core--Plant Disease Theory I: Molecular, Subcellular and Cellular Levels, II: Pathological Dysfunction Involving Plant Tissues and Organs, III: Disease in Plant Populations: Plant Pathology Colloquium. Seminar.

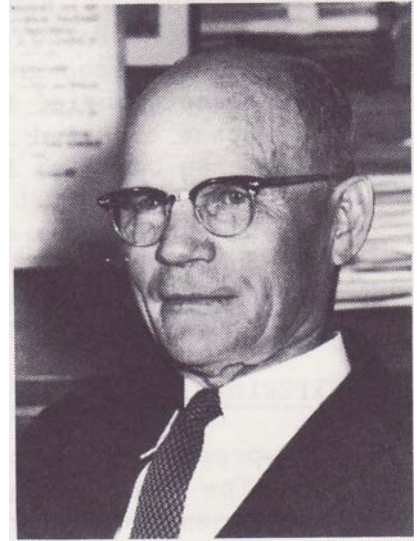
Department Heads 1907-1982



E.M. Freeman
1907-1940



E.C. Stakman
1940-1953



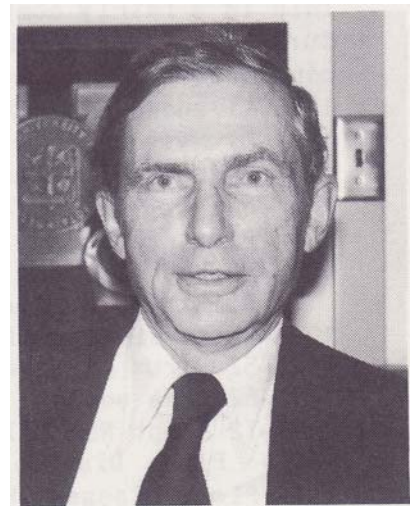
J.J. Christensen
1953-1961



M.F. Kernkamp
1961-1972



F.A. Wood
1972-1977



D.W. French
1977-

FREEMAN, EDWARD MONROE

Born, February 12, 1875, St. Paul, MN. HS, Central, St. Paul, MN, 1892. BA, 98; MA, 99; PhD, 05(botany), U of M. Research under Marshall Ward, Cambridge University England, 01-02. Instructor, 02; Asst Prof (botany), U of M, 03-05; Asst, Minnesota Geological and Natural History Survey (summers) 98, 00, 02-05; Pathologist, Office of Grain Investigations, USDA, Washington, DC, 05-07; Prof and Chief, Division of Vegetable (later Plant Pathology), U of M, 07-40; Asst Dean and Director, Dept of Agr, U of M, 13-17; Dean, College of Agriculture, Forestry and Home Economics, 17-43. Died, February 5, 1954, St. Paul, MN.

STAKMAN, ELVIN CHARLES

Born, May 17, 1885, Algoma, WI. Lived as a boy in Brownton, MN. HS, Cleveland, St. Paul, MN, 1902. BA, 06; MA, 10 (botany); PhD, 13 (plant pathology), U of M. High school teacher, Red Wing, MN, 06-07; Mankato, MN, 07-08; Supt. of Schools, Argyle, MN, 08-09; Inst, plant pathology, 09-13; Asst Prof, 13-16; Assoc Prof, 16-18; Prof, 18-53, U of M; Head, Section of Plant Pathology, Division of Plant Pathology and Agricultural Botany, 13-40; Chief, Division of Plant Pathology, 40-53; Agent, USDA, in charge of Cooperative Rust Lab, 18-55; Special Consultant in Agriculture, Rockefeller Foundation, 53-70. Died, January 22, 1979-

CHRISTENSEN, JONAS JERGEN

Born, August 22, 1892, Hutchinson, MN. HS, Hutchinson, MN, 1913. BS, 21; MS, 22; PhD, 25 (plant pathology), U of M. Rural school teacher, Mercer, ND, 15-16; Medical Corps, US Army, 17-19; Inst, botany, School of Agr, 20-23; Inst, plant pathology, 23-25; Asst Prof, 25-31; Assoc Prof, 31-38; Prof, 38-61; Acting Chief, Division of Plant Pathology, 48-53; Head, 53-61. Agent (part time) Division of Cereal Crops and Diseases, USDA, 22-37. Died, June 20, 1964, Green Bay, WI.

KERNKAMP, MILTON FREDERICK

Born, September 16, 1911, Washington County, MN. HS, Johnson, St. Paul, MN, 1929. BS, 34; MS, 38; PhD, 41 (plant pathology), U of M. Asst, plant pathology, Agr Exp Sta, College Station, TX, 35; Res Asst, 35-36; Inst, 36-41, plant pathology, U of M; Asst Plant Pathologist, Div Sugar Plant Inv, USDA, Meridian, MS, 41-42, 46; Active duty, US Army, 42-46; Asst Prof, plant pathology, U of M, 46-49; Assoc Prof, 49-56; Prof and Asst Director, Ag Exp Sta, U of M, 56-61; Prof and Head, plant pathology, 61-72; Prof, 72-77; Prof Emeritus, 77-. Home: Sun City, AZ.

WOOD, FRANCIS ALOYSIUS

Born, November 17, 1932, Perryville, MO. BS, 55 (forestry); MA, 56 (botany), U of Missouri; PhD, 61 (plant pathology), U of Minn. Teaching Asst, botany, U of Missouri, 55-56; Experimental Mycologist, U S Army Chemical Corps, 57-58; Res Asst, plant pathology, U of M, 58-61; Asst Prof, forest pathology, Penn State U, 61-66; Asst Director, Center for Air Environmental Studies, Penn State U, 65-67; Assoc Prof, plant pathology, and Res Assoc, CFAES, Penn State U, 67-70; Prof and Res Assoc, 70-72; Prof and Head, Dept of Plant Pathology, U of M, 72-77; Dean for Research, Food and Agricultural Sciences, U of Florida, 77-.

FRENCH, DAVID WESTON

Born, November 10, 1921, Mason City, IA. HS, Niagara Falls Senior, Niagara Falls, NY, 39. BS, 43 (forestry); MS, 49; PhD, 52 (forestry and plant pathology), U of M. Active duty, US Army, 43-46; Res Asst, forestry, 46-48; Res Asst, plant pathology, 48-50; Inst, 50-52; Asst Prof, 52-57; Assoc Prof, 57-63; Prof, 63-; Asst Head, Department of Plant Pathology, 73-77; Acting Head, 77-79; Head, 79-.

The Department by Decades

THE FIRST DECADE: 1907-19171/

E.M. Freeman

Preface

Institutions - and the Division of Plant Pathology and Botany must be classed as one - have prenatal histories that are frequently important because personalities and events in such prenatal periods influence profoundly subsequent history. Indeed, institutions are largely the reflection of personalities involved. They may originate, accelerate or retard the birth and progress of the institution, in which they are inextricably woven. At any rate, they leave their stamp, be these faint and easily forgotten or deep and indelible. For this reason, eschewing what might be deemed a becoming modesty, I offer first an account of events that led up to the establishment of the Division of Plant Pathology and Botany at the University of Minnesota.

The first courses offered in the field of Industrial Botany and Plant Pathology at the University of Minnesota were given in the Department of Botany in the College of Science, Literature, and the Arts of the Minneapolis campus, when that department was under the headship of Professor Conway McMillan; and the courses were formulated and given by myself, then an Assistant Professor of Botany.

In 1903, '04, and '05 a course in Plant Pathology was offered, also a course in Industrial Botany, and a third course in Timber and Wood Rots. The latter course was designed especially for Engineering students, but there were no registrations and the course was later discontinued. The Plant Pathology

and Industrial Botany courses were accepted as required courses in the College of Agriculture. I left the Department of Botany in 1905 to go to the U.S. Department of Agriculture to take charge of Cereal Disease Investigations. The Industrial Botany course was continued in the Botany Department for some years after my departure.

1907-08

The Establishment of the Division of Plant Pathology and Botany in the Department of Agriculture.

The Division of "Vegetable Pathology and Botany" was established by the Board of Regents beginning August 1, 1907, when E.W. Randall was Dean of the Department of Agriculture, at University Farm. I was appointed head of this division with a leave of absence until January 1, 1908, in order to wind up my work in the U.S. Department of Agriculture. This arrangement had a financial advantage. It made possible the immediate organization of the new plant pathology division and the closing of the Washington work and left five months' salary added to the small Plant Pathology budget. Incidentally, I expended this thousand dollars for a new high-power Zeiss microscope. To say that this shocked Dean Randall and President Northrop is a gross understatement. In a sense, it is the symbol of a research quality the division has striven to maintain throughout its history. The Division of Vegetable Pathology and Botany at Minnesota was probably the first Division of Plant Pathology established in this country (although there is some doubt about this, Ed.).

January 1, 1908, I came to permanent residence at Minnesota. The quarters of the division consisted of one office about 12 x 20 feet in the

¹¹Written for the 40th anniversary of the Department (Aurora, Vol. 23, 1947).

Administration Building on the first floor (Coffey Hall). We had the use of the Agronomy lecture and laboratory rooms on the same floor. The Agricultural Botany of the School of Agriculture was not at first connected with this division. It so happened that Mr. W.L. Oswald, who was at that time in charge of the School of Agriculture Botany, became ill, and I took his classes for several weeks immediately upon my coming to Minnesota. Before the end of the year Mr. Oswald requested that his work in the School be incorporated in the new Division of Vegetable Pathology and Botany and this was approved. In 1908 I started the forestry botanical work in connection with the summer session at Itasca Park.

In this year also, the question was raised before the University Board of Regents as to the relation of this new division to the Botanical Department of the College of Science, Literature, and the Arts. Specifically, the question of the autonomy of the new division was called in question, and it was claimed that it should be a part of the Botanical Department of the College of Science, Literature, and the Arts. A hearing was given before a committee of the Board of Regents, consisting of Regent S.M. Owen, President Cyrus Northrop, and Regent E.W. Randall. Professor F.E. Clements and President Northrop presented the matter from the standpoint of the Botanical Department. Professor S.B. Green, Professor of Horticulture, Dean Randall, and I presented the matter from the standpoint of the Department of Agriculture. It was decided by the Regents' Committee that the two departments should be separate and that the Division of Vegetable Pathology and Botany should be an autonomous division in the Department and College of Agriculture.

On April 1, 1908, we removed our offices from the main building to the third floor of the Horticulture building (southern-most unit of the 1983 Home Economics Complex) where we obtained

about one-half of that floor through the courtesy of Professor S.B. Green of the Horticultural Department. This arrangement was made possible by the Physics Department, which exchanged quarters with us. In the Horticulture Building we also had the use of a lecture room on the third floor. We lost no time in adapting the new quarters to our use. Through the exchange we obtained a very considerable number of laboratory tables and desks.

On April 1, 1908, W.L. Oswald, who occupied the position of Instructor in Botany in the School of Agriculture, was appointed Assistant in the Experiment Station.

Field Work

A small plot about two rods square in a very sandy and sandbur-infested soil was obtained for preliminary experimental use directly back of where Haecker Hall is now standing (1364 Eckles Avenue). When I think of that little experimental plot, I can never forget - with I hope a pardonable amusement - Stakman and Alden Potter counting smut heads in oats and barley, arguing endlessly and so vehemently about everything or nothing that they seemed oblivious of the fact they were sitting on and among the barbs of *Cenchrus tribuloides*.

Cereal disease investigations in cooperation with the U.S. Department of Agriculture were inaugurated at this time.

1908-09

E.W. Randall resigned as Dean of the Department of Agriculture, and J.W. Olson, State Superintendent of Public Instruction, was appointed to succeed him. In this year there was a large increase in registration in the Agricultural and Forestry branches of the College.

1909-10

Dean J.W. Olson resigned about January 1, and Dean A.F. Woods, under whom I had worked in the U.S. Department of Agriculture, came to University Farm. Mr. E.C. Stakman was appointed Instructor in Botany and Assistant in the Experiment Station beginning July 1, 1909. He had been a student in my classes in the Botanical Department, and after graduation in the College of Science, Literature, and the Arts had been teaching botany and other high school subjects in Minnesota high schools.

Through the kindness of Professor S.B. Green, head of the Horticultural Division, we came into possession of the Lugger Herbarium. Dr. Otto Lugger had been the head of Entomology and was also an able botanist and diligent collector. We obtained the use of the room in which the Herbarium and cases were located, which gave us the entire third floor of the Horticulture Building.

We obtained Lot 1 - one acre of land in the southeast corner of the Experiment Station grounds adjacent to the continuation of Commonwealth Avenue and the Fair Grounds. We removed an old shanty called the "Well House" from its location and hauled it on skids, with the assistance of the Animal Husbandry Department, to the new field. There is a little question as to whether or not we had formal approval for the removal of the old "Well House", but Dean Olson intimated that if the house were moved he would probably not notice it. He happened to pass it on its way to the field, but I assume that his eyesight was poor and his attention diverted. He never mentioned it. The new field was thickly infested with quack grass but was the only field we could obtain. On February 15, an allotment of one and one-half acres north of the existing plot of Lot 1 were added to our experimental field, making three and one-half acres as a permanent Plant Pathology field. The location of the

Plant Pathology field in this particular quarter of University Farm was deemed desirable at that time in order to keep the disease as far as possible from the other experimental fields.

1910-11

In the summer of 1910, Professor Green, one of the most powerful builders of University Farm and a staunch friend and supporter of plant pathology, passed away. He was largely responsible for the establishment of a Plant Pathology Division at University Farm. The College of Forestry, which he had built into a separate college, was again merged with the College of Agriculture in the following year.

1911-12

The most significant event of this year was the arrival of the new University President, Dr. George E. Vincent. In his approximately six years as President he raised the University's educational standards to an exceptionally high degree. He was truly the great educational builder of the University of Minnesota. He was a particularly staunch friend and supporter of all enterprises at University Farm. It was a joy as well as an inspiration to work under and with him. He played an important role in the development of the Division of Plant Pathology and Botany.

1912-13

This was a year of extensive planning. Under the new leadership of President Vincent, large and much-needed increases for legislative appropriations were formulated. That this planning was effective is seen in the following year. At the request of the Home Economics Division a new course in General Bacteriology was organized for Home Economics students by Mr. Stakman cooperating with the Divisions of Dairy and Veterinary Medicine. I recall very clearly how, shortly after Stakman -

bristling with teaching and disciplinary zeal - started this course, a large group of Home Economics students flooded my office to overflowing, wailing dismally that Mr. Stakman was going to "flunk" the whole class and that no one could possibly complete his class assignment. I calmed their fears as best I could. When Stakman finished his part of the course another flood of the same students invaded my office. This time they were smiling and full of enthusiasm. "Stakman's Bacteriology was one of the best courses they had ever had - and couldn't he be retained for the rest of the course?" He could not - but this episode illustrates how educational standards in any college may and must be raised and improved; viz., by personal courage of each staff member.

1913-14

In this year came an unusually large increase in the appropriations for the division (almost 100%), chiefly through special appropriations by the legislature, and specifically for various kinds of Experiment Station work. Also in this year a special appropriation was obtained from the Board of Regents of \$10,000 for the purpose of remodelling the old Drill Hall for the Division of Vegetable Pathology and Botany, and work was begun immediately on the remodelling^{2/}. For several years an attempt was made to call the building the Industrial Botany Building, but the term could not be popularized, and the building has practically been known as the Plant Pathology Building and to most former denizens (and quite appropriately so) as the Tottering Tower. The name of the division has also been changed from Vegetable Pathology and Botany to Plant Pathology and Botany. I do not recall whether specific action for the change of name was taken by the Board of

2/ The Tottering Tower, which stood at the present site of the west end of the agricultural main library, was demolished in August, 1971.

Regents, but the change was included later in the budgets of the Board of Regents. The first agricultural experiment station bulletin, issued under the name "Division of Plant Pathology and Botany", was Bulletin 133, 1913. In the college curricula the change was first made in the year 1916-17. The year 1913-14 saw the greatest increase in material equipment that the division has experienced in its first two decades. Their special legislative appropriations increased very greatly the Experiment Station research in Plant Pathology and Agricultural Botany.

A very significant development began this year in the establishment of State Seed Inspection and a State Seed Laboratory in the Division of Plant Pathology and Botany. Assisted by Mr. Oswald, I had drafted the first State pure seed law (a law requiring the labelling of seed as to purity and germination). After several unsuccessful attempts in preceding legislatures, this was finally passed in 1913. We started a vigorous inspection campaign among seed companies, retailers, and even among farmers, and finally a way was found to curb even out-of-state mail order houses. The Seed Laboratory made free analyses and rapidly extended its services throughout the State. It was realized that such regulatory work as was involved should not be permanent, since regulation is not compatible with teaching and research. After building a sound inspection system and a very efficient laboratory, the whole setup was transferred to the State Department of Agriculture, when this was established some years later (1919). While operated in this division, the Seed Laboratory and inspection as well as the seed law itself were administered in the direction of education as far as possible.

1914-19 Inclusive

This was the period of the first World War. I had been appointed Assistant Dean of the Department of

Agriculture in 1913, and in a reorganization of the Department when Dean R.W. Thatcher became Dean of the Department (1917), I was appointed Dean of the College of Agriculture, Forestry and Home Economics. Added duties made necessary the allocation of much division work to other members of the division. To facilitate this, the sectional organization was adopted in 1913, namely: a Section of Plant Pathology (Mr. Stakman, head), a Section of Agricultural Botany and Seed Laboratory (Mr. Oswald, head), and finally a Section of Plant Physiology. The latter section was organized (1919) in cooperation with the College of S. L. and A. Because of the great need for physiological researches in the Experiment Station, the arrangement was that a joint staff be appointed between the Department of Botany, College of S. L. and A., and the Division of Plant Pathology and Botany, College of Agriculture. The teaching function of the Section of Plant Physiology was to remain in the College of S. L. and A., and research which was projected in the Experiment Station should be carried on under the direction of the Division of Plant Pathology and Botany. Dr. L. I. Knight was the first physiologist appointed under this organization. He had previously taught in the University of Chicago and at the same time carried on Experiment Station work at the University of West Virginia.

During the war period the division suffered the usual disorganization. I was associated with the National Research Council Committee on Biology and Agriculture in the efforts to increase production, and Dr. E.C. Stakman was a member of the famous Phytopathological War Board which toured the country in the interests of the increase of production of cereal crops. Practically all of the members of the division were either in the army or engaged in an effort toward production increase.

The extension work of the division was (in 1916-17) placed in the hands of

a special Extension Pathologist under the Extension Division, Department of Agriculture, and A. G. Tolaas was appointed Extension Pathologist.^{3/} He resigned in 1919 to take over the Office of Seed Potato Certification, and Mr. Frank Frolik succeeded him as Extension Pathologist. At the end of about a year Mr. Frank Frolik resigned and R.C. Rose became Extension Pathologist.

During this period also, considerable amount of cooperative work especially with the U.S. Department of Agriculture, Office of Cereal Investigations, was developed.

The rapid growth and expansion of the division during the war period and in the five succeeding years is well illustrated by statistics compiled for the year 1923-24 - sixteen years after its founding. The personnel on the regular payroll at that time (1923-24), excluding all miscellaneous labor, included 25 persons as follows: Professors 2, Associate Professors 1, Assistant Professors 2, Instructors 11, Assistants 4, Field Foreman 1, Secretary and Clerical 4. The budget for the Division of Plant Pathology exclusive of the budget of the Dean of the College was \$40,440. The division had developed cooperation, as indicated above, and had developed many enterprises with which it was still cooperating or had engaged in cooperative enterprises with other organizations all of which were directly concerned with the field of work of the division, and with funds expended either directly by the division or with the Division of Plant Pathology and Botany in an advisory or other capacity. This list includes the total enterprises in the field of Plant Pathology and Botany in which the division was at that time (1923-24) engaged; U.S. Department of Agriculture part-time agents \$4320; U.S. Department Special Agents \$6,000; Seed Certification Agents \$7,500; Barberry Eradication Agents under the U.S. Department of Agriculture \$33,000;

3/ See history of Extension by H.L. Bissonnette.

Barberry Eradication under the State Department of Agriculture \$7,000; Seed Laboratory \$5,000. All funds being expended in the state in the field of Plant Pathology and Botany therefore totalled (with agents) \$103,260. A very creditable score: 1907-08, \$4,175; plus 16 years, \$103,260!

Early Enterprises in the Division of Plant Pathology and Botany

The following is a brief account of some of the chief enterprises of the Division of Plant Pathology and their development during the first decade-and-a-half of its history.

(1) Land. The first allotment was a few square rods of sand near the present Dairy Building (Haecker Hall). The next allotments, obtained from the Poultry Division, made a total of 2 1/2 acres in the southeast corner of the farm. About 1913 or 1914, approximately 4 acres were obtained in the northern part of the farm adjacent to an old "Russian" apple orchard. By 1924, 7 acres were in use.

An episode in connection with the allotment of land in the north end may be of interest. We had pressed vigorously for more land, since the original 2 1/2 acres were obviously too small for our expanding experiments. Expansion in that area would practically shrink the Poultry land holding still more - so someone had to move. Professor Andrew Boss, then Superintendent of University Farm, then offered the four acres in the north end "on condition that we promise not to ask for more land". We respectfully declined to meet this condition, moreover asserting that as long as we lived we expected to ask for more land if we needed it. The condition was promptly removed.

(2) Buildings. As stated above, the division started in one room in the main building on University Farm (Coffey Hall), from which it moved to the second floor of the Horticulture building (Home Economics, South unit). In 1911, \$10,000 was obtained to remodel the old Drill Hall which became the new Plant

Pathology Building, given exclusively to the use of this division. In 1920 a \$25,000 two-story addition to the back of the building was constructed. In the field, the little shanty known as the old "Well House" was used in the original field in the southeast part of the farm. When a new allotment of land in the north end of the farm was obtained, a field house costing \$2,500 (special appropriation) was constructed about 1913.

A range of greenhouses was obtained in cooperation with the Division of Agronomy and Entomology shortly after 1913. Previous to this time, a small amount of space had been available in the horticulture greenhouses. The new range of greenhouse buildings in connection with the old blacksmith shop in the back of the Tottering Tower cost \$10,000. In the early 1920s the coal bunker and store house of the old blacksmith shop were converted into laboratories for experiments on continuous lighting and cold temperatures for Plant Physiology.

(4) Organizations Developed Through the Activity of the Division. In 1913 the Seed Law (mentioned above) was adopted by the state legislature and a laboratory established in the Experiment Station and administered by the Division of Plant Pathology and Botany. The annual appropriations for the testing of seeds and the operation of the laboratory were continued under the supervision of the division until transferred at the recommendation of the Division and the Department of Agriculture to the State Department of Agriculture in 1919. The Seed Laboratory has continued in cooperation with this division, though administratively a department under the State Department of Agriculture.

In 1919 the work which had been carried on for some years in the Division of Plant Pathology and Botany looking toward certification of seed potatoes was crystallized by the state legislature in the Seed Certification

Laws which had been formulated largely by Stakman and Tolaas. The office for the administration of this seed certification was placed in the State Department of Agriculture. A.G. Tolaas, Professor and Extension Pathologist in the Department of Agriculture in the University was placed in charge. This important aid to the seed potato industry in the state was not obtained as simply as the above brief statement might lead the reader to believe. Some years of preliminary maneuvering were needed to bring it about. From the earliest days of the division we realized that the seed-potato business, in which Minnesota held an advantageous position, could never be profitably continued without the control of the numerous diseases to which potatoes are susceptible. We finally decided that the first approach should be through more effective organization. Largely through Tolaas's activities the seed-potato growers were induced to form a State Seed-Potato Association, which promptly elected Tolaas as secretary. It was with the help of this organization that the certification laws and machinery were finally obtained. We learned from this that plant disease control may sometimes require social organization as well as fungicides and insecticides.

Barberry Eradication. The deadly role of barberry in the life of wheat rust had been known since DeBary's classical researches in 1865. But no one in this country could ever summon sufficient courage to attack the problem of barberry eradication. Then came World War I with its demand for maximum production. The time was ripe for any campaign that would increase production. It seemed the golden opportunity to start barberry eradication.

The division cooperated with pathologists from neighboring States in 1918 in a conference to determine the feasibility of barberry eradication. It was decided to push such a campaign throughout the North Central States. Through the activities of this division,

the Board of Public Safety of Minnesota was induced to pass an order, which was followed later by a law enacted by the legislature, authorizing the eradication of barberry and establishing quarantines. The first appropriations in the State were for \$2,500 for this purpose and were allotted to the State Entomologist's Office. Later the State appropriated \$20,000 for the year and the appropriation in 1924 was \$7,000 a year for this purpose. The division was also very active in promoting a campaign throughout the barberry eradication territory of thirteen States (later 18) and has been instrumental in attaining legislation in all these states and in the dissemination of information throughout the country. To Dr. Stakman should go the chief credit for the success, not only of the eradication campaign in Minnesota but in the national campaign as well. His aggressive yet persuasive oratory and indefatigable energy have won, often over overwhelming odds, the support of literally hundreds of conventions, legislatures, congressional committees, and organizations of many kinds all over this country. The division has worked in close contact in this campaign with the Conference for the Prevention of Grain Rust. This Conference was and is a living tribute to the extraordinary debt which the eradication campaign owes to the late Franklin Crosby of General Mills, Minneapolis. He was the prime mover and organizer of this Conference of businessmen, chiefly of the Twin Cities, for providing financial backing totaling hundreds of thousands of dollars and the staunchest moral support from the business world.

The most vivid picture which I carry of the early days of the campaign took place one night at the Minneapolis Club, where Crosby had assembled the business heads from every kind of business or other activity centering in the Twin Cities. I recall that as I looked the crowd over I wondered how many billions of dollars of invested capital was represented. Presidents of

the largest banks, transcontinental railroad presidents, heads of milling and large mercantile establishments, governors of several States, legislators, judges - every kind of business large and small seemed conspicuously represented. Stakman, to most of these dignitaries and wealthy tycoons absolutely unknown, was scheduled to make the only speech. We were sitting in the back of the hall when Mr. Crosby opened the meeting and called immediately on Stakman. "Stak" jumped up and with that semi-belligerent air of eagerness to enter a fray of discussion and wits, strode solidly down the center aisle. Before he reached the speaker's platform he pulled one of his little speaking tricks - he began his speech on the march - and continued on the platform for an hour a veritable verbal barrage that held the intense interest of every man in the audience. He told simply and effectively the story of the rust of wheat and the role of barberry, the complicated problem of barberry eradication, and the need of support not only from public agencies and the farmers but from business men and the urban centers.

The effectiveness of that speech is illustrated by the remark made after the meeting by "Jake" Preus, then Governor of Minnesota, when he personally congratulated Stakman and promised support of his office to the campaign: "Would Dr. Stakman consider a proposition of 'stumping' the State for the Governor in the next political campaign?". Stakman subsequently "stumped" this and many other States, but not for political campaigns.

The barberry eradication campaign is still (1947) in progress in the North Central States and is probably the greatest campaign in history as far as the eradication of plant diseases is concerned and from the standpoint of territory covered and results obtained (terminated in 1979).

During the World War I period another eradication problem was

administered through the Division of Plant Pathology. This was the fight against blister rust of white pine and involved chiefly the eradication of gooseberries and currants from infested areas into which the disease had been imported on seedling white pines from Europe. I was personally much interested and busily engaged in this campaign. It was part of a national campaign and legally assigned to the Minnesota State Inspection in the Office of State Entomologist. We were deputized, however, to carry on the work and for some years a vigorous campaign of eradication of Ribes, chiefly along the eastern border of the state, was conducted by the Division of Plant Pathology in cooperation with the Blister Rust Eradication Office of the U.S. Department of Agriculture. Because of the administrative allocation in the State Entomologist's Office, the considerable sums of money from State and federal sources do not appear in the Plant Pathology Division budget. Many thousands of dollars became available and were expended during a fairly long period of years by Plant Pathology in this campaign - which was finally taken over and is still continued by the Minnesota Forest Service of the State Department of Agriculture (terminated in 1965).

The division has been in close cooperation with the Office of Cereal Investigations since the beginning of the division in 1907. An extensive cooperation dealing with the cereal rusts and smuts and many other diseases has been developed. The cooperation has been very effective and has been furthered by the excellent spirit shown by the Office of Cereal Investigations.⁴

I hope the above gives some idea at least of the beginning and first decade of progress and development of the Division of Plant Pathology and Botany. We were indeed fortunate. We had received all that could be reasonably

4/ See history of The Cereal Rust Lab by J.B. Rowell

desired from the University administration, the State of Minnesota, and many other cooperating agencies. Yet one ever-present dream remained to be realized - a new, modern and suitable building for the important work of the division. Now in the year 1947 that dream has come true. Do you wonder that I now professionally and personally look back on a life-time effort largely in Plant Pathology with some degree of equanimity and a large degree of satisfaction?

Decade: 1917-1927^{1/}

J.G. Leach

That period in the history of Plant Pathology at Minnesota falling between the years 1917-1927 inclusive, might appropriately be called the Premodern Era. It was ushered in during those hectic days of the First World War when, in the words of a popular song of the day, we could have truthfully said, "We don't know where we are going, but we are on our way". The steady growth of the preceding era so effectively initiated and guided by the wisdom of E.M. Freeman, aided and abetted by the rising genius of one E.C. Stakman, was temporarily thrown into confusion by the war emergency. But as is characteristic of the Department, adversity resulted only as a stimulus to new accomplishments, and soon history was being made.

It was during this temporary setback by the call to arms that the national barberry eradication campaign was born. One of the most vivid recollections of the writer of his early days at Minnesota is that of the Literature Seminar held one cold winter evening in the drafty living room of E.C. Stakman's home on Raymond Avenue, when plans for the campaign were discussed. Little did he realize what far-reaching influence these plans were

^{1/}Written for the 40th anniversary of the Department (Aurora, Vol. 23, 1947).

to have on the plant pathology of the nation in general and at Minnesota in particular.

This Era saw the rise and development of the concept of physiologic specialization within species of pathogenic fungi. Although the famous P. graminis tritici-compacti was discovered in the last hours of the preceding era; the classic "New biologic forms of Puccinia graminis" made its appearance in January, 1919, and the flood of new forms, a la Stakman and Levine, followed closely. And from all reports the flood has not yet completely subsided.

The early days of this period were subject to considerable Hebraic influence as a result of which the Big Chief acquired the honorary title of Rabbi^{2/}. It is likely that this Hebraic influence would have had a much greater effect on course of history had it not been followed closely by an invasion of Norsemen (or should we say Norsewomen), spearheaded by one Norwegian amazon of the Berg clan (Berg x Levine). This Scandinavian influence resulted in a wholesome and happy union of the two that helped prepare the Department for the Invasion of Brains from Abroad that was to follow.

Another outstanding event of this era was the appearance on the scene of Alfred Eagle (supervisor of St. Paul field plots) who, in the writer's opinion, has had almost as much influence on the development of the Department as any other one person, with the exception of Freeman and Stakman. The writer can vouch for the fact that when the Eagle flew into the Plant Pathology field plots, all was Chaos. It seemed as if Eagle said "let there be

^{2/} Refers to Moses Naphtalison Levine (a Jewish immigrant from Latvia), who worked with Stakman (the Big Chief) on stem rust in the early days and was on the USDA staff in the rust lab until he retired about 1955. M.N. Levine married a blond Norwegian woman named Berg.

1921-22



Rear row: Aamodt, Barker, Lambert, Christensen, Conner, Hursh, Seal, Bailey, Brierley,
Noble, Gilbert, Henry, Levine
Seated: Stakman, Newton, Leach, Dossdall, Freeman

order" and there was order. The writer is proud that he was among the first to recognize Eagle's genius and that he had some part in seeing that he was retained as a permanent fixture.

While the field plots were being Eaglized, an event of equal importance was taking place in the office. The appearance of Laura Hamilton in the office at first brought about as much Chaos as there had been in the field before the arrival of Eagle. Traffic in the main office was something terrific. Every male in the building was making all kinds of excuses to go into the office to get a glimpse of the new stenographer and perhaps to get up courage to ask for a date. They soon learned however, that Laura was as efficient and businesslike as she was good-looking, and that business before play was her motto. Soon the office machinery was running as smoothly as the field machinery. Laura's business efficiency has not prevented her from taking a personal interest in all those who passed through the halls of the Tottering Tower, and it is this historian's humble opinion that Laura Hamilton must be recognized as one of the major influences of the "Premodern Era" that have helped make the Department what it is today.

No historical account of the "Premodern Era" would be complete without recognition of the rise and development of Potato Seed Certification under the able direction of the genial and Master Punster Arne Tolaas. Those of us who were responsible for research and teaching in the field of potato pathology owe much to Arne and his certification program. His office in the attic was the Mecca of all potato pathologists, and most of the good ideas in this field (if there were any) had their inspiration in the "bull sessions" on potato diseases that were held in that office. The financial support to potato research now coming from his office is a magnificent gesture, but is equalled in every respect by the less tangible cooperative activities that

were maintained throughout the "Premodern Era".

It was during the early part of this Era that Stakman, on one of his foraging expeditions, came in contact with that scientific paragon, H. Reginald Buller, and persuaded him to visit the Tottering Tower. Thus was initiated an association that profoundly influenced the thought of all inhabitants of the Tottering Tower and made familiarity with "Researches on Fungi" a prime necessity for all aspirants for the coveted degree.

Reference has been made to the Invasion of Brains from Abroad that followed soon after the Hebraic period. This invasion was initiated by Waterhouse of Australia, soon followed by further infiltration from "Down Under", in the persons of R.J. Noble, H.J. Hynes and others. While we were busy trying to hold our own with the invaders from down under, we were attacked from the north by a hoard of mental giants.

Among the early invaders from the north were Guthrie Sanford, A. Henry, J.H. Craigie, Margaret Newton, D.L. Bailey, T. Johnson, I.L. Conners, Bill Broadfoot, and W.F. Hanna, all of whom left an indelible Bulleresque impression on the spirit of the Department and who, after having drunk at the foaming fount, have moved on to spread the fame of the Department far and wide.

Having withstood these early invasions, the Department had no difficulty in coping with similar invasions from all corners of the globe, including Olaf Tedin from Sweden, Bela Husz from Hungary, Chi Tu from China, PeeWee Wallace from Mississippi, and Herman Rodenhiser from New Hampshire. All invaders were successfully converted to belief in the infinite power and supreme importance of physiologic specialization and were sent out as ardent disciples of Aurora Sporealis.

While all this mental and spiritual

development was taking place, due attention was being paid to physical welfare. Unless my memory fails me, the first official Plant Pathology Kittenball Team made its appearance shortly after the beginning of the Premodern Era and held the Ag Campus Championship throughout the period. From the records of early sports reporters, it seems that Stakman was the star of the team the first year, managing to win all games merely by force of argument and clarity of logic in expounding the rules of the game to the umpires.

The Premodern Era also can claim the honor of having conceived and brought forth the official publication of our patron Saint, Aurora Sporealis, in which these chronicles are recorded. The first Aurora, dated August 1, 1924, was issued by a committee consisting of Helen Hart, H.A. Rodenhiser, and A.W. Henry, chairman. This publication is proof in itself that the Premodern Era was one of high attainments in the field of Literature and Art. A perusal of the first 4 volumes of Aurora, ending in July, 1928, reveals 17 poems, some of epic length, and one 4-act play. How deeply poetic were the pathologists of the Premodern Era is revealed by this gem of metered composition: "Peridermium kurilense on Pinus pumila Fall. and Peridermium indicum n. sp. on Pinus exelsa Wall."

Decade: 1927-1937¹/

Louise Dosedall

The period between September 1, 1927, and September 1, 1937, marked an interlude between wars in which the division continued its rapid growth and developed more thoroughly into an international center where persons from near and far gathered for the interchange of ideas regarding the problems of plant pathology.

Written for the 40th anniversary of the Department (Aurora, Vol. 23, 1947).

Among those studying were persons from Minnesota, North Dakota, South Dakota, Iowa, Wisconsin, Ohio, Michigan, Kentucky, Tennessee, Pennsylvania, Washington D.C., Virginia, New Hampshire, Maine, Florida, Mississippi, Louisiana, Kansas, Colorado, Arizona and Utah.

The invasion from Canada was continued by William F. Hanna, Thorvaldur Johnson, Frank Greaney, Bjorn Peturson, Dean C.C. Neufield, Dr. J. Levitt, Eric Sharvelle, M.W. Cormack and Fred Davies. From Belgium came Germain Verplancke; from Czechoslovakia Dr. J. Peklo; from Germany Leo Ostrach, Kurt Hubert, Martin Schlegtehdal, Dr. Karl Isenbeck and Dr. Hanna Becker; from Great Britain came J.H. Western, Sydney Dickinson, Alan R. Gemmell and Ian Tervet; from Poland Dr. Karol Zaleski; from Arizona and Russia Nicholas V. Ponomareff; from Holland and Java Dr. S.J. Wellensiek; from India M.V. Kamat and Syed Vaheeduddin; from China Chih Tu, T.C. Loh, Lee Ling, C.S. Wang, L. Hwang, C.T. Wei, Shan M. Chen and Chen Tong Tsiang; from South Africa Dr. Len Verwoerdt; from Australia John Churchward; from New Zealand J.G. Gibbs; and from the Phillipines Valeriano M. Sarmiento.

The third decade in the history of the division was also characterized by a steady stream of staff members to distant parts for study, consultation and investigation. Dr. J.G. Leach spent a year (August 1927-August 1928) studying bacterial diseases with Dr. S.G. Paine at Cambridge University in England and with Dr. C. Stapp at the Biologische Reichsanstalt in Berlin-Dahlem. During the same year Dr. R.B. Harvey visited various universities and research institutions in England, Germany, and Russia. Dr. J.J. Christensen studied smuts with Dr. Hans Kniep at the University of Berlin (October 1929-October 1930) and visited various places in Europe. Clyde Allison was the first in a series of exchanges at the University of Halle, Germany,

under Professor T.H. Roemer in Plant Breeding and Plant Pathology, during the academic year 1928-29, followed by Frank Kaufert in 1930-31, Clyde Christensen in 1932-33 and Dr. Helen Hart in 1937-38. The Levines spent three months in Palestine in 1935. In 1936-37 Dr. Harvey again was on leave of absence to do research for the Florida Citrus Commission.

It was during this period that Dr. Stakman really became a world-wide traveller. After frequent trips all over the United States, Canada and Mexico, he and Arthur Verrall set out May 15, 1930, for Liberia to study plantation rubber for the Firestone Plantations Company. Dr. Stakman spent approximately three months studying the situation, and as a result of his recommendations there has been a steady stream of research workers from the local center to Liberia to investigate rubber diseases. Arthur Verrall was the first (May 1930-March 1931), followed by Rolland Lorenz (1931-33), George E. Hafstad (1934-36), Lee Hines (1934-36), Chester A. Wismer (1934-37). The latter came home the other way around and thus completed a trip around the world. The affiliations with the Firestone Plantations Company also led to the establishment of a research fellowship at Minnesota, so that investigations on certain phases of rubber diseases have since been carried on locally by various graduate students.

On the way home from Liberia in 1930, Dr. Stakman attended the International Botanical Congress at Cambridge and then spent approximately five weeks visiting various institutions in Great Britain. J.J. Christensen also was at the Congress. Having barely returned home, Dr. Stakman left again in November 1930 for Germany to become guest professor at the University of Halle. Besides travelling in Germany, Czechoslovakia, Austria, Switzerland, France, Belgium, Italy, and Egypt in the spring of 1931, he made stops in Ceylon, Malaya, Java and Sumatra to study the status and needs for production of

natural rubber. On the way home short visits were made in China, Japan and Hawaii. In 1935 he attended the International Botanical Congress at Amsterdam, serving as vice president of the Phytopathological Section, and then spent the months of August to November visiting institutions in Great Britain, Holland, Germany, Belgium, France, Czechoslovakia and Austria.

As a result of these sojourns with us by persons from many parts of the world, visits from many others, and travels of the various members of our own group to distant lands, many a Thursday-night seminar became highlighted by tales of foreign lands and foreign plant disease problems.

The ever increasing number of graduate students and visiting research fellows, and the increasing staffs of the various services offered, put a severe strain on the physical capacities of the Tottering Tower, which had been built in 1893 as a gymnasium but had been modified and renovated at various times to fit various and sundry needs at different periods. The constant cry was for more laboratories, more greenhouse space! As early as 1921 a plea was made to Dean Coffey for new greenhouses for the plant science groups. But materialization of the dreams of more adequate space was slow in coming. Greenhouse 9 and 10 of Ag Botany were built from funds given by Washburn-Crosby Company in 1922 to the Agronomy

Division. Houses 13 and 14 were built in 1927 from funds of the State Department of Agriculture appropriated to furnish space for tuber indexing of the Seed Potato Certification office. The location of those houses deprived Dr. Harvey of a basement room where he was studying the effect of light on plants, leading to another appeal for more space. In 1927 a special appropriation permitted the construction of a new headhouse, which included four constant temperature rooms and eight greenhouse units wired for powerful lights for growing plants in winter; of these,

Plant Pathology got houses 15, 16, and 20, and Plant Physiology houses 17 and 18. This completed the series now south of the Tottering Tower.

The drafty Tottering Tower was weather-stripped in 1927 and equipped with thermostatic controls; the following year the first-floor lecture room in the northwest corner was divided vertically to make a forest pathology laboratory, which housed Arthur Verrall, Frank Kaufert, and Dale Chapman, and an ante-room for storing class material. In 1930 the ante-room was yielded to E.L. LeClerc, U.S.D.A. collaborator, for a sugar beet disease laboratory.

An energy- and time-saving improvement came in 1929, when phones were installed in individual offices, making it no longer necessary to buzz or shout from the main office on the third floor to floor 1, 1 1/2, 2, 2 1/2, 3 1/2, or 4 so that the public could be informed how to save potatoes, petunias, oak trees, or what have you, from the ravages of disease.

Disaster nearly befell the old T.T. in 1931, when, at 6:15 PM on May 8, flames burst from the headhouse. Someone had left the gas burning under the paraffin pot. Prompt action by late workers brought the fire department, and damage was slight. The hero of the occasion was Reiner Bonde, now Old Timer in Maine: he glanced up from his work in the Herbarium, spied smoke, and without an instant's delay packed into a box 24 volumes of Saccardo and ran with it down three flights of stairs and outside to safety! From that day, paraffin has been melted by steam in the Tottering Tower.

In 1932 the interior walls of the building were painted light buff, giving an illusion of more space. But the pinch of the extra coat of paint was felt at times. In 1934 the high-ceilinged northeast lecture room was divided horizontally; this left the seating capacity undiminished and provided on the new floor 1 1/2, three laboratory-offices and a long narrow room which

served as laboratory, incubator room, and hall. The physiology lab on the second floor back was then divided to provide private offices for Dr. Harvey and Dean Freeman. Maple floors replaced many of the old fir floors. With all of these changes the building became a maze in which strangers had difficulty in finding their way about. To find Mr. Tolaas, for instance, one climbed a narrow and steep staircase from the center of the third floor hall to the Fourth Floor Front, and in order then to find Mr. Rose he had to descend the same staircase to the third floor, proceed to east end of the hall and mount another stairway to the Fourth Floor Back!

By 1937, expansion and subdivision seemed to have reached their limits, and request was made of the legislature for funds for a new building to house Agronomy-Plant Genetics and Plant Pathology-Botany. The bill, however, was not passed.

Special Events

A few special events occurring during the third decade should not be left unmentioned. In 1928 Dr. E.C. Stakman was awarded the Emil Christian Hansen Gold Medal and Prize in Denmark for his outstanding researches on the black stem rust of wheat. As pointed out in the Report of the President of the University for the biennium "-- this signifies that Dr. Stakman has a world-wide standing as an eminent scientist in the field of Plant Pathology".

In 1933 the division celebrated the 25th anniversary of its founding with a commemoration service and celebration in the Fireplace Room of the Home Economics Building on the evening of June 1. The Division was host to all plant science groups from both campuses. The program was planned to honor Dr. Freeman as founder, but he was unable to attend because of a severe bronchial cold. Arrangements were made, however, whereby he was able to hear all that was said and to send back his message over a loud speaker. Dr. Stakman served as chairman,

giving a short account of the early days of the division, and members of the various plant science groups presented congratulations, praise and blame: Dr. H.K. Wilson represented Agronomy, Dr. R.A. Gortner Biochemistry, Dr. C.O. Rosendahl Botany, Professor W.H. Alderman Horticulture, Dr. F.J. Alway Soils and Professor Andrew Boss, Vice Director of the Experiment Station, the Administration.

As a tribute, Dr. Freeman was presented with 9 bound volumes of the publications of the Division, including about 300 papers, some dating back to 1911. He was also presented with a volume of "Talking Leaves", illustrating the growth of the Division with photographs, drawings and snapshots. The first leaf was inscribed as follows:

"For 25 years the genius of your leadership has helped men and women to learn and live. They present you with these talking leaves that you may know something of their respect, admiration, affection and gratitude."

In 1938, summer meetings of the American Association for the Advancement of Science (A.A.A.S) were held in Minneapolis on June 25-27, and the American Phytopathological Society met at University Farm. Some joint sessions were held, with about 500 in attendance, including symposia in which Old Timers Olaf S. Aamodt and Dean Freeman took part. There were field trips, inspection of field, greenhouse, and lab exhibits - accompanied by the usual lemonade; there was a chicken dinner furnished by Northrup King and Co. at their seedhouse; a classic kittenball game between visitors and locals, with presentation of a tin loving cup, fashioned by Earle Hanson, to Professor H.L. Bolley as the most valuable player; and a banquet at University Farm. Entertainment at the banquet included a drama in three episodes from 200 years of phytopathological history - 1835, presented by Henry Darling and Clyde Christensen; 1935 by Carl J. Eide and

Matt Moore; and 2035 by P.D. Peterson and Howard Johnson.

During this decade the habit of having a get-acquainted picnic in the fall became traditional. The first of an annual series - although not the first group excursion - was held in 1935 at Battle Creek Park on a Thursday evening in October. To quote from Aurora,

"Fifty phytopathologists ranging from Bobby LeClerg, age 5 years, to ... Stakman, age (mental) 3000 yrs., made merry and ate 25 pounds of meat ... 20 dozen buns, a bushel of apples, 6 dozen doughnuts, etc. It cost the single men \$.39 and the married men (including Matt Moore, Earle Hanson, and Fred Davies \$.78 ..."

Researches in Progress:

The real center of interest during the decade lay in the varied projects underway and the manifold ramifications of the problems being investigated. Inquiries into physiologic specialization were no longer confined to Puccinia graminis but were being made also in other fungi: P. coronata (H.E. Parsons); P. sorghi (J.J. Christensen, H.E. Brewbaker); cereal smuts (H.A. Rodenhiser, L.J. Tyler, G. Hafstad, E.G. Sharvelle, M.B. Moore, K. Isenbeck, J.G. Churchward, C.S. Wang, L. Ling); Phlyctaena linicola (H.A. Rodenhiser); Fusarium spp. (C. Tu, J.G. Leach, C.J. Eide, J.J. Christensen); Pestalozzia funerea (C.M. Christensen); and Helminthosporium gramineum (J.J. Christensen, T. Johnson, T. Graham).

Implications of heterothallism and mutation were being explored by E.C. Stakman and J.J. Christensen in Ustilago zaeae. Mutation and saltation in Helminthosporium sativum kept J.J. Christensen, Fred Davies, and Thomas Graham busy for many years, while Sydney Dickinson concerned himself with the mechanism of saltation in species of Fusarium and Helminthosporium. Single-spore isolations had become of

fundamental importance, and W.F. Hanna devised a simple apparatus for picking up spores, while Dickinson contributed further to the technique of isolation. These problems evolved directly into the field of genetics of fungi, with ramifications into the physiology and cytology of the organisms concerned.

J. Western was interested in sexual fusions in *U. avenae* under natural conditions; and C.M. Christensen, while at Halle, Germany, devised a technique for securing haploid lines of *U. tritici*. Ingenious Matt Moore invented a simple partial-vacuum apparatus for inoculating loose smuts.

Rust epidemiology studies were being continued, including population trends of physiologic races and distribution of spores in the air. Studies on disease resistance also were being made along various lines: *P. graminis tritici*, stomatal behavior in wheat (Helen Hart), effect of light (H. Hart, I.L. Forbes, L.W. Melander, K. Zaleski, L. Hwang), physiologic resistance (W.N. Ezekiel); *Melampsora lini* (E.G. Sharvelle); and *Actinomyces scabies* (J.G. Leach, F. Krantz, H. Darling).

Insects in relation to disease were being investigated: maggots in relation to blackleg of potatoes and heart rot of celery, and bark beetles in relation to *Ceratostomella* blue stain in Norway pine by J.G. Leach; insects in relation to black rot of crucifers by Delia Johnson. Microorganisms antibiotic to smuts, rust, and other fungi were being studied by Miss Johnson, R.H. Bamberg, M.N. Levine, Robert Atkinson, J.J. Christensen, and Fred Davies. Interrelationships of winter killing and root-rotting organisms in alfalfa also were being studied by M.W. Cormack.

Investigations on diseases of ornamental plants, especially gladiolus and iris, were being made by Louise Dosedall.

Special mention should be made of

Matt Moore's seed grain treater, which had its birth toward the end of the decade. No one thing emanating from the division has become, probably, so widely known and popularly used. Described in at least two mimeographed editions by the Extension Division with 6000 copies issued in 1936 a total of 171,700 copies of *The Minnesota Seed Grain Treater* were issued in printed form at Minnesota or by the U.S. Department and circulated by the extension services of many other States and in Canada. Adding thereto 445,770 copies of USDA Miscel. Pub. 219, in which the treater was described, the grand total (up to 1944) becomes 633,470!

Various phases of forest pathology also were receiving attention: elm die-back and *Fomes ignarius* (A.F. Verrall); wood decay and tree rusts (R. Lindgren, D. Chapman); heart rot of balsam fir and biology of *Pleurotus corticatus* (F. Kaufert); insects in relation to blue stain (J.G. Leach, L.W. Orr (Entom.)), C.M. Christensen, R. Nelson); and survey of forest diseases (C.M. Christensen, R. Lorenz).

E.L. LeClerc became our statistical expert, and, in addition to his work on sugar beet diseases, he demonstrated how experimental designs could be improved. Toward the end of the decade Dr. Stakman became interested in grain smuts as allergenic fungi, in cooperation with Dr. W.F. Wittich of the American College of Allergists.

In Plant Physiology, Dr. R.B. Harvey was investigating cold resistance and winter hardiness in plants, the role of ethylene in the ripening process, and the use of toxic agents in eradication of noxious plants. His experimentations in coloring, waxing and sterilizing of fruits and vegetables, their quick freezing and storage at low temperatures, the use of ethylene in fruit and vegetable ripening and in the blanching of celery led to many widely used practical applications. In 1936 he

became interested in the X-ray detection of internal defects in fruits and vegetables.

In mentioning these investigations it is realized that problems cannot be divided strictly into chronological time periods, since those of the moment are but outgrowths of previous investigations and form the beginning points for those of the future. The third decade in the growth of the Division was one of great investigative activity.

Decade: 1937-19471

E. C. Stakman

The decade 1937 to 1947 was a period of uncertainty and change. Economic depression, war, and post-war readjustments made it difficult even to carry on some of the long-time programmatic investigations and necessitated complete suspension of certain basic research projects. Recovery is still underway. But the retirement, in 1943, of Dr. E. M. Freeman, founder and Chief of the Division and long Dean of the College of Agriculture, Forestry, and Home Economics, was an event from which there can be no recovery.

Doc Freeman founded the Division with the idea that botany could and should function in improving and insuring agricultural production. With extraordinarily clear vision, he saw that the alleviation of many deplorable conditions required the solution of many basic problems. He appreciated the value of experimentation but also recognized its limitations unless supported by basic researches. This may be axiomatic in 1948, but it was not axiomatic in 1908. Doc Freeman was eminent among a small group of pioneers

in plant pathology and applied botany. He charted the course of basic investigations for decades to come. But he was eternally curious, also; research was not only a practical service but also an intellectual adventure. Doc Freeman's science solved problems and enriched life. He had the genius to take students with him on his scientific, speculative, and philosophic excursions. He was a great teacher. His lectures on evolution were a morphogenic stimulus in the expansion and evolution of hundreds of minds toward maturity. Even when the burden of administrative duties was heaviest, the Dean retained his glowing zeal for science. He expected interest, effort, and attainment of students, teachers, and investigators; and it is a tribute to his genius that they tried to fulfill his expectations. He was a genuine naturalist and he was naturally genuine. Troubles simply faded into oblivion under Doc's treatment. His analytic and synthetic powers, his human understanding and warm sympathy, his contagious enthusiasm, his strong sense of justice, his inexhaustible store of common sense, his optimism and resourcefulness, and his devotion to duty have made him a great leader in science, education, and administration. He has been wise, he was stimulating, and he was human; he still is, and watches us from his pictures in the Library and in the Seminar Room and occasionally in person, and expects us to carry on.

The Division is trying to carry on, even under conditions that were trying during at least half of the decade. Despite the depression, the war, and changes in personnel, there has been some progress. A total of 280 publications, with many more manuscripts ready for the final polishing, is evidence of productive scholarship. During the decade, 33 M.S. degrees and 45 Ph.D. degrees were earned and conferred, a considerable number to students from other countries. There have been 39 graduate students from 13 countries. And many of our own students

¹/Written for the 40th anniversary of the Department (Aurora, Vol. 23, 1947).

visited foreign parts as members of the armed forces, then returned after an enforced absence of several years and pitched in as if they never had been away. More power to them.

On October 15, 1941, most of the Division moved from the Tottering Tower (Phytobrickhaus tremuloides Graham) to Phytobrickhaus elegans or erectus, depending on the nomenclatorial system. Adjustment to the new building was not particularly easy, at least for some of the older members of the staff. Phytobrickhaus tremuloides was by nature and art a maze of dark and devious passages, of oscillating floors, quaking walls, rattling windows, and, in the winter time, drafts of hurricane intensity. It was the hallowed home of generations of mice, cockroaches, and other friendly if somewhat annoying and occasionally offensive biological entities. And yet its snugness, intimacy and heterodoxy conduced to productive scholarship. People from various parts of the world congregated there and had to associate with each other so closely that they had to fight or become friends. Fortunately, most of them became friends. The traditions of the Q.C.F., the Canyon, the Blue Room, the Better 'Ole, and diverse and sundry other cubicles and labyrinths, contributed to the educational progress that was made in the T. Tower which appeared to have been designed by a series of architects aided by Delerium tremens. In reality, however, the jigsaw complex resulted from numerous attempts to adapt an armory-carpenter shop-gymnasium-agricultural engineering conglomerate to the expanding needs of our division.

With all of its quirks and squeaks, the walls of the old Tottering Tower must still echo with the sounds of the discussions and arguments; they must still quiver with the zeal of graduate students who were trying to contribute to science rather than merely to satisfy the requirements for a degree. The enforced closeness of association

probably actually did have a stimulatory effect. The problem usually was to keep graduate students from talking all day about their own work rather than to find a graduate student who had some work to show.

But now the Division is in Phytobrickhaus elegans. If the old building was the Tottering Tower, the present one should be the Skycutter. The two buildings have one thing in common: both have been the campus lighthouse. Hundreds of inquiries were made about the amount of electric current that was consumed for lighting purposes in the T.T. The beautiful new Skycutter also has the reputation of using large amounts of electric current for lighting purposes during long periods day and night.

The new building of course, has decided advantages over the old one. Organized instruction is given principally on the ground floor; the second floor houses common facilities such as the library and herbarium, plus a number of offices and one good laboratory. The third floor is devoted principally to office and laboratory space for experiment station work, and the fourth floor is sacred to graduate students and is sanctified by some. The Seminar Room is one of the most attractive in the University. The furniture that the Old Timers gave for the room in 1941 is one of its great charms. The old family tradition has been maintained by the institution of the Kaffe Klatsch, which klatsches daily in the Seminar Room at about 3:30 in the afternoon and about 9:30 at night.

Bricks and mortar do not make a University, but they can help. The present building is less hazardous to life, limb, and equilibrium. It is at least possible to offer laboratory work in advanced courses and to offer a few more square feet of space for the research of graduate students. There also is more greenhouse space and somewhat better equipment. And despite the physical separation of applied plant

physiology and agricultural botany, still housed in the Tottering Tower, the sections have coalesced into a homogeneous unit. There is more space and a far more logical arrangement of facilities, but possibly some of the old intimacy is gone. Time was when one person almost had to sit in another's lap to use the same microscope. Very rarely someone still treads on another's toes but not necessarily because of crowding. Coffee hours and informal seminars still provide opportunities for group effort. The contrast between the No. 3 pine tables in the Old Seminar room and the beautiful "Old Timer" tables in the present Seminar room typify the generally well-groomed appearance of *P. elegans* as contrasted with the rather informal garb of *P. tremuloides*.

The growth and evolution of the Seminar library, although possibly not of prime importance, is noteworthy historically. The library was started on the theory that graduate students in applied science might partially satisfy their hunger for general education if the intellectual victuals were easily accessible. Some graduate students have given themselves the elements of a liberal education by judicious reading in the library, while others have at least looked at a lot of pictures. One of the very gratifying features is the degree to which the library has become self-perpetuating. It has become more or less traditional for individuals to present the library with one or more books when the degree of Old Timer is about to be conferred. There seems to be a more or less spontaneous request on the part of the Seminar that the books presented be properly inscribed. This means that the members of the Seminar want to know why the donor considers the book a valuable one. The custom has had a tendency to provoke mirth and also thought regarding the relative values of books. It should be the ideal of every one doing graduate work to educate oneself as completely as possible. The Seminar library has helped some people

in the past, and it is hoped that it may help still more in the future.

Whether or not the quality of teaching has improved in the last decade, the quantity definitely has increased. In 1937, 22 courses were offered; and in 1947, the number was 39. Attempt has been made to meet the needs of students. As an example, a course in Physiology of Seeds and another in Special Agricultural Botany have been added to give students in agricultural botany an opportunity to learn more about the basic factors affecting seed germination and to study economic plants regardless of the part of the world in which they are grown. Likewise, the inclusion of courses in Elementary Mycology, Advanced Study of Fungi, and Industrial Mycology give opportunity for students to learn more about fungi if they do not want to take the classical 3-quarter course.

In the field of plant pathology, there is a new course in Virus Diseases of Plants; and the courses in Genetics of Plant Pathogens, Physiology of Plant Pathogens, and Ecology of Plant Pathogens have been added so that the subject matter may be approached still more from the standpoint of basic principles. The course in Principles of Plant Disease Control is in the same general category, as attempt is made to classify control measures and give at least some of the basic factors involved. There has been a tendency also to increase the number of credits in basic courses, on the theory that it is better for advanced students to concentrate on a few subjects at a time, thus giving greater opportunity for intensive study. As concerns methods of teaching, each teacher naturally is independent. There has been a growing tendency, however, to try to combine the need for organized learning with opportunity for individual learning. This method has been very successful, even in the elementary courses, in which all students do a certain amount of prescribed work but also have

1932



Rear: Harvey, Bonde, Steinhauer, Dunn, Christensen, Leach, Jonk, Landon, Moore, Shumway
Front: McLoed, Hamilton, Dossdall, Loh, Freeman, Larson

opportunity to investigate a problem of their own choosing. There is nothing new in this concept, but the outstanding success of the method is due to the teaching skills of those who have made it work. Wider opportunity also has been given for research and teaching assistants to help with the teaching, and there now are at least half a dozen young men who have become enthusiastic and successful teachers.

Whatever progressive evolution there may have been in the scope and effectiveness of the work of the Division has been due to group effort. Many people have contributed, including full-time staff members, research assistants, clerical force, field administration, Federal Collaborators, and graduate students.

Fortunately, a nucleus of permanent staff members has remained in the Division; unfortunately, some went elsewhere. To chronicle all of the changes would require too much space; hence, changes in full-time staff members only are therefore recorded. The unexpected and untimely death of Dr. R. B. Harvey was a severe blow, as Harvey was exceptionally prolific of ideas, was very inventive, and knew techniques remarkably well, in addition to having had a wide experience in many phases of basic and applied botany. During this period, Dr. E. G. Sharvelle resigned to accept a position at Purdue University in the spring of 1946; and Dr. Ian W. Tervet left for Nebraska during the summer of the same year. Of the full-time Federal Collaborators, Dr. Erwin L. LeClerc left in 1939 to go to Louisiana State University; and Dr. Andrew Downie, who replaced him here, left in 1944 to take a position in Colorado. Dr. R. H. Bamberg left for Montana in 1937; and Dr. Earl W. Hanson, who took over his work, left Minnesota for Wisconsin in 1946. Dr. Robert C. Cassell also left in 1938 to go to Illinois. Replacements for those who left include Dr. Eric O. Mader for Dr. Sharvelle; former-Minnesotan Dr. Milton

F. Kernkamp for Dr. Tervet; William Q. Loegering for Dr. Cassell; and H. W. Bockstahler in place of Dr. Downie.

History of the past does not include prophecy for the future. Nevertheless, future prospects must be predicated partly on past development. A new and vigorous generation is beginning to assume responsibility. This is as it should be. Many Old Timers have attained eminence here or elsewhere; some of them are on the way to the heights now. If the past is any indication of the future, the traditions of the Department will be carried on, and it will become more useful and productive than it has been in the past. Fortunately, a considerable number of all ages realize that the science of plant pathology and the various phases of applied botany are progressing, that many pioneer investigations were necessarily superficial, and that future progress depends on progressive emancipation from empiricism.

Decade: 1947-1957

C.M. Christensen

One of the big changes in the Department during this decade was the retirement, on June 30, 1953, of E.C. Stakman as Head. A brief recapitulation may be of interest. In 1913 Stakman was appointed head of the Section of Plant Pathology, of the Division of Plant Pathology and Botany, the latter of which then included the state seed laboratory, and he held this position until 1940 when he succeeded E.M. Freeman as head of the Division. In 1946 the sections of Plant Pathology and Plant Physiology were combined into the division of Plant Pathology and Agricultural Botany, with E.C. Stakman as Head. E.M. Freeman, had been titular head since the establishment of the Division of Vegetable Pathology and Botany, August 1, 1907, but became Assistant Dean of the College of

Agriculture in 1913 and Dean in 1917; from then on he had little to do with Plant Pathology except for giving some of the lectures in Mycology until the early 1930s. Freeman died in 1954, at the age of 79.

Among the first staff members appointed by Stakman were J.G. Leach and Louise Dosdall, about 1920; J.J. Christensen shortly thereafter; Helen Hart in 1933; and C.M. Christensen, C.J. Eide and M.B. Moore about 1930. All of these had received their advanced training under Stakman, as did all the rest of the staff hired by Stakman, with the exception of E.O. Mader, who was hired as Assistant Professor in 1946 and left in 1948. Stakman wanted his people to be well Stakmanized before they joined up.

Stakman ran his department with a firm hand. There were no staff meetings to hash over administrative details, no long-winded discussions by non-teachers as to how the teachers should teach, or of research goals and how to reach them, or how to divide up the swag. There wasn't much swag, and what there was, Stakman controlled, which was the typical procedure for department heads in those days. Until shortly before his retirement in 1953, Stakman was the official advisor to nearly all graduate students in the Department (Leach and J.J. Christensen were responsible for a few). The staff member with whom the student was working might have some advisory capacity in the student's research, but Stakman was in charge of the student's course work, signed the papers, determined when the student would come up for preliminary and final exams and, of course, was chairman of the examining committee.

Staff members were expected to handle the teaching duties, if any, that went with their appointments, come to all seminars, exhibit zeal, and not take vacations. Some of us were on the staff for ten years or more before we found out that we had a vacation coming. Some

taught a heavy load, some had little or no teaching responsibility. Dr. Helen Hart, for example, according to Stakman, agreed to join the Department in 1933 on the condition that she never would have to teach, an agreement that was held to. She advanced moderately rapidly to the rank of Professor. Dr. Louise Dosdall, on the other hand, became the departmental mycologist as soon as she received her Ph.D. degree in 1922 and taught the same three courses in mycology until she retired, in the late 1950s, as an Assistant Professor.

Several staff members who were offered positions in other universities or with the USDA refused them, preferring to stay in Stakman's department. Several staff members who left for other institutions chose to return to work in Stakman's department when the opportunity arose, one of them at a lower salary than he was receiving in the position he chose to leave, so there must have been some attractions. One of them was the atmosphere of intellectual excitement and accomplishment that pervaded the Department. Stakman had a way of making his staff and students feel that they belonged to an elite group right on the leading edge of scientific progress, that their work was important, and that they were on an outstanding team. Graduate students from all over the world were coming to study under him, and everyone was caught up in the momentous exploitation of new frontiers. No other plant pathology department, anywhere in the world (so they believed) could have anything like it. Who would want to take a vacation when one could be a part of that? Stakman was a powerful and persuasive promoter.

Stakman had always travelled widely, but in the 1940s his travels became more and more frequent and extensive. He was a consultant for the Rockefeller Foundation's Mexican Agricultural Program, served on various national committees, and had many speaking engagements throughout the

country. Most of the talks were on the place of science in general, and agricultural sciences in particular, in human affairs. Some of the published versions of these are classics. Like many of his fellow agricultural scientists with extensive experience in some of the developing countries, he was very much aware of the food-production dilemma that confronts so much of the world today and that threatens to become worse tomorrow. Stakman maintained, at least publicly, the hope that reason and humanity might triumph, and that, through enlightened international cooperation, a better world might eventually come about.

After his retirement he retained and regularly occupied an office in Plant Pathology (J.J. Christensen's old office) where he was available for advice, opinions, suggestions, encouragement and counseling. Shortly after his retirement, in September, 1953, at the American Institute of Biological Sciences (AIRS) meetings in Madison, Wisconsin, former students, associates, fellow workers and admirers announced the establishment of a fund for an E.G. Stakman Award, in commemoration of his name and his contributions to Plant Pathology and to learning. The award consists of a scroll, a medal, and an honorarium, and is given periodically to an individual chosen by a committee of scholars as having contributed significantly to Plant Pathology. He continued his speaking tours and consultantship with the RF for many years, and remained active in the Department until shortly before his death on January 22, 1979.

On July 1, 1953 J.J. Christensen succeeded Stakman as head of Plant Pathology. He had been Acting Head many times over the previous ten years and was thoroughly familiar with the workings of the Department; to some extent it was merely a matter of he and Stakman exchanging offices, which they did. Chris or JJ as he was familiarly known to all of us, was widely known and

highly respected, and he had the support of the Experiment Station and of the central administration of the University, as well as of outside organizations in agriculture and industry. He also inherited a capable and loyal staff who were in general devoted to advancement and promotion of plant pathology rather than to selfish ends. That always helps. He was not the intellectual or philosophical leader that Stakman was, but by the time he took over, department heads in general were losing their guru status and were becoming primarily occupied with various aspects of COMMUNICATIONS. In communicating with his staff, Chris tended to favor the loud shout; sometimes when a purchase order, involving what he thought was reckless spending, landed on his desk you could hear his roars of dismay several offices away. He was fair and impartial; he yelled at all of us equally and did not favor one over another.

Plant Pathology began to undergo some changes in the 1950s, in part perhaps because of the new order of things, in part as a result of outside forces. Chris may have bucked some of the new order to some extent, as was natural, but he adapted to it enough so that the Department functioned as smoothly as a group made up of diverse and independent spirits is ever likely to. If he did not lead the change, he didn't hold it back either. Tuesday afternoon and Thursday evening seminars may have lacked some of the intellectual adventure and authoritarianism that prevailed under Stakman, but they still were lively, intensive and in some ways more diverse than they had been before.

Plant Pathology in the 1950s began to expand and diversify into new areas, and to function much more directly and effectively in the economic life of agriculture and industry of the state and the region than it had before. Productive work got under way in the areas of diseases of shade and forest trees; virus diseases of crop plants,

1947



2nd row: Barbosa, Murakishi, Hasanain, Bockstahler, Teller, Kernkamp, Stakman, Hingorani, Chen, Hendrix, Cohen, Miller

3rd row: Christensen, Silverborg, Young, Munnecke, Ibrahim, Hassan, Gibler, deZeeuw, Shurtleff, Cotter, Ausemus, Harrar, Bulger

4th row: Feldman, Tsiang, Anwar, Dossall, Orellana, Kommedahl, Daly, Boosalis, Misra, Marino, Melendez, Hart

Front row: Shepherd, Borders, Eagle, Andrews, Rowell, Eide, Fridlund, Schneider, Melander, Hak

including cereal crops and fruit trees; diseases of canning crops, especially corn and peas; the nature, cause, and prevention of microbiological deterioration of grains and seeds in storage; diseases of legumes and pasture grasses; ecology of plant pathogenic fungi; and nematode diseases. At the same time, work continued on the cereal rusts, and was expanded on diseases of potatoes and vegetable crops. New staff members were hired (D.W. French, T. Kommedahl, J. B. Rowell, and R. W. Wilcoxson); even some with a non-Minnesota background were hired (R. Durbin, K. Fezer, A. Linck, and D. Taylor) .

As the results of some of this new research begun to become known, additional support was attracted and money began to roll in - from agribusiness and chemical companies, crop production organizations, grain milling, merchandising and processing firms, state and federal sources. The big burgeoning in Minnesota plant pathology described by Kernkamp in the next decade really had its genesis in the 1950s.

From the beginning of 1947 to the end of 1956, staff members published 207 papers (and one book - The Molds and Man, by CMC, which up to 1975 went through three editions and 12 printings). Of these 207 papers, 176 were research results, the others being reviews, biographies of departed fellow toilers in the vineyard, and general disquisitions, mainly be ECS. About 50 of the 176 research papers dealt with rusts and smuts, the others with other fungi and other disease problems. Aside from some publications on stem rust (Race 15B made its last big breakout in 1954) almost none of these papers mentioned physiologic specialization, and none dealt with variation of fungi on artificial media. In response to the demands of changing times, Plant Pathology began gearing up to cope with new problems in agriculture and industry.

One indication of the rise in Plant Pathology's fortunes at this time was the selection of M.F. Kernkamp, from our staff, as Assistant Director of the Experiment Station, a position from which he returned, in 1961, to become Department Head.

A great stimulus to effective field work was acquiring the research area at Rosemount, a brief account of which follows (contributed by MFK).¹~ During World War II the U.S. acquired 11,500 acres of land near Rosemount, just south of St. Paul and 25 miles from the campus, for the Gopher Ordinance Works. After the war, 8000 acres of this land were deeded to the University on a 99 year lease, for the sum of \$1.00, and 3200 acres were set aside as the Rosemount Agricultural Experiment Station, to be used for crop, livestock, and forestry research. Each department on the St. Paul campus was invited to put in a request to the Experiment Station for land. J.J. Christensen and M.F. Kernkamp made a "walk-over" survey of the area and selected 80 acres for use by Plant Pathology. Kernkamp was given responsibility for plot assignment, operations, budget, and coordination with the General Farm Superintendent. This arrangement continued until 1954, when a civil service Experimental Plot Supervisor was appointed to handle most of the on-the-scene work, with Kernkamp in charge of overall administration and budget.

From 1957 to 1983 the area available to Plant Pathology has increased to 240 acres.

Rosemount Experiment Station offered, and continues to offer, almost unlimited opportunities for field plot research, and has become one of the finest of such facilities in the United States. It has been a major element in the increased productivity of the Department. □

For further information on the Rosemount Experiment Station, see article by O. Bielenberg.

Decade: 1957-1967

M.F. Kernkamp

The decade 1957-67 was exciting. It was a period of prosperity from the standpoint of funds, numbers of students, a building program and major changes. The number of graduate students reached an all time high. The first million dollar budget was reached and funds were made available for new buildings, greenhouses and headhouses. The spin off of nationwide student revolt over the Vietnam War in the 1960s had its effect on graduate students in the Department. They became more and more independent. Even honor societies were considered by some to be too elitist to join when invited to do so. This chapter will review the events that transpired during that decade 1957-67. There were problems, but overall significant progress was made.

It is said that the root of all evil is money. However, money is also needed for a public institution to function. Funds from State Legislative appropriations and the USDA continued to increase, although at a very modest rate. Following World War II, the Federal Government went on a binge of appropriating billions of dollars for research. Grants and contracts became available for research from the following agencies: Atomic Energy Commission, National Institute of Health, National Science Foundation, Department of Defense, US Aid for International Development, Food and Agriculture Organization, and USDA. Also the Federal Government made funds available through National Science Foundation Scholarships and National Defense Education Act Fellowships.

Philanthropic organizations such as the Ford and Rockefeller Foundations made grants for research.

It also was common to have contracts with various agricultural industries. Our Department had contracts

at various times with the Green Giant Co., Cargill Incorporated, and different agricultural chemical companies.

We also had contracts at different times with the Minnesota State Department of Agriculture.

Because of these funds the Department attained a budget of \$1,100,000 by the end of decade. The amount of research increased rapidly and the number of graduate students reached an all time high, with over 60 at one time. The faculty and staff grew accordingly. Including USDA personnel there were 36 academic faculty. At one time there were approximately 150 people on the payroll including Civil Service personnel and part-time student help.

The affluence of the Department must have been far beyond the dreams of those who were the originators in 1907. Of course, there were problems with all of the growth, particularly space. Every office and laboratory was packed. Even storage space was at a premium. However, some of the problems were resolved with additional buildings, greenhouses, headhouses and transfer of the physiology group to other departments.

In 1961 J.J. Christensen retired as Department Head, a position he had held since 1953. M.F. Kernkamp was appointed Head of the Department and served in that position for 11 years.

The Hematologist position changed three times. First Dr. Roger V. Anderson replaced Dr. Donald Taylor. Dr. Anderson resigned in 1965 and he was replaced by Dr. David MacDonald. Drs. Edward Stadelman and Lee Olson, plant physiologists, were added to the faculty in 1965. The Cereal Rust Lab grew to a group of nine professional staff with eight to ten technicians at various times. Dr. R.W. Romig was appointed Research Leader in 1963. Also in 1963, the USDA Sugar and Tobacco Division stationed Dr. Lucas Calpouzos in the Department. When Dr. Helen Hart retired

in 1966, Dr. Calpouzos resigned from his position with the USDA and joined the faculty of the Department.

Because of the availability of funds and sabbatic or quarter leaves by department faculty, we were able to bring in visiting professors. Among them were Dr. John Western from England, Dr. Carl Boothroyd from Cornell, Dr. H.C. Young, Jr. from Oklahoma, Dr. Irvin Watson from Australia, Dr. Patricia Allison from Ohio State and others who were with us for shorter periods of time. In addition, numerous professors were invited to the Department for special lectures and seminars.

The years after World War II were years of change and the decade 1957-67 was no exception. Research was referred to as applied and basic. The scientific community went into a surge of basic research aided and abetted by Federal agencies. For example, the National Science Foundation would not grant funds for a project if it was not what they called basic research.

This attitude was reflected in courses and style of teaching. Demands for classes in weeds and seed identification, diseases of field crops and diseases of fruits and vegetables literally disappeared. Graduate students in agronomy and plant genetics, horticulture, entomology and other areas discontinued to minor in plant pathology. Instead they minored in plant physiology, biochemistry, statistics, mathematics, and some in physics. Hence we discontinued the so-called applied courses in diseases of crops, giving more attention to genetics, physiology, ecology of plant pathogens and virology.

Many departments were offering courses in various aspects of plant physiology with approximately 15 to 20 professors teaching these courses. Subsequently, the professors organized a plant physiology curriculum that was approved as an official major by the Graduate School. Our Department had

several professors doing research and teaching in physiology and biochemistry of plant pathogens. Thus the Department was authorized to grant advance degrees with a major and minor in plant physiology.

The graduate program expanded and flourished with changes. Courses were revised. Graduate student programs were under continual surveillance and altered to fit the times. In this decade 92 advanced degrees were granted, 64 to American students and 28 to students from other countries.

Courses in Agricultural Botany became less and less in demand so those courses were cancelled. Interest in plant physiology continued to expand. Consequently more courses in plant physiology were initiated. The faculty in that segment of the Department increased to four and there were 15 to 20 graduate students. They had their own seminar and it was a fairly coherent unit in the Ag Botany building.

Since the Department was engaged in plant pathology and in plant physiology endeavors, it seemed logical to change the name to the Department of Plant Pathology and Physiology. Such a proposal was made to Central Administration and in 1963, the Board of Regents approved the name change.

The plant physiology activities were doomed for a demise, however. In 1958, the first plant physiologist was added to the faculty of the Department of Agronomy and Plant Genetics. This was rapidly followed by additional plant physiologists in that department and similar appointments in Horticulture and Forestry. Consequently our plant physiologists came into direct competition for funds when other departments were doing the kinds of research formerly reserved for Plant Pathology and Botany. The situation became untenable and culminated in the transfer of all faculty and students from plant physiology in the Department

to the departments of Agronomy and Plant Genetics and Horticulture. This occurred on November 1, 1966, and the name of the Department became the Department of Plant Pathology. For the first time the Department only had responsibility for plant pathology.

This decade saw the beginning of expansion of Extension activities in the Department. A Plant Disease Clinic was established in 1956 and continued to exist. ¹ We still had Dr. H. G. Johnson as our one full-time regular Extension Specialist. But in 1965 the Director of Extension allocated funds for a half-time assistant to work in Extension and do a thesis with Dr. Johnson. In 1967, funds were budgeted for a second full-time Extension Specialist and he, Howard Bissonette, came in the Department the next year.

In regard to Extension one other event is worthy of record. Until the year 1964 Extension activities were not funded through the Departmental budget. In that year, Extension was truly integrated within the Department and Extension personnel became line items in the budget along with all faculty and staff.

Mention was made in the introduction of the building expansion. In 1962, the Crop Research building (also called Phase I of Plant Science) was occupied by Plant Pathology, the Department of Agronomy and Plant Genetics, and Soil Science. Plant Pathology occupied eight laboratories, four offices and a storeroom. The three departments jointly had access to four custom built walk-in controlled environment chambers and four walk-in cold storage rooms. Five USDA cooperators, one faculty member and approximately 20 graduate students were assigned to the space. Needless to say the growth chambers provided much needed

1/ See article by Ward C. Stienstra for further information on the Plant Disease Clinic.

.environmental control of experiments with plant diseases.

The Agricultural Experiment Station acquired a commercial greenhouse that was owned by the Gibbs-Nelson Co. (located in the southwest corner of the Cleveland-Larpenteur intersection). Several thousand square feet of the space was allocated to Plant Pathology. It was not prime space for precise experimental work but provided excellent space for testing resistance of varieties to certain pathogens and for starting cuttings. For example, it was here that thousands of alfalfa cuttings were inoculated with wilt bacteria and later transplanted to the field. Along with this property the Gibbs-Nelson school building was assigned to Plant Pathology, providing much needed storage space.

In ¹⁹⁶³, the State Legislature appropriated \$1,200,000 for the second phase of the plant science research building, also to be occupied by Plant Pathology, Agronomy and Soils. After years of negotiating, trying to get Federal funds and planning, construction started in 1967. The building was placed between the Plant Pathology and Agronomy buildings. Plans called for each department to occupy one of the three floors. In addition, building plans included a laboratory specifically designed for an electron microscope for use by all of the departments in the Agricultural Experiment Station. Dr. Banttari chaired an electron microscope committee of faculty from other departments. This in effect gave Plant Pathology an inside track on the use of the facility.

The occupation of Phase II of the Plant Science Research Laboratory (later known as Plant Science) did not occur until 1969. However, the planning was revolutionary in the history of building in the University. It was the very first building whose plans included complete central air conditioning.

Research activities generally

continued in the time-honored directions such as disease diagnosis, etiology, and control. Cooperation with Agronomy and Plant Genetics, Horticultural Science, Entomology and Forestry was fostered and continued. Through some reorganization and changes in assignments of faculty members, more emphasis was placed on genetics, physiology and biochemistry of plant pathogens and virology.

For many years the Department tried to put a virologist on the staff, but all efforts failed to get the support of the Experiment Station Director. Finally the problem was solved by asking Dr. Banttari to take special courses in biochemistry and virology in the Medical School of the University of Minnesota. Also, he had a NATO scholarship that enabled him to study virus diseases and virology in Finland and Holland. After his return, the virology program improved immensely.

In 1963 the mycotoxin project began. It was almost a direct outgrowth of the years of research done by C.M. Christensen on grain storage. The people in the Diagnostic Laboratories of the College of Veterinary Medicine contacted M.F. Kernkamp concerning an outbreak of estrogenism in an experimental herd of swine maintained by a large manufacturer of pelleted pig feed. Kernkamp was familiar with the work on *Fusarium* toxicity done by J.J. Christensen of Plant Pathology and H.C.H. Kernkamp in Veterinary Medicine in the 1930s, and suspected that *Fusarium* might be involved. He turned the problem over to C.M. Christensen. Soon *Fusarium* was implicated, and C.J. Mirocha was brought into the project to furnish expertise in physiology and biochemistry. The work was directed mainly toward identification of toxins produced in stored grain by *Fusarium* and their effects on farm animals. Of particular interest were the estrogenic syndrome, refusal factor, stunting, and other deleterious effects resulting from consumption of grain in which toxins were produced by several common species

of *Fusarium*. Dr. Mirocha soon isolated and identified the toxins from *Fusarium* cultures Christensen had isolated. Dr. Glenn Nelson in Veterinary Medicine experimented with feeding animals with various dosages of the toxins and soon demonstrated the toxic nature of these metabolites to swine and poultry. The team of Christensen, Mirocha and Nelson pioneered in research on mycotoxins and their effects on livestock. By the 1970s Plant Pathology was internationally recognized for its work in mycotoxicology, and this has become a solid part of the Department's contribution. The research also resulted in saving thousands upon thousands of dollars for livestock producers.

Another area of research started in the mid 1960s when entrepreneurs attempted to grow wild rice commercially. A leaf and stem blight became epidemic in commercial paddies so the Department was called on for help in containing this and other diseases. Several people identified some of the pathogens and made numerous observations of disease development prior to 1967. The wild rice disease project was not official, however, until 1972 when the State Legislature appropriated funds for wild rice research.

During this decade several Old Timers passed away including J.J. Christensen (6/20/64), Ralph Cotter (7/1/64) and A.E. Eagle (6/10/67).

This decade can be characterized as a period of great affluence. More funds than ever before were available to the Department. This enabled much improvement in supplying laboratories with more and better equipment. Each laboratory became equipped with at least one refrigerator, one or two refrigerator-incubators, microvoid hoods, chemicals, glassware, microscopes and photographic equipment. Automatic dishwashers were installed in the three buildings where plant pathologists and physiologists worked.

1959



Back row (6): Welty, von Ruden, Ahlgren, Fujii, Ryan, Schleder, Telneset, Haglund
Row 5: La, N. Anderson, Milholland, Ohman, Wyllie, Merrill, Follstad, Taylor, Hadi di, Rodri guez,
Orillo, Cho, Chakravarti, Gerwitz, Covey, Knutson
Row 4: A. Anderson, Davila, Marinos, Miller, Mallik, Ortega, Carlson, Kommedahl, Sudi a, Sachs,
Tumbleson, Lutey, Wood, Line, Banttari, Frosheiser
Row 3: Penner, Kavanagh, Rogers, Renfro, Kennedy, Roberts, Goth, Bean, Aschenbach, Hami lton,
Abler, M. Anderson, Hershenson, Shen, Mumford, Johnson, Cotter, Lambert
Row 2: Eagle, Wilcoxson, Hart, Kernkamp, Stakman, Christensen, Eide, King, Abrahamson
Front row (1): Garrett, Durbin, Schroeder, Caballero, Miller, Elliot, Frederiksen, Leath,
Bissonnette, Harrison, Moore, Fezer

When the Department moved into the new Plant Pathology building in 1941, much of the furniture was moved from the Agricultural Botany building. This very outdated and old furniture, laboratory tables and benches were gradually replaced. Almost all of the laboratories in Plant Pathology were supplied with new and modern furnishings.

The number of Civil Service personnel increased from one Field Plot Supervisor to two, and technicians increased from zero to eleven. Clerical staff increased from three to five.

The building program has been described. It was impressive. While this was in progress the Department Head and Leader of the Cereal Rust Laboratory were deeply involved in securing Federal funds to build a complete laboratory greenhouse complex for that Laboratory. That did not come to fruition until the next decade. F-1

Decade: 1967-1977

Carl J. Eide

The years 1967 to 1977 were equally divided under two leaders: M.F.Kernkamp and F.A. Wood. Kernkamp, who had served from 1961, resigned the headship in 1972 to return to teaching and research. His administration, aided by abundant financing, saw many improvements, especially in buildings and equipment. Modern laboratories were occupied in the new plant science building in 1968; space in a new crop service building became available in 1969 and new greenhouses and a headhouse were completed in 1972. A new cereal rust laboratory, built by the federal government, was dedicated September 20, 1972. On May 16, 1972 a new headquarters building for APS and The American Association of Cereal Chemists was dedicated on the south edge of St. Paul. Dr. Kernkamp, as business manager of

APS, was one of the principal instigators in getting the new facility.

In the main plant pathology building, officially named The Stakman Hall of Plant Pathology in 1973, old equipment used since 1941 was replaced in both teaching and research laboratories. A Phillips 300 electron microscope was installed in the plant science building in March, 1969. It was an experiment station facility under the supervision of Ernie Banttari and later Dick Zeyen. In 1972 the experiment station installed a mass spectrometer in the biochemistry building. Chet Mirocha was mainly responsible for this purchase and one of the chief fund raisers.

In August, 1971, the old Tottering Tower, which stood where the main agricultural library now is, was demolished.

At the beginning of the decade (July 1, 1967) there were eight professors on the faculty: Christensen, Eide, French, Johnson, Kernkamp, King, Kommedahl and Wilcoxson. There were four associate professors: N.Anderson, Calpouzos, Kennedy and Mirocha; two assistant professors: Banttari and MacDonald; and two instructors: Moore and Nyvall. All except Calpouzos, MacDonald and Mirocha held advanced degrees from the Department. It was an aging faculty and, in the minds of some critics of Minnesota, "inbred".

Fortunately, things were about to change. Eide and Moore retired June 30, 1973 and C.M. Christensen in 1974. Calpouzos resigned October 31, 1971. King and Kernkamp retired in 1975 and 1977, respectively. Nyval3 instructorship was temporary.

Bissonnette joined the extension staff in 1968 and Ward Stienstra in 1970. Robert Brambl came in 1971. These were new positions and, in addition, a number of new civil service positions were filled. During Kernkamp's tenure the Department grew and improved in both

personnel and physical facilities. He had good reason to feel proud of himself.

When Al Wood took office July 1, 1972 he did some reorganizing, classifying the activities of the Department as either program development or operations. Assisted by an executive committee, he planned to spend much of his time on "program development" while an assistant head would be responsible for day-to-day operations in the Department. Dave French was made Assistant Head in February, 1973.

It *was* an effective combination and, at the end of five years, in compliance with University policy, Wood's administration was reviewed and he was given high marks for his leadership in initiating new programs, hiring competent faculty and staff and in acquiring outside financial support.

However, Al was not blind to other opportunities and accepted the position of Dean for Research at the Institute of Food and Agricultural Sciences, University of Florida, effective September 1, 1977. Minnesota's Department of Plant Pathology again started the painful process of Head Hunting.

At about the time Al took office in Minnesota, new revelations in plant pathology were being made manifest. For a couple of decades "basic research" had meant the biochemical-physiological approach. Nor had the Department ignored it. A course listed as "Physiology of Plant Pathogens" was offered, starting in 1939, but no real physiological research was done until Jim DeVay did so in the early 1950s. Rick Durbin (1958-1962) followed Jim with more pioneer work. Finally, in 1961, C.J. Mirocha joined the faculty. With talents for promotion and publicity as well as science, he got some much needed equipment and began to build the Department's reputation in physiological plant pathology. Bob Brambl has also

contributed excellent research in this area.

In the meantime various forces were affecting basic thinking by plant pathologists. Interest in population genetics represented a new attempt to use the principles of evolution in understanding epidemics and disease resistance. Van der Plank and improved computers opened new possibilities in the application of mathematics, and popular interest in the environment helped to turn the attention of plant pathologists to the neglected field of abiotic diseases.

Al was already a major prophet in both epidemiology and environmental pathology when he took over in 1972. He acted accordingly. The salary items on which Moore and Eide had been paid were filled by James Groth (PhD, University of British Columbia) and Robert Shrum (PhD, Penn State). Jim started to develop a program in population genetics, a logical extension of the work in genetics of plant pathogens and disease resistance in which the Department had excelled for half a century. Bob Shrum's job was the simulation and mathematical modelling of epidemics.

A generous grant from the National Park Service made possible, among other things, rapid development of environmental pathology, especially the effects of air pollution. The program thrived mightily under the scientific genius and grantsmanship of Dr. Sagar Krupa, Fil.-Dr. University of Uppsala, Sweden.

There were other changes. Wilcoxson was relieved of responsibility for forage diseases and devoted full time to foliar diseases of cereals. T.H. King was shifted from wild rice and fruit diseases and put to work on diseases of aquatic plants (part of the National Park deal). Kernkamp took over wild rice disease research, a job he hadn't anticipated when he gave up the

headship. Groth and Shrum were expected to do their basic work on "a horticultural crop or crop grouping". This took care of diseases of fruits and vegetables, formerly the responsibilities of King and Eide, and was considered adequate "since our coverage in that area of horticultural crops is relatively light".

A changing agriculture brought changes in disease problems during 1967-77. Stem rust had been of minor importance for several years, due largely to the use of resistant varieties of wheat, the principal one being Era. This (according to Bissonnette) made leaf diseases more evident and prompted measures for their control. Dutch elm disease, which first appeared in 1961 in Minnesota, killed hundreds, then thousands of elm trees. Oak wilt was destructive, as was dwarf mistletoe of conifers. Verticillium wilt of potatoes became a major problem, supposedly because of the culture of more susceptible potato varieties. Sunflowers were grown on rapidly increasing acreages, contributing to the Verticillium problem as well as raising questions of controlling mildew, rust and white mold. White mold also attacked dry beans, which were grown in greater amounts during the decade. The beans also brought rust and bacterial blight problems. Phytophthora root rot became a major disease of alfalfa and soybeans, and grower pressure finally brought special funds for the work on diseases of wild rice. There was an epidemic of southern corn leaf blight in Minnesota in 1970, but it was not as serious here as it was in other parts of the United States.

Much of the research in the Department was still done by graduate students and their thesis subjects reflect to some degree the research interests of the time, and to what degree new crop problems were investigated. During 1967-1977 approximately 43 MS and 61 PhD degrees were granted. Half of the theses dealt

with diseases of cereals, 12% with diseases of trees and the rest with other crops or subjects. Half of the pathogens studied were fungi other than cereal rusts (12%) or Fusaria (10%). Nine per cent of the theses were devoted to bacterial diseases while viruses, nematodes, mistletoe and abiotic causes came to 3% each.

Compared with earlier decades, there was less interest in physiologic specialization and genetics of pathogens and more in non-specific resistance. There were theses on the intimate details of infection and parasitism, on soil-borne pathogens, biological control and inoculum potential. There were a couple with statistical approaches to spore dissemination and population dynamics and one reported the use of the electron microscope to study resistance.

The record (not very reliable) of papers published by the Department ranged from 31 to 73 annually, averaging 43. Some were theses and some recorded faculty research, perhaps more sophisticated and, in most cases, done with the help of competent scientific assistants. There were some differences from the theses in subject and emphasis. For example, there were relatively few theses on grain storage and mycotoxins but these were the subjects of about 15% of the published papers. Disease resistance, breeding and selection for disease resistant crops accounted for about 11% of the papers. The emphasis, like that in the theses, was on broad-based rather than race specific resistance. Papers on the genetics of pathogens, including races, amounted to about 7%. New diseases, spore germination and basic studies of viruses accounted for about 7 or 8% each, as did disease control. Epidemiology (4 to 5%) and detection of disease (3%) were areas in which, like that of air pollution (2%), interest was growing rapidly at the end of the decade. New and sophisticated equipment probably stimulated the number of papers on techniques, which made 6% of the group.



Back row: Bielenberg, Lopez, Bohnenblust, Zinada, Ahlgren, Bugbee, Morton, Williams, Welty, Arntzen
 Row 7: Moore, Linck, Kucharek, Garza, Heagle, Froyd, Manion, Dueck, Green, Carlson
 Row 6: Meza, Hulluka, Rick, Chung, Breen, Keeling, Bush, Olson, R. Anderson, Jurst, England, Schroeder,
 Bernier, Sun
 Row 5: Finstad, Stewart, Stallknecht, Kommedahl, Smith, Kenny, Sauer, Cross, C. Christensen, Alabanza,
 Romig, French, Roelfs, Wendorff, Lindhart, Kennedy, Freter, Eide
 Row 4: Calpouzos, Patel, Miller, Luchsinger, Mi rocha, El Kandelgy, Rowell, Leath, Banttari,
 Stadelmann
 Row 3: Strandli, S. Anderson, Hamilton, Johnson, Kernkamp, Hart, Haga, Stakman
 Row 2: Landeen, Larson, Patoile, Aschenbach, Chang, Eugenio
 Front row: Nyvall, Vigil, Madsen, Bushnell, Husain, Hill, Fuchi gami

Researchers were relieved of some of their chores, especially crop-related problems, by a commendable increase in the extension staff, which consisted of Herb Johnson and occasional part-time help before Bissonnette (PhD Minnesota) came on the staff in 1968. In addition, Ward Stienstra (Michigan State) and Frank Pflieger (Oregon State) joined the staff in 1970 and 1974, respectively. Dick Meronuck (Minnesota) was on half time extension work in plant pathology from 1973 until he was increased to nearly full time in 1981. The extension staff included a secretary and a part-time director of the plant disease clinic. The clinic, started in 1956, grew steadily in experience and support, providing year-around service starting in 1973. Besides doing its principal job well, the clinic has provided invaluable experience for graduate and plant health technology students. The Department can well be proud of its contributions to both education and to the plant-growing citizens of the state.

One of Al Wood's major accomplishments as Head was the establishment of an undergraduate major in plant health technology (PHT), which lead to a BS degree and prepared students for positions with fungicide companies, as agricultural consultants, etc. The program has been highly successful and is discussed elsewhere in this history.

Several new courses were added to the Department curriculum. For PHT and undergraduates there was a two quarter survey of the different groups of plant pathogens and abiotic causes of disease as well as courses in plant disease diagnosis and clinical plant pathology. The graduate curriculum added courses on abiotic diseases, epidemiology, host-parasite physiology, population genetics and a new course in disease control. There were courses on practically all aspects of plant pathology, resulting in some duplication and ominous head-shaking by some of the Department's educational philosophers. A major

revision came in 1981. Among the survivors of that shake-up, besides beginning plant pathology for ag and forestry students, were Insects in Relation to Plant Disease, Genetics of Fungi, and Poisonous Plants (Prof. Kommedahl). That is called Survival of the Fittest.

In addition to new faculty members mentioned previously, others who joined the Department were James Percich (Michigan State), who took over the wild rice project when Kernkamp retired and also assumed responsibility for research in and teaching of disease control, especially fungicides. Elwin Stewart (Oregon State) became mycologist and Richard Zeyen (Minnesota) worked on the cellular bases of resistance and took charge of the electron microscope laboratory, an Experiment Station position.

In 1971 another new position was created, the incumbent to serve in Morocco under a USAID-Minnesota program. Benham E. Lockhart (California, Riverside) took the job and remained until September, 1976, when he returned to St. Paul as virologist. Following Lockhart, James Burleigh (Washington State) took the position and so became a member of the faculty. Dean James Tammen held the title of Professor in the Department.

Most of the new faculty started as Assistant Professor (one Professor). Excluding Wood and Tammen, there were 13, only three with PhDs from the Department. Thus was the gospel of hybrid vigor honored.

Several distinguished biologists from other American universities were employed for short periods, usually to teach summer sessions at Itasca. These included R.J. Bandoni, University of British Columbia; Charles Fergus, Penn State; R.J. Gilbertson, University of Arizona; R.W. Lichtwart, University of Kansas and J.D. Rogers, Washington State University.

The staff at the Cereal Rust Laboratory included J.B. Rowell, who became Leader in 1969 after Robert Romig resigned. Others were Bill Bushnell, Paul Rothman, Don McVey and Alan Roelfs. Following a relatively recent custom, these people have courtesy or adjunct appointments on the Department faculty. These appointments range from Assistant to Full Professor. Fred Frosheiser, USDA alfalfa pathologist is Adjunct Professor, and pathologists on the staff of the North Central Forest Experiment Station with Adjunct appointments included Ralph Anderson, Gerald Anderson, Darroll Skilling, Thomas Nicholls, Arthur Schipper and John Ohman.

During the decade there were eight Research Fellows, two Research Associates, three Research Specialists, one Scientist, 15 Junior Scientists, four Assistant Scientists and a number of Laboratory Technicians and Senior Laboratory Technicians on the staff at various times. Some worked for a few months only. Of those on the payroll for several years were: Roxanne Denny, Riley Hendrickson, Beth Schauerhamer Kuehn, John Musicko, Syd Nystrom, Mary Pelvic Ooka, Sadanand Pathre, Alan Pierce, Patricia Rincker Donald, Thomas Robison, Rama Urs, Gary Weaver and Carol Windels. Their employment marked a major change from the policy of earlier years when most of the technical assistants were Research Assistants (graduate students). Of course, prosperous times accounted for some of this change in policy. A couple of the lady scientists married graduate students.

Among the most useful people in the Department were Leonard Sargent, Arthur Stark and Orville Bielenberg. Leonard's principal job was to order supplies and equipment for researchers, receiving the same and, with the help of Connie Vosberg, accountant, keeping books on the purchases. As Experimental Plot Supervisors, Art Stark and Orville Bielenberg maintained the experimental fields at St. Paul and Rosemount,

respectively, tirelessly and patiently carrying out the wishes of investigators, many of who had only the foggiest notions about agriculture and its limitations. As a result, the experimental fields at Minnesota are among the best of any plant pathology department in the country, and make the Department a leader in field research in plant pathology.

Grace Aschenbach, Executive Secretary, who came on the staff in 1957, retired in 1973, after working for Dr. Wood for a year. She was replaced by Mary Holmlund, who was replaced by Linda Rivers Vukelich in 1974. Between 1967 and 1977 more than 30 women served on the office staff. Of those who stayed more than a year were: Marcia Asp, Debbie Baden Drange, Beverly Bergman, Carolyn Clifton, Anita Dille, Joanne Dorsher, Pamela Gans, Suzanne Lannan, Marcia Rosenau Morrison, Shirley Nelson, Susan Nowland, April Narcisse Percich, Charlotte Patiole, Ann Quigley, Judy Sanders, Sharon Susmilch Andrews and Connie Vosberg Post. They were competent, dedicated and lovely, and like some of their scientific sisters, some married graduate students; one a professor.

The Department continued to attract scientists from other countries, who were here for periods of a few weeks to more than a year. They did research, gave lectures and taught courses for regular staff members on leave. Among this distinguished group were: Colin Booth, England; Antonio Bottalico, Italy; El Said Ahmed El Baz, Egypt; Sidney Dickinson, England; Gian Ercolani, Italy; N. T. Flentje, Australia; J.N. Gibbs, England; Todashi Inaba, Japan; Dennis McGee, Scotland; Cajocararu Ionescu, Rumania; Kenji Ishii, Japan; J.A. Meyer, Belgium; Alan Paton, Scotland; David Punter, Canada; M.A. Sellam, Egypt; Csaba Czathmary, Hungary and Isaak Wahl, Israel.

Dr. Kernkamp, who wrote a concise and useful summary of his reign, speaks

of a reduction in federal funds for research, starting in 1968 and of the University Retrenchment and Reallocation in 1971-72, which resulted in loss to the Department of two civil service positions but no faculty. Fortunately some people have a natural talent for grantsmanship and Al, writing for Aurora in 1974, mentions grants totalling \$175,000 annually, and these were not all. Like booze, this helped to ease the burden.

Rather than trying to quote figures, it can be said that during this period no faculty were fired; they received modest salary increases to partially offset inflation. There was a steady flow of equipment and supplies; the UPS and University delivery men were daily visitors. Very few people, even the hired help, were seen peeling potatoes for PDA; why the hell bother, the Difco stuff was only \$35/lb. Exceptions were the Fusarium investigators, who claim that Fusarium spp. can detect and dislike the commercial product.

Neither did grinding poverty keep the faculty from attending meetings and making other trips, even to foreign countries. Even graduate students sometimes had a little financial help to attend APS meetings. Most of such assistance came from grants.

Travel was so common as to be of little historical interest. Many trips were short; there were a few sabbatic and quarter leaves. Neil Anderson went to Australia in 1970-71; Kommedahl to Iceland, 1968; Wilcoxson to India, 1971; and Kernkamp to the Far East, 1968.

Tom King virtually replaced Stakman as departmental foreign missionary, actually spending longer periods abroad than Stakman ever did. He was in Korea for nine months in 1957; two years in Bangkok, 1964-67; three months in India, 1970; and two years in Indonesia, 1971-73. Stakman, of course was still active, making several trips abroad, primarily

in his capacity as Special Consultant with The Rockefeller Foundation. He and Don Fletcher circumnavigated the globe in 1968.

What with distinguished scientific visitors and travels abroad, the Department has maintained its cosmopolitan character. A more formal arrangement was started in 1970 as a USAID project in cooperation with the Institut Agronomique et Veterinaire Hasan II in Rabat, Morocco. M.F. Kernkamp was leader of the plant science group under this project, a job later assumed by Roy Wilcoxson. Ben Lockhart served as pathologist for the Department in Rabat until 1976 and several graduate students from Morocco have studied for advanced degrees in St. Paul.

The Department's potential for international influence was highlighted in the fall of 1970 when it was announced that Norman Borlaug, PhD 1942, had been awarded the Nobel peace prize for his work in increasing world food production. The Department was filled with pride. Department Head Kernkamp was on a trip to Morocco and missed the chance of a lifetime to brag on the local TV.

In May 1975, the Department sustained a Graduate Education, Research and Extension Review, including a 3-day investigation by an external review committee consisting of Durward Bateman, Arthur Kelman, J. Artie Browning, John Fulkerson, Charles Kingslover, and Otto Schultz. In their written report they recommended, among other things, the addition of faculty for forest disease extension and cereal disease research; preservation of the mycological herbarium; more field biology research; at least "one non-professional support person" for each faculty member; and combining the plant pathology, entomology and horticulture clinics. These suggestions were implemented as finances became available and if changing circumstances did not make them unnecessary or undesirable. The general

The Years: 1977-1982

conclusions of the review were that the Department was strong and thriving.

Other Events of the Decade

The Second International Congress of Plant Pathology was held on the West Bank campus of the University in September, 1973. Kernkamp was in charge of local arrangements. Stakman gave the opening address. Big success.

The First Annual Stakman Memorial Softball Game between staff and students was played May 17, 1975, Stakman's 90th birthday. Stak threw out the first ball. Students won.

Several Old Timers passed away, including recently retired faculty members Helen Hart (5/2/71) and Ray Landon (3/20/75). Death came also to Old Timers J.G. Leach (5/25/72); Ralph Lindgren, (5/21/72); L.W. Melander, (6/7/72); A.G. Tolaas, (6/24/72); and E. B. Lambert, (8/12/72). Laura Mae Hamilton, who held a position with the federal rust project, retired January 26, 1968. She died of cancer, May 12, 1972.

On July 19, 1977, a few weeks before the 70th anniversary of the authorization of the Department, Dr. Stakman suffered a paralytic stroke and cardiac arrest. Partially incapacitated, he lived in a nursing home until his death January 22, 1979. □

During the recent strike of the University Service Employees, C.M. Christensen was apprehended at the Cleveland Avenue entrance by a group of strikers and was informed that there was no reason for his entering the campus as there wasn't any one working. C.M.C. replied that since he was just a teacher and they never worked anyway, he might be permitted entrance. His statement was accepted.

--From Aurora Sporealis, Vol. 19, No. 6, 1943

The period 1977-1982 has been a challenging, exciting, and difficult time. Many new opportunities have arisen in the research, teaching, and extension programs, and many new demands have been made of the Department during a time of institutional budget cutbacks, retrenchments, and shrinking, uncertain resources. The ability of the Department not just to endure these difficult times, but also to prevail in meeting new opportunities and undertaking new responsibilities has been a tribute to the resilience and resourcefulness of the department head, faculty, staff, students and many friends of the Department.

In August, 1977, F. A. Wood resigned from the Department to accept a position as Dean for Research and Professor, Institute of Food and Agricultural Sciences, at the University of Florida. During his tenure as Head he initiated a number of new programs that have become strong components of the Department, such as research in air pollution, epidemiology, and ecological genetics and the undergraduate major in Plant Health Technology. During Wood's administration the Department changed much in its character and direction because of faculty retirements and because of the interests and abilities of newly recruited faculty.

After an extensive search for a new Head, D. W. French, who had been serving as Acting Department Head since Wood's departure in 1977, became the sixth Head of the Department in January, 1979. Since 1978, three Assistant Professors have been recruited, and University administrative approval has been granted for construction of a new building that will help accommodate the expanding physical needs of the Department. Construction of this building will reflect the efforts of French, Wood, many faculty and administrators, and supportive clientele, but it especially reflects the capable efforts of J. F.

Tammen, then Dean of the College of Agriculture and Professor of Plant Pathology, who worked effectively to ensure that the needs of this Department for additional teaching and laboratory space would be answered.

After French became Department Head, he found it necessary to relinquish his research and teaching duties in forest pathology. In 1980, Robert Blanchette (Ph.D. Washington State) was recruited to work in this area, and he has continued some of the research initiated by French as well as developing several new types of research that reflect his own interests and abilities. Other assistant professor positions were filled too. When Robert Shrum left the Department, his responsibilities for research and instruction in epidemiology were filled in 1979 by the appointment of Paul Teng (Ph.D., Lincoln College, U. of Canterbury, New Zealand) whose research program rapidly is becoming one of the largest in the Department. M.F. Kernkamp retired in 1977, and his postdoctoral associate, James A. Percich (Ph.D., Michigan State) was promoted to Assistant Professor to continue the research program in wild rice diseases. Percich also assumed teaching duties in chemical control of plant diseases, and in 1982 he, along with Paul Teng and Howard Bissonnette, initiated a sugar beet disease project. A new cereal pathology position was added to the Department, and was filled in 1979 by James Baumer (Ph.D., Univ. California, Riverside).

Additional faculty changes occurred during 1977-82. Erik Stromberg (Ph.D., Oregon) joined the Department in 1977 on a new USDA-APHIS program for disease detection and monitoring; in 1981 Stromberg resigned to accept an extension position at Virginia Polytechnic Institute. In 1980, John B. Rowell retired as Leader of the USDA Cereal Rust Laboratory, but continues as a Professor in the Department; this position was filled by another able and experienced scientist-administrator,

former department head at Washington State University, John Schafer. Herbert Johnson, Extension Plant Pathologist, also retired in 1980; unfortunately, extension administration had to close this position because of severe budget constraints. Herb's responsibilities on corn and soybeans are being handled very effectively by Ward Stienstra. Richard Meronuck, who for several years had a split appointment between the Department and the Office of Special Programs, joined the Department as a full-time Extension pathologist in 1981. John Mizicko resigned as Extension Pesticide Specialist in 1978 and Fred Morgan worked in this position from 1979-81. In 1981, Asimina Gkinis (Ph.D., Wisconsin) resigned her position as Extension Specialist to work in private industry; Fred Baker assumed her responsibilities in tree pathology but this position is scheduled for termination on June 30, 1983. James Burleigh, who had been on the faculty with the USAID/Minnesota project in Rabat, Morocco since 1978, resigned in 1981 to return to California but has since arranged to return to Morocco in August of 1983. Benham Lockhart, a virologist in the Department, accepted a two year assignment in Morocco which has been extended to December, 1983. James F. Tammen, Dean of the College of Agriculture and Professor in the Department since 1976, left the University in 1981 to become president of Oglevee Associates in Pennsylvania.

The Department's office staff changed too. Barbara Edstrom replaced Linda Rivers Vukelich as Executive Secretary in 1978, and in 1982 she was promoted to Administrative Assistant, a new post in the Department. There were other changes in the office staff with the arrival and departures of Angela Carver, Anita Dille, Tim Huberty, Suzanne Lannan, Barbara Mueller, April Narcisse, and Sharon Susmilch. More recent arrivals are Ann Arendt, Meg Kight Clemens, Patti Sebesta, and Kelly Sieg. Both Debbie Baden-Drange and Connie Vosberg Post have worked in the office for nearly nine years, thereby

greatly adding continuity to the smooth operations of the office. Leonard Sargent, who served the Department very effectively as Supply Supervisor for 14 years, died in 1981.

Art Stark retired as Research Plot Coordinator at St. Paul after nearly 15 years of highly competent service; his job was filled by Loren Nickelson who had been with the wild rice project. Dann Adair replaced Loren in 1982. Orville Bielenberg, Research Plot Coordinator at Rosemount is scheduled to retire in 1983 after more than 20 years of outstanding service. The Departmental librarian, Nina Jorgensen, was moved to another part of the library system early in 1982, and except for a few hours a day the library remained locked to those without a key. The Department was able to partially fund a librarian, and Erik Biever was hired in mid 1982. In 1980 the Plant Disease Clinic hired its first non-graduate student Director, Jill Pokorny, a recent Plant Health Technology graduate.

More technical support people than ever before, both civil service and academic staff, worked on many if not most of the projects in the Department, some of them for several years. Researchers in the civil service category were hired under titles that ranged from Laboratory Technician to Scientist. Likewise, the non-tenure staff positions came under an assortment of titles such as Research Fellow, Research Associate, Research Scientist, and Assistant Specialist. Among this group of valuable scientists who left during 1977-82 are: Boris Chevone, Don Christopherson, Michael Coscio, Riley Hendrickson, Beth Kuehn, Sid Nystrom, Sadanand Pathre, Frank Russo, Tom Robinson, and Paul Scherman.

Several Visiting Scientists came to Minnesota for periods of a few months to two years, primarily to study and research in the areas of grain storage and mycotoxicology, air pollution, host-parasite relations, tree diseases, plant viruses, population genetics, and the

nature of resistance to cereal pathogens. These scientists include: Peter Onesirosan from Nigeria; Vessalina Ilieva, Bulgaria; Tsung-Che Tseng, Taiwan; Takumi Yoshigawa, Japan; Balazs Harrach, Hungary; Stefan Godzik, Poland; Matthew Rutze, Germany; Anne Lemmetty, Finland; Monica Olsen, Sweden; J. Anikster, Tel Aviv; I. A. Watson, Australia; Shih-I Lu and Mrs. Tong Xia Zhu, China; John N. Gibbs, John Gay, and John Lacey, England; Tim Carver, Wales; and Edward Hill, Macalaster College, St. Paul.

Among those identified as 'Visiting Professors' in Aurora was John Ayers, who took a sabbatical leave from Penn State for 6 months in 1978. John M. Skelly, VPI, taught the course in forest pathology in spring quarter of 1978, and John Gibbs, England, taught the advanced course in forest pathology in 1980. Nobel Laureate Norman Borlaug was appointed Honorary Visiting Professor in 1978 and has been invited to exercise the Professorship at any time convenient to him at least once a year. Shorter visits for classroom lectures and discussions with students and faculty were made by A. Shigo on forest pathology, R. J. Lukens on fungicides, J. M. Daly on toxins, and H. Mussell on host-parasite recognition and induced immunity in plants. Donald T. Wicklow, a fungal ecologist at the Northern Research Laboratory (ARS, USDA), Peoria, Illinois, was a student-sponsored guest scientist in December, 1982.

On January 22, 1979, E. C. Stakman died at age 93 after a prolonged illness. Stak was more responsible than any other for the nature and character of the Department, which was shaped during the forty years he was Department Head. During the last 26 years of his life (in official retirement) he was vigorously involved in writing, consulting, and traveling, and he remained thoroughly involved with the students and faculty and the affairs of this institution until his death. Many of Stakman's friends, colleagues, and

former students met on campus on May 17, 1979 to remember him as a teacher and friend, and to explain how their lives had been affected and enriched by their associations with him.

In 1979, the Department formulated an Endowment Policy when a bequest by E. C. Stakman increased the Departmental endowment fund severalfold. Before that, several smaller gifts and bequests had been received and invested. The Department has a number of endowment trusts; among these are the E. C. Stakman Award Fund, the Plant Pathology Library Endowment Fund, the E. C. Stakman Visiting Scientist Fund, the Bausman Fund, the Helen Hart Fund, the Thomas French Memorial Fund, and the Stakman Softball Fund.

With the retirements of Professors C. M. Christensen, C. J. Eide, and M. B. Moore, and the hiring of new faculty in the 1970s, the age composition and educational backgrounds of the faculty shifted. By 1980 about half of the faculty was under age 40 and came from a variety of educational backgrounds. As the new faculty became established in the Department, interesting and sometimes exciting exchanges of new ideas and methodologies occurred. More emphasis is now placed on quantitative experimentation and the fundamentals of systems analysis. Information storage and data analyses are processed on several computer terminals that connect with the university mainframe facilities. In addition, mini-computers and microprocessors are seen increasingly in most laboratories. Analyses that used to take days and months are now done in minutes and hours.

Pathology research that supports plant breeding programs continues to be the backbone of field and glasshouse research. Crop management approaches to plant disease made a strong comeback through integrated pest management initiatives. Fundamental research areas including plant virology, bacteriology, nematology, and fungal biochemistry,

initiated in the 1960s and 1970s continue. Progress also continues in post-harvest grain storage, mycotoxin identification, biological control, fungal systematics, fungal diseases, and wood product deterioration. As in all biological sciences today, there is a great deal of interest in applications of genetic engineering, monoclonal antibody production, lectins relative to parasite specificity and other topics.

After many years of effort, several research activities are now receiving national and even international attention. Among these are the development of the herbarium, genetics of Rhizoctonia solani, slow rusting, epidemiology and crop loss assessment, cytological basis of host-pathogen incompatibility, nature of resistance in alfalfa diseases, mycotoxicology, biological control, and Scleroderma canker on conifers as well as other forest and shade tree diseases.

Advanced equipment to support research efforts has also expanded. The ground floor of Stakman Hall now contains a mass spectrometer, and the ground floor of the Plant Science building contains an enlarged electron optical facility with x-ray microanalysis capabilities. Other improvements include 15 vehicles in the Department, and expansion of the Plant Pathology farm at Rosemount to 240 acres.

Additional space to meet the expanding research and teaching efforts of the Department has been needed for several years. Through the support of many individuals and organizations in the state, the Legislature became convinced of this need, and in 1978 approved \$600,000 for architectural plans, which were completed in 1980. The 1980 legislature approved the building through a bonding bill passed that year, and construction is scheduled to begin May 15, 1983. The new building will connect the facilities of the Plant Pathology, Agronomy, and Soil Science departments and add 12,000 square feet

to the Department. Since plant pathology also will occupy the entire Plant Science Building when the new building is constructed, the Department will gain much needed space for its research and teaching programs.

In the meantime, space problems had been lessened by converting the basement of the headhouse into offices for graduate students. The storage room on the first floor was modified for the mycotoxicology project which had to evacuate their space in 201 so that the air pollution project could expand. More storage space was sacrificed to expand the electron microscopy facility in Plant Science. Space in North Hall was acquired, and now is occupied by the herbarium, a computer lab, and as offices for students and faculty desiring a quiet place to read, write, and think. Within Stakman Hall, walls were built to enclose the stairways, a measure to comply with government fire regulations, which cost the University about 3/4 of the amount needed to construct the original building.

Graduate and undergraduate programs changed with the adoption of a new "core curricula" for the B.S. (Plant Health Technology), M.S. and Ph.D. majors. Within the core curricula, students gain sound pathology background, with more emphasis placed on research experience and related areas of appropriate experience and study. Opinions among the faculty regarding student education range from having no set coursework to having a specific number of credits of plant pathology courses. Debates about what education in plant pathology should entail will most likely continue to be a topic of lively discourse. The new core curricula were in effect for the first full academic year in 1982, so it will take several years to evaluate their success.

Several workshops and symposia were organized and hosted by the Department since 1977. These were in the areas of air pollution, computer resources,

methods for plant disease surveys, food mycology, and Fusarium identification.

On August 24-28, 1980, the national meeting of the American Phytopathological Society was held jointly with the Canadian Phytopathological Society on the West Bank of the Minneapolis campus. Richard A. Meronuck was chairman of the local arrangements committee. Everyone in the Department contributed to the success of the event by becoming involved in the extensive activities, which ranged from membership on organizational committees to driving guests to and from the airport. Even a 6:30 a.m., 5-mile run from the east end of the Franklin Avenue Bridge to Northrup Auditorium was organized for the benefit of those addicted to exercise. The week before this meeting, a ¹¹ E. C. Stakman Commemorative Symposium on Assessment of Losses which Constrain Production and Crop Improvement in Agriculture and Forestry" was held on the Minneapolis Campus. It was organized and guided to success by Drs. Teng, Krupa, Baumer, Groth and Meronuck. Proceedings of the symposium were published in an experiment station bulletin which proved so popular that all copies were sold within two years.

The past five years, besides being challenging and exciting, have been years of financial difficulty for the State and the University. In spite of this, a new building has been approved, new faculty have been recruited and new equipment and field facilities acquired. Immediate space needs have been satisfied and financial losses minimized. It has been a time of building on the strengths of the past while anticipating the challenges and trends of the future. The Department has indeed been fortunate in having dedicated and competent leadership in a difficult period. □

More Than 500 Candidates Earn Degrees in 75 Years

Carol E. Windels

Graduate education, the lifeblood of any science or discipline, has continued to be a tradition of major importance since the inception of the Department of Vegetable Pathology and Botany in 1907. Initially, there was a naturally occurring lag period before M.S. and Ph.D. degrees were granted to aspiring candidates. In 1910 two M.S. degrees and one M.A. degree were received by three students. R. A. Jehle completed a thesis entitled, "Life history of Sclerotinia fructigena (Persoon) Schroeter"; Jane Nisbit, "A study in the identification of quack grass"; and E. C. Stakman (M.A.), "A study in cereal smuts in Minnesota". By 1913 E.C. Stakman earned the first Ph.D. degree in the Department (in fact, only two other students received doctorates from the University that year). His thesis, "A study in cereal rusts: physiological races", marked the beginning of one of the Department's most significant contributions to science, that of demonstrating the genetic diversity and physiological specialization of microorganisms.

From these auspicious beginnings, through August 1, 1982, a total of 511 students have received 654 graduate level degrees in the Department. The five hundredth individual to graduate was Frederick Baker who passed his Ph.D. thesis defense on July 2, 1981 (D.W. French, advisor). His thesis, "Biology and Control of Eastern Dwarf Mistletoe", is 254 pages in length, which likely sets another record. The first 75 years have seen slightly more Ph.D. degrees (51%) than M.S. degrees (49%) conferred. Students from 55 other countries comprise 35% of the graduates. Nearly 28% of the graduates received both degrees in the Department, while 35% received the M.S. only and 37% received the Ph.D. only. Nineteen of all M.S. degrees were "Plan B" (without thesis), and the first was granted in 1944. Only

40 of the graduates are women, and 47% of them received their degrees since 1971.

Table 1. Number of M. S. and Ph. D. degrees granted at 5-year intervals from 1907 through August 1, 1982.

5-year intervals	M.S.	Ph.D.	Total
1907-12	5	0	5
1913-17	4	1	5
1918-22	10	4	14
1923-27	16	10	26
1928-32	16	19	35
1933-37	11	21	32
1938-42	14	22	36
1943-47	13	19	32
1948-52	26	39	65
1953-57	40	44	84
1958-62	44	38	82
1963-67	40	44	84
1968-72	22	35	57
1973-77	28	18	46
1978-82	33	18	51

The number of M.S. and Ph.D. degrees conferred in 5-year increments since 1907 are summarized in Table 1. The years from 1953 through 1967 mark the heyday for record numbers of graduates, although if examined on an annual basis, the trend began in earnest in the late 1940s. This pattern reflects the return to the classroom of students from service in World War II and the Korean War. Equally important was the generous availability of federal, state, and private funds for education, and for basic and applied research. A prime job market also ensured the bearer of a newly earned graduate degree a choice of employment opportunities. In these bumper years, 1962 ranks number one for the most degrees granted (14 M.S. and 12 Ph.D.); 12 doctorate degrees were also granted

in 1968. The last decade shows fewer graduates, a response to dwindling research dollars, inflation, and a declining job market. Also, more graduates received M.S. than Ph.D. degrees. Some of these M.S. graduates continued their education at other universities, a practice now encouraged by many advisors. Many others found jobs in industry, private consulting, and universities where a knowledge of plant pathology and technical skills were in demand.

A complete list of the graduates from 1907 through August 1, 1982 follows.

MS AND PhD DEGREES GRANTED
(Through August, 1982)

Name	MS	PhD
Abrahamson, Mary	1962	1964
Ahlgren, George E	1962	1966
Alabanza, Armagedon A.	1967	
Ali, Syed Bazley	1954	
Allison, Clyde C.	1930	1935
Allison, J. Lewis		1940
Andersen, Arne S.	1960	
Anderson, C. George	1928	
Anderson, Darryl L.	1969	
Anderson, Gerald W.		1963
Anderson, Neil A.	1957	1960
Anderson, Ralph L.		1952
Anderson, Roger V.	1957	
Anderson, William H.		1974
Andres, Markus		1982
Andrews, Edward A.	1943	1953
Andrews, Mark W.	1981	
Andrews, Stuart R.		1953
Anwar, A.A.		1949
Arntzen, Charles J.	1967	
Asare-Nyako, Andrew	1963	1965
Ashagari, Dereje		1975
Ashraf, Mohammad	1962	
Atif, Abdul Hakim	1973	
Atkinson, Robert E.*		1952
Bailey, D.L.	1921	1924
Baker, Frederick A.		1981
Bamberg, R.H.*	1929	1933

*Deceased

Name	MS	PhD
Banttari, Ernest E.	1959	1962
Barbosa, Carlos G.	1948	
Barker, H.D.		1923
Baskin, A. David		1950
Bazley, Ali Syed	1954	
Bean, George A.	1960	1963
Bedi, Kishan S.		1951
Bergdahl, Dale R.	1974	1979
Berger, Philip H.	1980	
Bernier, Claude C.		1965
Bevis, Roderick Reid	1970	
Bird, Julio P.	1950	1956
Bisby, G.R.*		1919
Bissonnette, Howard L.	1958	1964
Bohnenblust, Kenneth E.		1966
Bonde, Reiner*		1938
Bonnen, Alice	1982	
Boosalis, Michael G.	1948	1951
Borders, Huey I.	1938	1947
Borich, Patrick J.	1963	
Borlaug, Norman E.	1941	1942
Bowden, Robert L.	1981	
Breen, Patrick J.	1963	
Brierley, Philip*	1922	
Brinkerhoff, Lloyd A.		1962
Broadfoot, W.C.	1925	1932
Bromfield, Kenneth R.		1957
Brown, George Eldon		1965
Broyles, James W.*		1955
Bugbee, William M.	1962	1965
Butler, Edward E.		1954
Campbell, Robert N.	1954	1957
Campos, Alfredo*	1950	1958
Cardenosa, Ricardo	1952	
Carley, Harold Edwin		1969
Carlson, Lauren E.	1962	1965
Cassell, R.C.		1938
Castano, Jose J.	1955	1967
Castillo, Bernardo S.	1959	
Castronovo, A.J.P.	1954	
Chakravarti, B.P.		1960
Chang, Annabelle I-Pin	1967	1970
Chang, Ho-Shii		1972
Chao, Tung Fang		1952
Cheetham, Ronald D.	1967	
Chen, Der-Fen	1958	
Chen, Shan-Ming	1940	1943
Cherewick, William J.	1940	1943
Chilton, St. John P.		1938
Cho, Yong Sup	1961	1970
Choong, Sister Stephana	1966	

Name	MS	PhD	Name	MS	PhD
Christ, Barbara Jane	1980		Flor, H.H.	1924	1929
Christensen, Clyde M.	1930	1937	Flores, Marco A.	1957	
Christensen, Edgar V.	1958		Fogelman, Raymond	1920	
Christensen, J.J.*	1922	1925	Follstad, Merle N.	1961	1964
Chung, Hoo Sup	1957	1967	Forbes, Irvin L.		1935
Churchward, J.G.*	1933	1936	Franc, Gary D.	1982	
Clemente, Dolores Anne	1967		Frederiksen, Richard A.	1957	1961
Cohen, Mortimer		1951	French, David W.	1949	1952
Cormack, M.W.		1936	French, Edward R.	1963	
Cotter, R.U.*	1924	1929	Fridlund, Paul R.	1952	1954
Covey, Ronald P., Jr.	1959	1962	Frosheiser, Frederick I.		1955
Cox, Darrell J.	1977		Froyd, James D.	1964	1967
Craigie, J.H.	1925		Fuentes, Santiago F.	1958	
Crane, Gerald Lee		1968	Furnier, Glenn R.	1980	
Cross, John E.		1966	Gardner, David W.	1980	
Crow, Robert V.		1975	Garrett, Wiley N.		1962
Daly, Joseph M.	1947		Garza-Chapa, Raul		1965
Darley, Ellis F.		1945	Gattani, Mohn Lal		1946
Darling, Henry M.	1935	1943	Gavinlertvantana,Supraneel	1977	
Davidson, Richard S.		1947	Gemmell, Alan R.	1937	
Davies, F.R.		1938	Gerwitz, David L.	1961	1962
Davila, Edmundo	1961		Gibbs, Alwyn F.		1971
De La Isla, Lourdes	1957		Gibbs, Gordon J.		1937
Del Prado, Frank	1951		Gibler, John W.	1950	1951
DeNazareno, Nilceu R.X.	1980		Goodman, Jacob J.		1951
DeVay, James E.		1953	Goth, Robert W.	1957	1961
DeZeeuw, Donald J.	1940	1949	Goto, Shosuke		1953
Dickinson, Sydney		1932	Gottlieb, David*		1942
Donald, William W.	1974		Graham, Thomas W.	1933	1942
Dorworth, Charles E.		1966	Grahek, Theodore A.	1951	
Dosdall, Louise*		1922	Grau, Craig R.		1975
Douglas, Dexter P.		1968	Greaney, F.J.	1926	1931
Downie, Andrew R.	1941	1942	Grisham, Michael P.		1979
Drescher, Robert F.	1953	1956	Gronquist, John A.	1977	
DuCharme, E. P.		1949	Groth, James Vernon	1969	
Dueck, John	1966	1971	Gustafson, Paul A.	1960	
Dutta, Prasanta K.		1958	Guzman-Naranjo, Julia		1961
Eide, Carl J. El-	1929	1934	Hadidi, Ahmed L.	1962	
Kandelgy, Sayed M.	1964	1965	Hafstad, G.E.	1933	
Ellingboe, Albert H.	1955	1957	Hagler, Winston M.		1979
Elliot, Arthur M.	1960	1961	Haglund, Frances E.	1933	
Eugenio, Cesaria P.	1965	1968	Haglund, William A.	1958	1960
Evans, Nevada	1912		Haissig, Bruce		1969
Failles, George D.	1956		Hak, Tewfik Abdel		1948
Fanse, Hemant A.	1965	1968	Halloin, John M.	1964	
Feldman, Albert W.		1947	Hamm, Phillip Curtis*		1950
Felix, Luis C.	1948		Hanson, Earle E.	1939	1942
Feng, Kuo A.		1967	Harrar, J.G.*		1935
Fields, Richard W.	1961		Harrison, Monty D.		1961
			Hart, Helen*	1924	1929

Name	MS	PhD	Name	MS	PhD
Hasan, S.F.		1949	Jons, Virgil L.	1975	
Hasanain, Syed Z.		1948	Jorgensen, Johannes		1962
Haugen, Larry G.	1982		Josephson, Mark	1977	
Hawn, Elmer J.		1956	Kamat, M.N.	1932	
Hayden, Eugene B., Jr.	1954	1956	Kardin, M. Kosim	1981	
Heagle, Allen		1968	Kaufert, Frank H.	1930	1935
Hemerick, Glen A.	1952		Kausar, Abdul G.*		1951
Henderson, Lavanial	1950		Kavanagh, Thomas		1960
Hendrix, J. Walter		1948	Keeling, Bobbie L.		1966
Henry, A.W.		1923	Kennedy, Bill W.		1961
Herrett, Richard A.		1959	Kenney, Michael J.	1966	
Herzfeld, Dean E.	1982		Keplinger, Joseph A.	1953	
Hijano, Edgardo H.	1979	1981	Kernkamp, M.F.	1938	1941
Hildreth, Robert C.		1957	Khan, Abrar M.		1950
Hill, Curtis B.	1981		King, Thomas H.	1939	1946
Hill, John H.	1966		Kiral, Bulent	1975	
Hines, Lee	1930		Klug, Robert J.	1954	1957
Hingorani, Monohar K.		1947	Knous, Ted R.		1979
Hoerner, G.R.	1918		Knutson, Donald M.	1965	
Holton, C.S.*	1929	1932	Knutson, Kenneth W.	1956	1960
Horricks, J.S.		1963	Kommedahl, Thor	1947	1951
Hoskin, Daphne Alderson	1969		Konerza, Riley D.	1953	
Hotson, Hugh H.		1951	Kotheimer, John B.	1958	
Hsi, Wei-Ley Sunny	1977		Kotila, Martha A.	1946	
Hsia, Yu Tien	1950		Kraft, John M.	1962	
Hsu, Gene T.P.	1973		Krog, Norman E.		1952
Hsu, Nancy, Ju-Shen*	1946		Kroll, Robert E.	1973	1977
Hubert, Kurt	1933		Kromroy, Kathryn M.W.	1982	
Hudler, George W.	1973		Kucharek, Thomas A.	1965	1969
Hulluka, Mengistu	1966				
Hunter, Barry Bailey	1967		La Yong Joon	1962	
Hursh, C.R.		1923	Lachmund, H.G.	1941	
Husain, Syed M.		1965	Lambert, E.B.*	1922	1927
Hwang, Liang*		1939	Lambert, Roger G.	1957	1961
Hynes, H.J.*	1925		Lang, David S.	1975	1978
			Lapis, Delfin B.		1970
Ibrahim, Ismail A.	1949	1952	Laskaris, Thomas	1938	1941
Intrama, Siriphong	1959		Laurence, John A.	1973	1976
			Leach, J.G.*	1918	1922
Jackson, L.W.R.*	1927		Leath, Kenneth T.	1965	1966
Jacobsen, Barry J.		1973	LeClerg, E.L.*		1932
Jehle, R.A.	1910		LeTourneau, Duane J.	1951	1954
Jereseck, Jon D.	1976		Levine, M.N.	1916	1924
Johnson, Delia E.*		1930	Lieberman, John R.	1971	
Johnson, Dennis A.	1975	1978	Lindgren, R.M.*	1928	1937
Johnson, E.M.		1930	Line, Roland F.	1959	1962
Johnson, Herbert G.		1953	Ling, Lee	1936	1937
Johnson, H.W.		1928	Littlefield, Larry J.	1962	1964
Johnson, Keith	1981		Liu, Stephen C.Y.		1957
Johnson, Lois E.B.	1977	1980	Livingston, Clark H.		1966
Johnson, Thorwaldur*	1925	1930	Loegering, William Q.		1949
Johnston, Frederick B.		1944			

Name	MS	PhD	<u>Name</u>	MS	PhD
Logsdon, Charles E.		1954	Nyvall, Robert F.	1966	1969
Loh, T.C.		1933			
Lopez, Luis Cesar	1962		Ochoa, Carlos N.	1955	
L o p e z , R a f a e l	1964		Ohh, Seung Hwan		1973
Lopez-Fries, Luis Cesar		1966	Ohman, John H.	1958	1961
Lorenz, R.C.	1942		Old, Kenneth M.		1964
Lu, Shih-I	1950	1952	Olien, Charles R.	1955	1956
Lutey, Richard W.	1959	1962	Olmsted, Donald S.	1955	
Lyle, James A.		1953	Onesirosan, Peter Tosan	1968	
MacInnes, Jean	1919		O o k a , J e r i J .		1975
Mallik, Muhummad A.B.	1961		Orellana, Rodrigo		1948
Manabe, May Yoshiko	1965		Orjuela, Juan E.		1957
Manion, Paul D.	1965	1967	Ortega, C. Benjamin	1946	
Martin, W.J.		1942	Ortega, Jacobo		1960
Mehta, P.R.		1949	Oshima, Nagayoshi*		1957
Melander, L.W.*	1924	1930	Ostry, Michael E.		1978
Melendez, Angelica	1951				
Menge, John A.	1969		Paharia, Kishun D.		1956
Meronuck, Richard A.		1971	Palm, Mary E.	1979	
Merrill, William, Jr.	1961	1963	Palmer, Louis T.		1968
Mew, Twing Wah (Tom)		1972	Palmer, Marguerite A.	1977	
Meza, Carlos R.	1967		Pandey, Mahesh C.	1966	1969
Michaelson, Merle E.		1953	Papavizas, George C.	1953	1957
Milholland, Robert D.		1962	Parson, H.E.*	1928	
Miller, Charles W.		1960	Patel, Kantilal		1967
Miller, James D. Miller,		1971	Pelaez, Alfredo	1972	
Lawrence I. Misra, A.P.		1953	Penner, Donald	1960	
Mital, James		1947	Person, Lee H.*	1929	1937
Mohamed, Hosni A.	1982		Peterson, P.D.*	1926	1929
Moloney, Donal	1955		Petty, M.A.		1940
Monson, Arvid M.	1969		Peturson, Bjorn	1929	1952
Mont, Ricardo	1964		Piemeisel, F.J.* Pierre-	1915	
Moore, M.B.	1970		Louis, Felix Postigo,	1944	
Moreno, Martinez Ernesto	1934		Rosendo Pratt,	1952	
Morrison, Richard H.		1969	Gregory C. Prescott, Jon	1980	1982
Morton, Harrison L.	1968	1972	M. Presley, John T.		1970
Mullin, Robert S.	1964	1967	Preston, Dudley A.		1947
Mumford, David L.		1950	Pusposendjojo, Nursami	1940	1947
Munnecke, Donald E.		1962	Puttick, G.F.*	1975	1979
Murakishi, Harry	1949	1950		1920	
Murillo, Gabriel P.		1948			
	1952		Qasem, Subhi A.		1959
Nair, P. Narayanan					
Natour, Rashad M.		1956	Reiling, Theodore P.		
Nelson, R.M.*	1957		Reilly, Joseph J.		1957
Nelson, Richard R.	1924	1930	Renfro, B.L.	1954	
Newton, Margaret	1952	1954	Rick, Paul D.		1960
Nisbit, Jane*		1922	Roane, Curtis W.	1966	
Noble, R.J.*	1910		Roberts, Bill J.		1953
Norgren, Robert L.	1922	1923	Robles, Leonel H.		1962
Norquist, Myrtle A.	1963	1967	Rodenhiser, H.A.*		1946
	1952			1925	1928

Name	MS	PhD	Name	MS	PhD
Rodriguez, A.E.	1954		Skovmand, Bent	1973	1976
Rodriguez, Jose	1945		Slattery, Robert J.		1977 1980
Rodriguez, Ricardo A.		1960	Smeltzer, Dale Kellogg	1955	
Roelfs, Alan P.		1970	Smith, David H.	1966	1968
Rogers, Wallace E. Rojas-		1964	Smith, Mark A.	1979	
Garciduenas, Manuel Rose,	1956		Somodiryo, Kaselan J.		1978
R.C.	1915		Southern, Joseph W.	1980	
Rowell, John B.		1949	Stade, Susan	1910	1913
Ryan, Edward W.		1962	Stakman, E.C.*	1966	1968
			Stallknecht, Gilbert F.		1932
Saari, Eugene E.	1962	1966	Starr, G.H.		1974
Sackston, W.E.		1949	Steele, John A.	1981	
Salisbury, Philip J.		1970	Stennes, Mark		1953
Sanford, G.B.*	1923	1925	Stewart, Donald M.		1964
Santiago, Joaquim C.		1956	Stingl, Helmut		1968
Sarbini, Gusti	1976	1980	Sturgeon, Roy V., Jr.	1969	
Sarojak, Douglas J.		1975	Sullivan, Timothy P.	1966	
Sauer, David B.	1964	1967	Sun, Ming-Hsien	1979	
Sayoud, Rachid	1980		Sunderwirth, Stephen D.		1964
Schaal, Lawrence A.	1925	1941	Sundheim, Leif		1955 1980
Schipper, Arthur L., Jr.	1965	1968	Swaebly, Mary Ann Swanson,	1977	1981
Schleder, Eric G.	1960		Steven P. Sweets, Laura E.	1970	
Schmidt, Elmer L.	1975	1978	Swendsrud, David P.		1968 1970
Schneider, Charles L.	1953	1956			1960
Schneiderhan, F.J.	1915		Tainter, Franklin H.		1946 1948
Schreiber, Mark C.	1977		Taylor, Donald P.		1963
Schroeder, David B.	1962	1965	Telneset, Stein O.		1940
Schroeder, Harry W.	1954	1955	Tervet, Ian W.	1982	
Schwandt, John W.	1970		Thies, Judy A.	1943	1947
Schwartz, Howard F.	1975		Thomas, Walter D., Jr.		1934 1957
Schwinghamer, Erwin A.		1954	Thornberry, H.H.	1953	1958
Seal, J.L.		1927	Threinen, James	1977	
Sederstrom, Scott G.		1980	Thurston, H. David	1912	
Seid, Alton Harry	1968		Tjokrosudarmo, Ambarwati		1947
Sharvelle, E.G.		1934	Tolaas, A.G.*		1929
Shearer, Bryan L.		1975	Tsiang, Chen Tong Tu,	1953	1956
Shen, Josephine M.		1962	Chih*	1960	
Shimabukuro, Richard H.	1962	1964	Tuite, John F.		1955
Shrief, Saleh H.	1979		Tumbleson, Myron E.	1950	
Shukla, Tapa Nath		1952	Turk, Fateh M.		1934
Shulstad, Orris Harold	1950		Tveit, Martin T.		1939
Shumway, C.P.	1931		Tyler, L.J.		
Shurtleff, Malcolm C., Jr.	1950	1953	Tyner, Lawrence E.		
Siggers, Paul V.*		1939			
Silberman, Meira B.		1966	Ukkelberg, H.G.		1932
Silverborg, Savel B.		1947			
Silverman, William		1958	Vaheeduddin, Syed		
Singh, Sheodhan		1956	Vargas, Joseph M., Jr.	1935	1936
Singleton, Larry L. Siwula,		1974	Vaughan, E.K.		1968
John T.	1971		Vaughn, John R.		1942
Skiles, Robert L.		1952			1940 1947
Skilling, Darroll D.		1968			

Name	MS	PhD
Venette, James R.		1975
Venkataram, C.S.	1953	
Verrall, A.F.		1934
Vest, Hyrum Grant, Jr.		1967
Von Ruden, Dale A.	1961	
Voorhees, Richard K.		1941
Walker, Kenneth R.	1957	
Wallace, H.A.H.	1951	
Wallace, J.M.*	1957	1929
Wallace, Monica K.	1978	
Walter, J.M.*	1931	1933
Wang, Chi Shi	1936	1937
Wang, Sinn S. (Andrew)		1969
Warner, Gloria M.	1967	1976
Warren, Herman L.		1970
Watson, I.A.		1941
Welty, Ronald E.	1961	1965
Wenzler, Herman C.		1980
Widin, Katharine	1977	1980
Wigginton, Louis	1965	
Wilcoxson, Roy D.	1955	1957
Wiley, Hunt B.	1979	
Williams, Wayne T.	1965	
Wilson, Coyt T.		1946
Windels, Carol E.	1972	1980
Wismer, Chester A.		1950
Wolf, James C.	1971	1975
Wood, Elsa	1955	
Wood, Francis A.		1961
Wood, Leon S.		1958
Woodruff, William C.	1978	
Wyllie, Thomas D.	1957	1960
Young, Harry C., Jr.	1943	1949
Zaki, Abdel-Hamid I.		1964
Zeyen, Richard J.		1970
Zinada, Abdul-Aziz H.	1967	

And There Were Still Others

A number of successful plant pathologists graduated from Minnesota with bachelors degrees and worked for Masters or PhDs at other institutions. The people named below are honored Old Timers whom we like to think acquired knowledge and inspiration during their association with the Department. Most, but not all, majored in plant pathology

as undergraduates. Some took graduate work, but seized opportunities elsewhere to continue their education. There were probably others, but the mists of time grow pretty dense as the years pass, and we apologize to any we have missed.

Freeman H. Weiss, BA, 1915
PhD, Cornell, 1922
Allan G. Newhall, BS, 1918
PhD, Cornell, 1929
Camille L. Lefebvre, BS 1929
PhD, Harvard, 1932
Earl D. Hansing, BS, 1933
PhD, Cornell, 1941
Kermit W. Kreitlow, BS 1936
PhD, Louisiana State U, 1940
Axel L. Anderson, BS, 1937
PhD Michigan State U, 1941
Robert A. Zabel, BS, 1937
PhD, N.Y. State College of Forestry,
Syracuse, 1948
John E. Mitchell, BS, 1939
PhD, Wisconsin, 1948
Arden F. Sherf, BS, 1939
PhD, Nebraska, 1948
Max L. Schuster, BS, 1940
PhD, Washington State U, 1946
Brad Mogen, BS,
MS, North Dakota State U, 1982

The historical supplement of 1947 lists an impressive 140 individuals receiving degrees in other disciplines but who minored in plant pathology or in the Section of Plant Physiology which was then part of the Department. These students, presumably with the consent and/or advice of their advisers, came into the Department to learn the unusual application of basic biological principles to practical problems that Freeman, Stakman and their colleagues taught. Times changed. After World War II biochemists needed more math and physics, plant breeders more statistics and chemistry. There were fewer minors in plant pathology.

But the early days produced an impressive list of names of people, especially in plant breeding and agronomy, who have maintained their relationships with the Department,

relationships which have been mutually beneficial and satisfying. Some held positionE in plant pathology at some time during their careers. To mention a few: Olaf Aamodt, Kenneth McIndoe, Kenneth Neatby, Elmer Ausemus, David Smith, Will Meyers and Ernest Rinke. W.D. (Dorney) Valleau was a PhD in horticulture and Stanley Buckman majored in forestry and biochemistry. Clarence E. Bausman, a botany major, was so impressed that he willed \$20,000 to the Department "to be used for research in plant pathology". □

Students Come From Near and Far

Carol E. Windels

Degree graduate students:

Among the graduates and the current graduate student body, 65% were born in the U.S.A. (Figure 1) and 35% were from other countries (Table 1). Forty-five states in the U.S.A. are represented. Several states produced at least ten students (Minnesota, New York, Wisconsin, Michigan, Illinois, Ohio, Texas and Iowa). The local Minnesota contingency is 125 strong, and makes up 35% of the American graduates. Nearly 42% of the "native" Minnesotans are from the St. Paul-Minneapolis vicinity. The remainder hail from 71 towns throughout the state, with the cities of Winona, Duluth, Cloquet, Hibbing, and Long Prairie yielding 5, 4, 3, 3, and 3 students, respectively.

Students from other countries number 194 and come from six continents and 55 countries. About 41% of these students are from four countries, which in order of frequency include India, Canada, China and Mexico. For further information, a summary of international cooperation is presented elsewhere in this Aurora.

Non-degree graduate students:

Based on Department files, 101 students (64 American and 37 from other countries) registered for course work, any of them as degree candidates. Some transferred to other departments at the University of Minnesota, or transferred to other plant pathology departments. Others lost interest in plant pathology, or followed their spouse elsewhere. Frequently students from other countries were on short-term scholarships, but some of these students completed graduate degree requirements at their home institutions after further studies there.

Table 1. Number of graduates and current graduate students from other countries.

Afghanistan - 1	Jamaica - 1
Algeria - 1	Japan 1
Argentina - 3	Jordan 1
Australia - 6	Korea 6
Brazil - 1	Latvia 1
Canada - 19	Lybia 1
Central Africa 1	Mexico 18
China - 18	Morocco - 5
Colombia - 6	New Zealand - 1
Costa Rica - 1	Nigeria 1
Denmark - 3	Norway - 1
Ecuador - 1	Pakistan 2
Egypt - 6	Palestine - 1
England - 9	Peru - 3
Ethiophia - 2	Phillipines - 4
France - 1	Portugal - 1
Germany - 2	Puerto Rico - 2
Ghana - 1	Saudi Arabia - 2
Greece - 1	Scotland - 2 South
Guatemala - 1	Africa - 3
Haita - 1	Suriname - 1
India - 25	Switzerland - 1
Indonesia - 5	Taiwan - 6
Iran - 1	Thailand - 2
Iraq - 1	Turkey - 1
Ireland - 3	Venezuela - 2
Israel - 1	Wales - 1
Italy - 1	

International Relations

Carl J. Eide

In 1922 Margaret Newton from Canada was awarded the PhD in plant pathology. There had been only two PhDs granted earlier and the Department was only 15 years old. Thus Margaret became the first of more than 150 students from other countries to earn an advanced degree in the Department during the ensuing 60 years.

These students constitute a major part of the Department's international influence but there were other ways by which the Department helped to advance science and disseminate knowledge worldwide. These included: 1) students and advanced scholars from other countries who studied and did research here but who took no degrees, 2) Minnesotans, both students and faculty, who studied, researched, advised and held positions

abroad, and 3) cooperation and service with international organizations.

In addition to those earning degrees, approximately 40 students from other countries took courses and did research in the Department. They were in residence for periods of one quarter to more than two years. Some were Research Assistants. For various reasons they, like a number of American students, did not seek degrees, but nevertheless most of them profited by their experience and many became well-known scientists. Among them were Olaf Tedin, S. Wellensiek, Lars Semb and Peter Wilde.

After the passage of years it is often difficult to distinguish the non-degree students from what may be called Visiting Scientists. Arbitrarily, the latter were usually a little older, had advanced degrees and many were on leave from positions high in the academic and

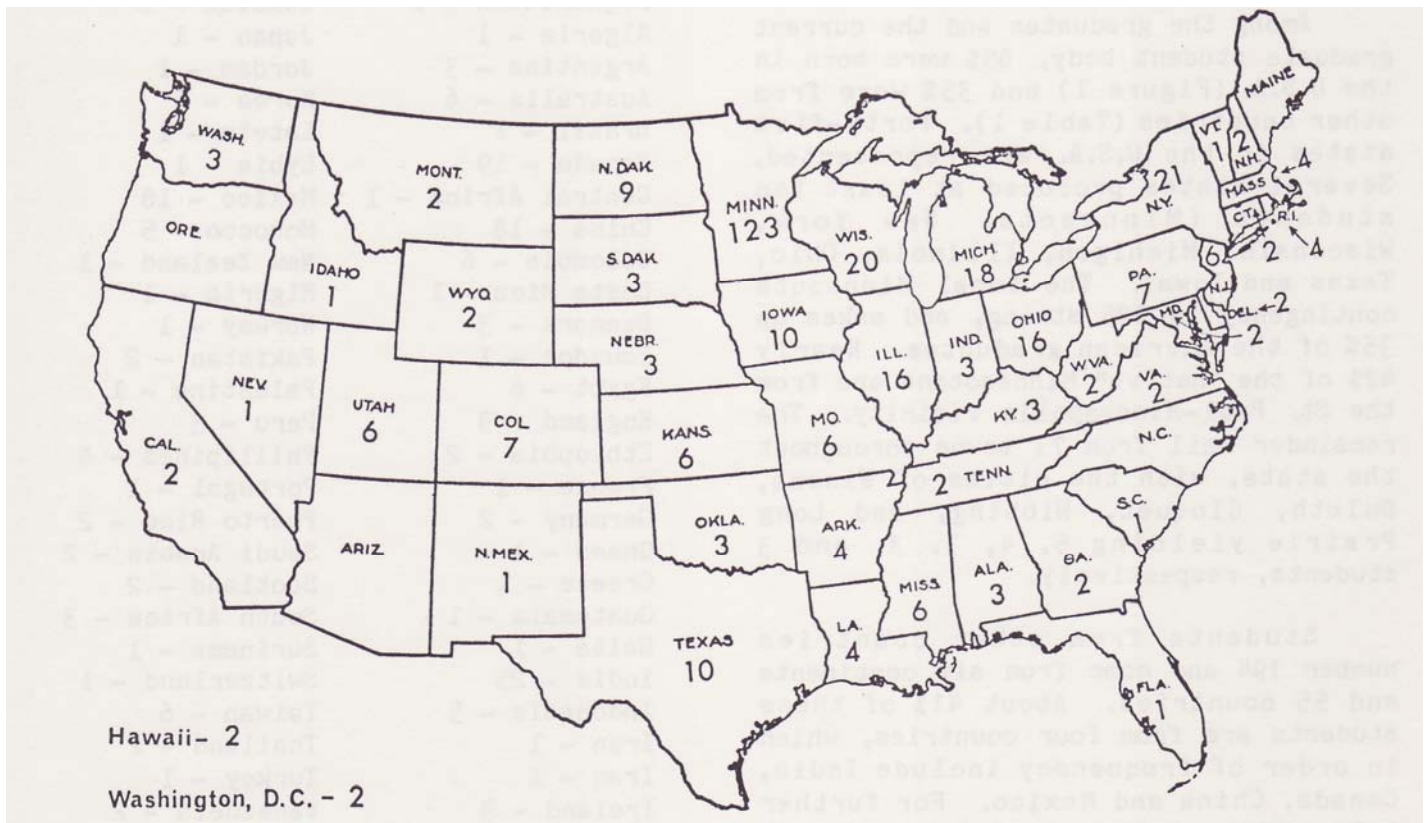


Figure 1. Number of graduates and current graduate students from throughout the U.S.A.

scientific world. Why did they come to Minnesota? For various reasons: a favorable financial deal; interest in research in progress in the Department; and the prestige of an association with a famous scientist. Undoubtedly Stakman and his colleagues and their work on cereal rusts were big attractions for many years. In recent years visitors have worked in several special areas, including bacterial diseases, grain storage and mycotoxins.

Of more than 75 scholars from other countries who studied in the Department in 75 years, the first was W.L. Waterhouse from Australia, who spent several months in 1920-21 working with Stakman and Levine on cereal rusts. Others who were well-known include: J.H. Western, U.K.; Karl Isenbeck, Germany; Karol Zaleske, Poland; Isaak Wahl, Israel; W.F. Hanna, Canada; J. Rodriguez V., Mexico; Gian Ercolani, Italy; F. Thatcher, Canada; and Elisa Hirschhorn and Jose Vallega, Argentina.

Their contributions were diverse. Some, whose visits were relatively brief, gave seminars and consulted with faculty and students; others accomplished considerable research. Still others were employed to teach courses or give a series of lectures. These included J.H. Western, Colin Booth and J.N. Gibbs, U.K. and N.T. Flentje, Australia.

It should be pointed out also that several past and present faculty were born in other countries, including E.G. Sharvelle and Ian Tervet, U.K., who took degrees at Minnesota; E.O. Mader, Germany, PhD, Cornell; Sagar Krupa, India and Paul Teng, Malaysia.

Minnesota students and faculty studied abroad when opportunities arose. Among the students, C.C. Allison, C.M. Christensen and Frank Kaufert each spent a year during the 1930s at the University of Halle, in Germany under an exchange arrangement whereby Karl Isenbeck, Hanna Becker and Kurt Hubert

came to Minnesota. None of the three Minnesotans took degrees in Germany. Regrettably, this arrangement was terminated and similar opportunities did not materialize.

In 1901-02 E.M. Freeman studied with Marshall Ward at Cambridge University in England, where he worked with brown rust of brome grass and became interested in pathogen specialization and host resistance. Thus the first member of the Department got his 'foreign experience' before there was a Department, but that experience helped to shape the course of research in the Department for more than half a century.

Stakman's early travels included a trip to study barberry eradication in Europe in 1923. As the Department grew, others studied in Germany and England: J.G. Leach, 1927-28; R.B. Harvey, 1927-28; J.J. Christensen, 1929-30 and Helen Hart, 1937-38.

During the 30s and 40s, leaves and scholarships were restricted, first by the depression and then by World War II. As a consequence, some faculty never got outside of the United States, or did so too late in life to benefit either themselves or the host countries.

Following World War II foreign travel by faculty members increased. Public and private support of science expanded. The Age of Grants dawned and applicants for grants soon learned to include an item for trips abroad which would look essential to the success of the proposed investigation. Foundations like Rockefeller, international institutions like FAO, and national programs like AID all sought to alleviate the sufferings of "emerging nations" by sending out scientific missionaries. Fellowships like Guggenheim and Fulbright were still available. Even private enterprise afforded opportunities to see the world.

Minnesotans responded, taking trips

that lasted from a few days to several years. Travel became commonplace. Whereas a departing scholar formerly was feasted and speeched when leaving, they now come and go and many times are not even missed except by the accountant, and perhaps the Head.

In recent years travel to attend symposia and international meetings has been frequent. Longer visits to do research or study new techniques, e.g. virus research, were also common. Staff members with special experience would spend several weeks or months helping to solve special problems. For instance, Clyde Christensen went to Mexico to work on grain storage problems and Kira Bowen, a research assistant, spent eight weeks in Mexico in 1982 helping investigators there to improve data collection for computer processing.

A number of graduates of the Department found careers in foreign countries, sometimes for years, others for life. G.R. Bisby, the Department's second PhD (1919) and a native of South Dakota, went to the University of Manitoba as Professor of Plant Pathology in 1920 and later became famous as mycologist of the Commonwealth Mycological Institute, Kew, England. However, most of the semi-permanent positions taken by alumni were provided by such organizations as the Rockefeller and Ford Foundations, FAO, USAID, MUCIA and by foreign governments.

The first opportunities for such careers came in the 1930s when the Firestone Rubber Co. employed Dr. Stakman to look into their plantation problems in Liberia. Stak and Art Verral spent three months there and as a result, a number of Minnesotans worked in Liberia over a period of several years. These were: Art Verral, Rolland Lorenz, George Hafstad, Lee Hines and Chet Wismer. Finally Kenneth McIndoe, who minored in plant pathology, took over the work and remained on the job until he retired.

Minnesota plant pathologists played a major part in the success of one of

the pioneer efforts to improve agriculture in developing countries. This was the Rockefeller Foundation (RF) program, first in Mexico and later in several other Latin-American countries. The program started with the appointment of a commission by the R.F. to study the needs of agriculture in Mexico. This was done at the request of the Mexican government. The commission consisted of E.C. Stakman, Minnesota; Richard Bradfield, Cornell and Paul C. Manglesdorf, Harvard.

The program in Mexico was started in 1943 with J.G. Harrar as its resident leader. The commission emphasized the need for research to get necessary information and the education of Mexican personnel to take over the program in the future. An extension program to bring new information to Mexican farmers was a third phase. These objectives were vigorously pursued under Harrar's leadership and the program was phenomenally successful. Twenty years later the yields of wheat, corn, beans and several other crops had increased several-fold. Mexican scientists came to graduate schools in the United States and earned MS and PhD degrees. They now have their own graduate school at Chapingo, an institution that Dr. Stakman helped to organize. The library there is named for him.

Rockefeller-sponsored programs were started in several other countries and their success probably inspired the proliferation of similar projects supported by private foundations and several national governments. The humanitarian value of these efforts was recognized when the Noble Peace prize was awarded to Norman Borlaug in 1970 for his work in increasing crop yields, often called "The Green Revolution".

Borlaug earned his honor, but honor also is due to many others who served on this and other programs. Many Minnesotans besides Borlaug and Harrar found careers in the Rockefeller programs. The list includes Old Timers John Gibling, Dave Thurston, Mike

The Seminar Tradition

Carl J. Eide

Prescott, Gene Saari, Louis Palmer, Bob Skiles, Bobby Renfro and Bent Skovmand. Students from Mexico and other countries came to Minnesota on Rockefeller fellowships and later carried on the work started by the Foundation in their countries.

Another program deserving special mention is the Minnesota/USAID project in Morocco, a cooperative effort to help that country build a faculty of agriculture at the Institut Agronomique et Veterinaire Hassan II. It was started early in the 1970s and Roy Wilcoxson has been the project leader for plant science for much of that time. Ben Lockhart, as a faculty member of the Department in Minnesota, worked in Rabat from December, 1971 until July, 1976, when he was replaced by Dr. J.R. Burleigh. Ben returned to St. Paul but in March, 1981 took leave from his position as Associate Professor and returned to Morocco. There he is organizing a department of plant pathology at the Horticultural Station at Agadir.

Minnesotans have contributed to other foreign missions but space precludes mentioning all of them here. One who was outstanding was T.H. King, who spent nearly three years (1964-67) at the Rice Production Center, Bangkok, Thailand for FAO and two years as Agricultural Adviser at Gadjah Mada University in Indonesia as a representative of MUCIA. He made several shorter visits to Korea, 1957 and India, 1970. A number of graduate students from these countries studied in the Department as a result of Tom's scientific missionary work.

Extended periods of service in a foreign country require special talents, special personal goals and a special degree of adaptability. Not everyone with scholastic and scientific ability acceptable in their home environment are fitted for the missionary type of life. Over the years the Department has furnished the world with a number of scientific ambassadors of which it can well be proud. □

Among many of the world's plant pathologists Minnesota once meant Stakman, stem rust and seminar. The uniqueness of Minnesota seminars was legendary; they were praised and cursed but nearly everyone agreed that they were different.

There is little doubt that Minnesota seminars owed their uniqueness to E.C. Stakman. Stakman loved knowledge, delighted in thinking and believed that real education meant learning how to think. Seminars gave him an opportunity to share his knowledge, match wits with others and teach students how to think. The process was never dull, but sometimes was exasperating to the students.

During either the formal Tuesday seminar or the literature review on Thursday nights, Stak might interrupt the discourse, ask for clarification of a point and then launch into a lecture or "shoot questions" at the cowering crowd. In so doing he disseminated facts (some furnished by the audience), stimulated thought and discussion, and found out how much students knew and if they were capable of learning more. Other seminar leaders tried his methods but the most charitable description of their performances is that they were not the equal of Stakman's.

But while his lectures were interesting and stimulating Stak's questioning sessions struck fear into many graduate students. It seems true that many people are ashamed of apparent ignorance and considered it a disgrace if Stak caught them without an answer, which was most of the time. Stak either was unaware of this type of fear or ignored it, and in time students learned that to Stakman, ignorance was no disgrace - apathy was.

It was inevitable that when Stakman retired, seminars changed. No one else

had his intellectual enthusiasm or talent for apparently spontaneous discourse on practically any subject. Accordingly the seminars became more "structured"; Thursday evening programs were made for at least a quarter in advance, so the committee members in charge could rest easy.

Of course the Tuesday seminar (for credit) always was organized. Usually a general field of plant pathology was chosen and students were assigned or chose topics in that field. They were required to write a summary article, in the current style of Phytopathology, and the papers were mimeographed.

For many years these mimeographed articles might be ten pages long, single spaced, with 30 plus titles of "literature cited". They were useful to people who were wise enough to save them and filled, in a modest way, the same need now filled by the Annual Review of Phytopathology and similar reviews. They were often useful to faculty members who might use "influence" to have a topic reviewed that would help them in their teaching or research. For example, in 1930-31, Stakman was in Germany, teaching at the University of Halle. J.G. Leach was Acting Head and the seminar topic was on insects in relation to plant disease. Later Leach wrote a book on the subject. Of course, variations of this ploy are familiar throughout the academic world.

Having spent many hours preparing and writing a paper, the student laid it aside and delivered the lecture from brief notes. Reading a prepared text was verboten. This experience, with Stakman and others interrupting and arguing, made the young scientist's first paper at a national meeting seem easy by comparison.

The regular seminar met every Tuesday during the three academic quarters, holidays excepted, at 4 PM. They lasted until 5:30, which often was nearer 6 PM when Stakman was in charge.

In 1982 the Tuesday seminar was replaced, in the fall quarter, by a Colloquium, 8200 f. at which invited speakers, mostly not students, present a lecture, followed by a discussion. In the winter quarter, two seminars are scheduled, dealing with different subjects. A different topic will be discussed at each session; all participants are expected to be familiar with the material and enter into the discussion. This, according to Prof. Richard Zeyen, is a classical seminar, and what Minnesota plant pathologists have been calling seminars for nearly 75 years actually were colloquia. There will be neither seminars nor colloquia during spring quarter.

The literature seminar, known in recent years as the "Thursday night seminar", had its beginnings in September 1922. A committee, consisting of Louise Dodsall, Jimmy Seal and J.J. Christensen, Chairman, was appointed (probably by E.C. Stakman) to schedule and organize meetings.

There is no known written record of earlier seminars of this kind, although Stakman told of evening meetings at the home of Dr. E.M. Freeman for the purpose of serious discussions of plant pathology and other branches of science and knowledge. Like Stakman in later years, Freeman found evening an optimum time for intellectual activity, and expressed displeasure if anyone lost interest before midnight. This may have been the genesis of a custom that affected the lives of many future students, especially those with different circadian rhythms.

At the third meeting called by the new committee on October 11, 1922, there was a ledger book which everyone signed: J.J. Christensen, D.L. Bailey, Ralph M. Nelson, G.B. Sanford, J.L. Seal, E.B. Lambert, Henry D. Barker, I.L. Connors, L.W. Melander, A.W. Henry, H.C. Gilbert and Louise Dodsall. It was the first of eight similar books, some larger, which contain the names of seminarians over a

period of 59 years. The ninth book was started in October, 1981.

Beside names, some of the books have brief notes about the programs, some serious, some facetious. The notes in the first book indicate that, 'Old Timers' fond memories to the contrary, the Seminar hasn't changed much in some respects. On October 11, 1922, Louise Dodsall explained the potentialities of a literature seminar and urged everyone to work for its success, a theme used by Stakman, Christensen, Kernkamp and by more recent seminar committees. There seems to be a recurring need for the Leaders to sell the seminar to reluctant sinners.

Chairman J.J. Christensen sent out typed notices of each meeting, urging the review of literature and announcing special speakers. The "minutes" of some meetings record that at least eight people sometimes reviewed literature, but that at other meetings only one did so. Stakman made several talks, some scheduled, some not. There were hot arguments. As in the Tuesday seminar, Stakman took the opportunity to teach, asking questions as in an elementary school. Occasional sessions were scheduled as "reviews" in which future candidates for oral exams were subjected to "rapid fire" questioning, leaving many convinced that they knew nothing. Eventually these review sessions were scheduled separately from the seminar and referred to, by cynical individuals, as "confirmation classes".

As long as Stakman was around, seminar committees didn't worry much about programs. Special speakers were welcomed but not sought very actively. If literature reviews were scarce, Stak could and generally would find something to discuss. On some occasions he might say, in his best formal manner, "Mr. Chairman, is there a lot of literature tonight?". Of course, no one had any and so he would humbly ask for time to say a few words. Frequently he was getting ideas about some problem in which he was

interested or trying out a speech he was scheduled to give. He made good use of the comments he received.

In recent years, without Stakman's backing, seminar chairmen, to avoid embarrassment, have taken care to find speakers for every meeting. No one could blame them. Old Timers grumbled about the lack of literature review but didn't do much about it. In 1981-82, the committee designated 5 of the 29 meetings as "open meetings" without any scheduled speaker. Literature review was urged. Graduate students seemed to take a renewed interest in the open sessions and the committee felt the "experiment" was successful. The Thursday Night Seminar Committee has a tough job, as only one who has served can appreciate.

The custom of having refreshments after seminar started early. They were simple: apples, peanuts, Eskimo pies, etc. Different people took the responsibility for furnishing the refreshments, apparently paid for by the seminar, at about \$1 per session. At some unrecorded date, individuals started bringing the refreshments at their own expense, presumably having a birthday about that time. They were rewarded by having the opportunity to tell where they were born and other interesting vitae. The refreshments generally were modest and homemade, although sometimes abundant and exotic. For example, in January 1977 Gloria Warner served a roasted boar's head, complete with apple in mouth and garnished with pineapple and other goodies. It was consumed with relish. "Bake-off" contests of bread and cookies have been popular recently; in one Matt Moore's "coarse and tough" wheat bread came in second to Fred Baker's entry and Matt has not been the same since.

The quizzing of the host, known in recent years as "roasting the host" frequently became personal and annoying to some of the hosts. Extroverts may have enjoyed it but to sensitive souls it was often an ordeal and embarrassment.

Much to the credit of the committee in 1981-82, the cruelty has been suppressed and the original idea of becoming better acquainted with student and faculty members has been restored to some degree.

Evening seminars were often continued at local refreshment spots by people with an extra thirst for knowledge, etc. This brought a modest income for places like The Terminal, Mannings, The Ground Round, and others, and provided the scholars with a sort of Old Heidelberg atmosphere for their acquisition of wisdom.

During the 20s and 30s every graduate student was required to register for the Tuesday PM seminar. Later, PhD candidates were excused after they passed their prelims, but they were expected to attend as auditors. Requirements gradually were reduced until, just before the 1981-82 curriculum change, only two quarters of seminar credit were required for the MS and three for the PhD.

Attendance at the Thursday evening seminar was voluntary, of course, but it was clearly understood that graduate students (and faculty) who did not come to seminar were missing a valuable educational experience. Miss two and

Stakman might ask solicitously if you had been ill; if not, did you feel that you were not getting much benefit from seminar? A few similar questions convinced you that the best and easiest thing to do was to go to seminar. J.J. Christensen believed devoutly and belligerently that only a major crisis should keep students from seminar, but he was less tactful than Stakman and encountered more resistance. Gradually the feeling grew that one could avoid seminar most of the time and still get a degree in the Department. Some students (and faculty) felt that being required to attend seminar violated their constitutional rights and stayed away defiantly. For whatever reasons, attendance at the Thursday seminar has gradually declined. The table comparing attendance in academic years 1951-52 and 1981-82 gives an indication of the magnitude of that decrease. The data are based on signatures from the seminar books.

Whether they attended voluntarily or under duress, students and faculty often found seminar, Tuesday or Thursday, a bore and a waste of time. They also often changed their minds after months or years of thinking about the subject after leaving Minnesota.

At almost any gathering of Old

Academic year	Students		Faculty	
	1951-52	1981-82	1951-52	1981-82
Total attendance	1058	439	152	86
Number of meetings	32	29	32	29
Attendance/meeting	33.1	15.1	4.4	3
Population of Dept.	54	52	10	17
Percent attendance	61.2	29.1	44	17.4

Timers various nostalgic comments about seminars can be heard. There is a tendency to forget the bad and remember the good. Perhaps more convincing than beery reminiscences are a couple of excerpts from letters by anonymous alumni on the subject:

"The Thursday Night Seminar, although it may have been inconvenient because of the time it consumed, was very valuable in promoting unity, community and esprit among members of the department, in giving needed speaking experience to the students, and to some extent, in increasing our knowledge of the field. . .

"In contrast, the formal seminar, which was held on Tuesday afternoons, was a terrible waste of time, except that, again, the speakers gained much needed experience. But my retention of information from those seminars was practically nil, and I remember them as being totally boring, unenjoyable, and

uneducational. I think the nature of the assigned topics was the main reason for this."

From another alumnus: ". . . I disliked Thursday Night Seminars while I was there, but realized their value soon after my departure. They were especially valuable in teaching a student to handle himself in front of any kind of audience - paper presentations at meetings were easy by comparison, and the only thing that does compare is a prelim exam. They were also great in building comradery (sic) among students and alumni - all who have endured those Thursday nights feel a certain oneness. I have since found that visitors to the department come away from Thursday night 'blood lettings' with their minds boggled. . ."

And so it goes. Even the current Curriculum Committee, who planned the New Day in plant pathology education, admitted that the Thursday Night Seminar was worth keeping. □



Smut Lab - In The Old Tottering Tower

People and Projects — 1982



Back row, 1-r: James M. Mital*, R A; Jennifer Juzwik*, R A; Joseph G. O'Brien*, R A; David W. French, Prof; Paul J. Scherman*; Mike J. Wingfield*, R A; Lewis Otjen*, Jr Scientist.

Front row, 1-r: Bill Livingston*, R A; Ellen A. Cypher*, R A; Cindy Mital, Sr Lab Tech; Kathy F. Zuzek, Sr Lab Tech; Jane Hess, Lab Tech; Robert Blanchette, Asst Prof; Peter J. Bedker*, R A; Absent: Elmer Schmidt, Res Fel.

RA=Research Assistant

*=Graduate Student

Project: Forest tree diseases; control programs for Dutch elm disease and oak wilt.

Miscellaneous Contributions:

A review of the card catalog in the Plant Pathology Branch Library reveals that 83 books have been authored (66%) or edited (34%) by 47 alumni and faculty.

During 73 years of publication of *Phytopathology*, three alumni have served a total of 16 years as Editor-in-Chief. These include: E.C. Stakman, 1925-28; Helen Hart, 1944-51; and Thor Kommedahl, 1964-67. M.C. Shurtleff was the first Editor-in-Chief of *Plant Disease* from 1980-82.

Several alumni have served as presidents of APS. These include: E.M. Freeman, 1918; E.C. Stakman, 1922; J.G. Leach, 1941; J.J. Christensen, 1944; J.H. Craigie, 1946; Helen Hart, 1956; C.S. Holton, 1963; H.H. Flor, 1968; T. Kommedahl, 1971; and W.N. Garrett, 1981.

From 1963 through 1983, 41 alumni and faculty members of the Department have written 46 of the 439 reviews in the *Annual Review of Phytopathology*. That's 10.5! Topics covered are diverse and are represented in all 14 of the regular ARP Sections.

People and Projects — 1982

L-R: Roy D. Wilcoxson, Prof; Alan R. Pierce, Asst. Scientist; Markus W. Andres*, R A; Brian Steffenson*, R A; Martha Sullivan, Technician; Monte Miles*, R A. Absent: Janese Thatcher* R A.

Project: Diseases of Barley.



L-R: C. J. Mirocha, Prof; Robert Pawlosky, Res Fel; Steve Hagen, Lab Atten; Tong Xia Zhu, Visiting Scientist; Linda Treeful*, R A; K. Chatterjee, Res Assoc; Yin Won Lee*, R A; Hamad K. Abbas*, R A. Absent: David Hewetson, Res Fel.

Project: Mycotoxins in feeds and food and their effects on human and animal health; Fusarium mycotoxins and their effects on the health of poultry.

L-R: Francis Pflieger, Assoc Prof; Ward C. Stienstra, Prof; Richard Meronuck, Assoc Prof; Howard L. Bissonnette, Prof; Debra Baden-Drange, Secretary. Absent: Fred Baker, Ast Specialist.

Staff: Extension Plant Pathology.

RA=Research Assistant
*=Graduate Student



People and Projects — 1982

L-R: Carl A. Matyac*, R A; Carol E. Windels, Scientist; Alfredo Orellana*, Thor Kommedahl, Prof.

Project: Ecology and control of corn root fungi related to production technologies.

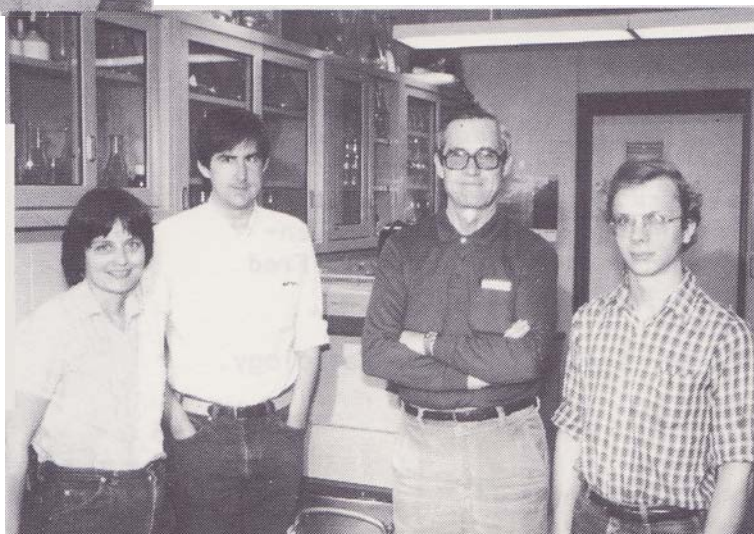


L-R: Rodney H. Vargo*, R A; Bridget Renlund*; William W. Shane*, R A; Jan Hille, Lab Atten; Elizabeth A. Ozmon, Sr Lab Tech.
Front, center: James S. Baumer, Asst Prof.

Project: Diseases of wheat; diseases of sunflower.

L-R: Roxanne Denny, Sr Lab Tech; Philip J. Graham*, R A; Bill W. Kennedy, Prof; Jeffery Tate*, R A.
Absent: Timothy Power*.

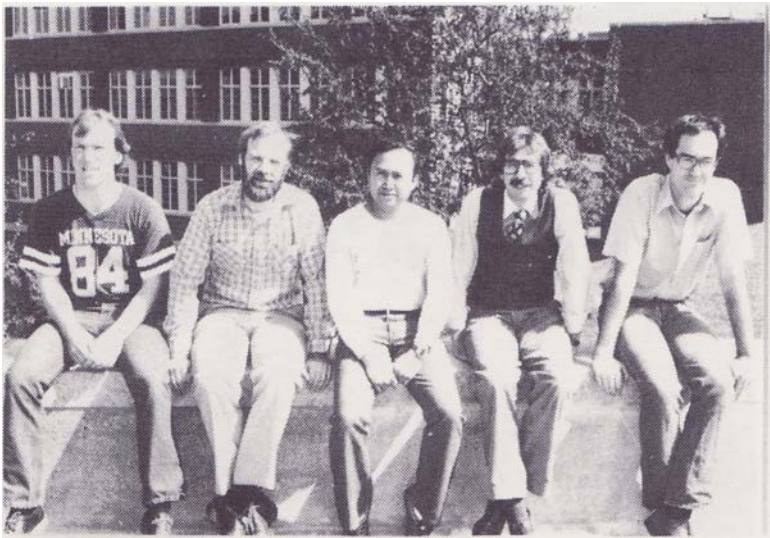
Project: Diseases of soybeans; detection, survival and control of plant pathogenic bacteria on seeds and other plant parts



People and Projects — 1982

L - R: Richard Meronuck, Assoc. Prof.; Daniel Gilman, R A; Loral Castor, Res. Assoc.

Project: Stored Grain Fungi.



L-R: Greg Otto, Lab Tech; James V. Groth, Assoc Prof; M. Kosim Kardin*; Alan Pierce, Asst Scientist; James A. Kolmer*; R A. Absent: Helen Alexander, Res Fel.

Project: Fitness measurement and genetics of disease interactions - rusts of vegetable crops.

L-R: Therese Atcham*, Paul Karelis, Laborer; Cho Lei Fei *, R A; Paul H. Goodwin *, R A; Ernest E. Bantari, Prof. Absent: Mahmoud Azar*.

Project: Electron microscopy of virus-plant and virus-vector relationships; potato virus diseases.



People and Projects — 1982

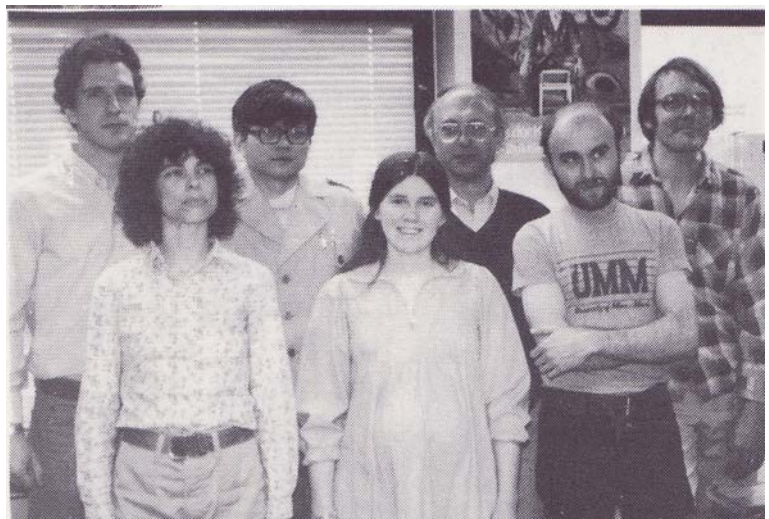


L-R: Mohamed Achouri*, Laura Todd*, R A; Janice Kaye*, R A; Indre Bildusas*, R A; Mary E. Palm*, R A; Elwin L. Stewart, Assoc. Prof; Francis Pflieger, Assoc Prof.
Absent: Marge Palmer*

Project: Mycorrhizal fungi, their systematics and pure culture synthesis on selected Minnesota tree species.

L-R: Colin Pope, Sr Lab Tech; Nora S Vig*, R A; Tze-Hong Lu*, R A; Diane Light, Lab Atten; Robert Brambl, Prof; Andrezej Durlik, Lab Atten; Wayne Gade, Res Assoc.

Project: Biochemistry of fungal spore germination; cell surface recognition factors in plant host and plant pathogen reactions.

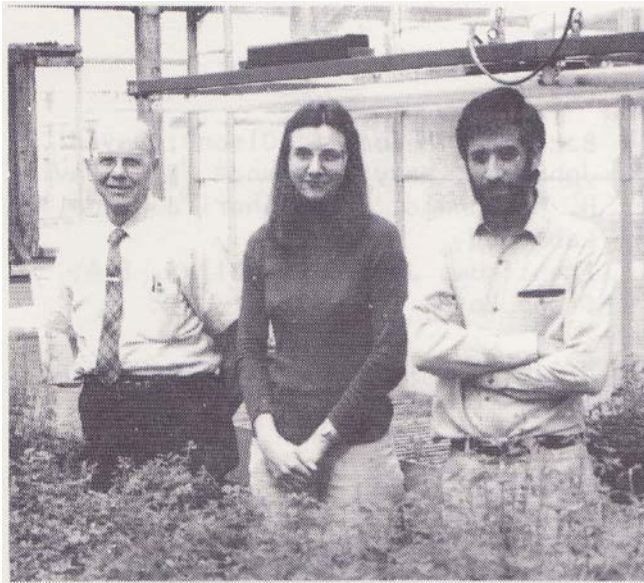


Back row: William W. Shane*, Res Fel; Coy W. Jones*, R A; Paul Teng, Assoc Prof; Kira Bowen*, R A; Mike Rotier, Laborer; Phyllis (Rae) Montgomery, Jr Scientist. Front and center: Kathryn Kromroy*, Res Specialist; David O. Erstad, Sr Lab Tech.

Project: Computer modeling of plant disease epidemics and crop losses for integrated pest management; integrated systems for managing potato pests in Minnesota.



People and Projects — 1982



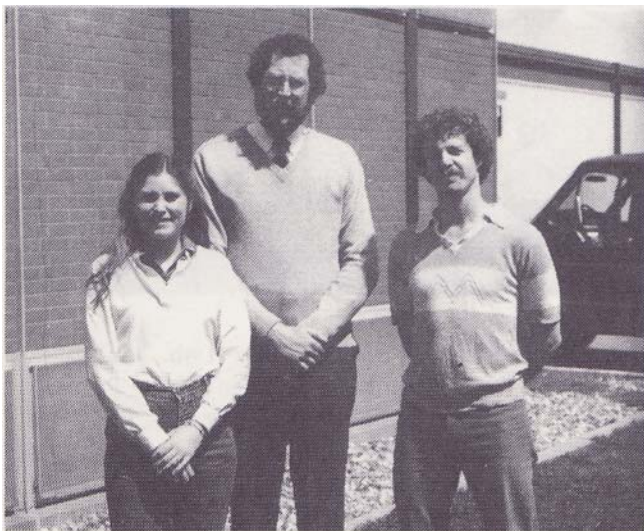
L-R: Fred Frosheiser, Prof and USDA; Judy Thi es*, R A; Jesus Perez-Fernandez* R A.

Project: Di seases of al fal fa.



Ward C. Stienstra, Professor.

Project: Turfgrass pathology.



L-R: Betty Smallwood Hotchkiss, Res Fel; James A. Percich, Asst Prof; Clint L. Kohls*, R A. Absent: Laura Schickli*, R A; Mike Hotchkiss, Res Fel.

Project: Di seases of wild rice.



L-R: Neil A. Anderson, Prof; Paul J. Zambino*, R A; D. Ross McQueen*, R A. Absent: Mohammed Rahel*.

Project: Genetics of plant pathogens.

People and Projects — 1982



L-R:

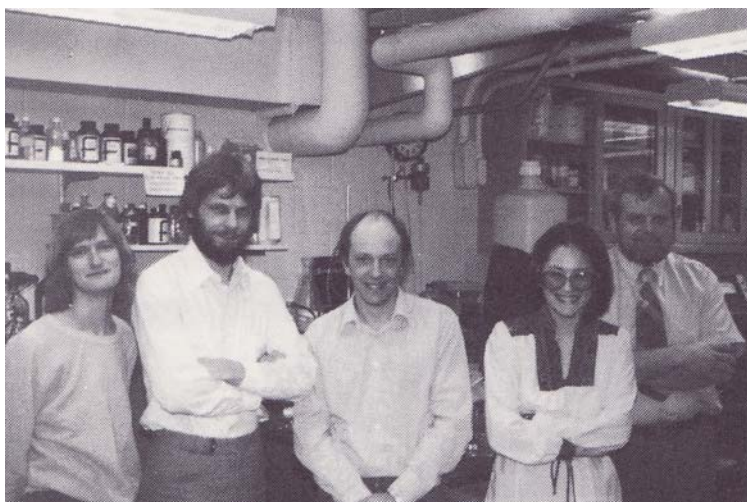
Back row: Melody F. Olson*; David Johnson*; Mary Sortland*, R A; David H. MacDonald, Prof; Sheri Johnson, Laborer.

Front row: Jane O'Laughlin*, R A; Diane Voth, Lab Atten.

Project: Plant parasitic nematodes.

L-R: Jean Batzer, Lab Tech; Gib Ahlstrand, Asst Scientist; Timothy Carver, Visiting Sr Scientist; Cindy Sadness, Lab Atten; Richard J. Zeyen, Assoc Prof.

Project: Cooperative electron optics facility; cellular bases for plant immunity to foliar fungal parasites, a quantitative assessment.



L-R: Bob Bitner, Sr Lab Tech; Steve Senum, Applications Programmer; David Gardner*, R A; Greg Pratt, Res Fel; Sixto Guiang III, Jr Scientist; Absent: Sagar V. Krupa, Assoc Prof.

Project: Air pollutants and their effects on the crops in Minnesota with emphasis on soybeans; chemical changes in atmospheric deposition and effects on land and surface waters.



Research Funded by Non-Experiment Station Grants — July, 1982

<u>INVESTIGATOR</u>	<u>TITLE</u>	<u>AGENCY</u>
N. Anderson	Interrelationships of Insects, Birds and the Environment on Infection of Trembling Aspen by Hypoxylon Mammatum	USDA
	Potato Variety Development - Program Acceleration	Red River Valley Potato Growers Assoc.
E. Banttari	Potato Variety Development - Program Acceleration	Red River Valley Potato Growers Assoc.
R. Blanchette	Ecology of the Pine Wilt Nematode	USDA
	Dwarf Mistletoe on White and Black Spruce	Blandin Foundation
	A Comparative Study of Decay Capacities by Wood Destroying Fungi Under Laboratory and Field Conditions	USDA
R. Brambl	Mitochondria) Biogenesis and Fungal Spore Germination	Nat'l Institute of General Medical Sci.
D. French	Arceuthobium Americanism on Jack Pine	USDA
J. Groth	Measurement of Diversity and Heterozygosity in Rust Fungus Populations	USDA
T. Krupa	Impacts of Stack Emissions from the NSP Power Plant on Terrestrial Vegetation	Northern States Power Company
	Minn/Wisc Power Suppliers Group Precipitation Monitoring Network	Minn/Wisc Power Suppliers
C. Mirocha	Metabolic Products, Mass Spectral Analysis and Synthesis of Toxic Trichothecenes	U.S. Army Medical Research & Development Command
	Preparation, Separation and Purification of Toxins	Army
	Aflatoxin Contamination and Storage Problems Associated with Corn and Beans Used in the Formulation of ACAMIL	Inter-American Development Bank

<u>INVESTIGATOR</u>	<u>TITLE</u>	<u>AGENCY</u>
C. Mirocha	Research in Mycotoxicology	Cargill Corporation
J. Percich	Investigations of Cercospora Leaf Spot of Sugar Beet	Sugar Beet Research and Education Board of Minn. and N. Dakota
F. Pflieger	Growth and Development of Poinsettia as Influenced by Endomycorrhizae Fertilizer and Pythium Ultimum	Society of American Florists Endowment
E. Stewart	Selection and Utilization of Mycorrhizal Fungi in Revegetation	State of Minn.-Iron Range Resources and Rehabilitation Board
	Isolation and identification of Deuteromycetes on Yarded Wood in the Mississippi River Valley	USDA
	Selection and Utilization of Mycorrhizal Fungi in Revegetation of Iron Mining Wastes	U.S. Dept. Interior, Bureau of Mines
P. Teng	Minnesota Bioindicator Field Study	State of Minn. Environmental Quality Board
	Estimating Yield Benefit from Fungicides for Control of Early and Late Blight on Potatoes	North Central Regional Pesticide Impact Assessment Program
	Experimental Designs for Developing Realistic Disease-Loss Models	USDA-SEA/CRSR
	Investigations of Cercospora Leaf Spot of Sugar Beet	Sugar Beet Research and Education Board of Minn. and N. Dakota
	Plant Pest Survey Activities in Minnesota	USDA-Animal and Plant Health Inspection Service

North Central Forest Experiment Station

Jay Hutchinson and Tom Nicholls^{1/}

Nearly three decades passed between the founding of the Lake States Forest Experiment Station (LSFES) in 1923 and the hiring of the first forest pathologist. The LSFES was renamed the North Central Forest Experiment Station (NCFES) in 1966. The 1920s had been devoted to reforestation and fire control; the 1930s and the Depression saw the first systematic inventory of forest resources; and in the 1940s emphasis shifted to speeding production of forest products for the war effort. In the 1950s, research broadened to include not only plant pathology, but genetics, entomology, and watershed management.

Federal forestry research of plant diseases was already incubating in 1949 in the Bureau of Plant Industry, Soils, and Agricultural Engineering. Ralph Anderson, who had just started on his Ph.D., recalls that the LSFES and the Department of Plant Pathology began cooperating on Hypoxylon research about this time. In June, 1952 Ralph received his doctorate and an appointment as the first plant pathologist in the new federal forest Disease Research Office where he was the sole occupant. In 1954 this Office was transferred to the LSFES.

During the course of his studies in the Department of Plant Pathology, Ralph Anderson was hired as a seasonal employee to do research under the direction of Dr. J.R. Hansbrough of New Haven (Bureau of Plant Industry) in

1/ Jay Hutchinson is Editor for the USDA Forest Service, St. Paul; Tom Nicholls is a Research Plant Pathologist, United States Forest Service, North Central Forest Experiment Station, St. Paul, and Adjunct Assistant Professor, Department of Plant Pathology, University of Minnesota.

cooperation with Drs. E.C. Stakman and Clyde Christensen. Even before Ralph transferred into the LSFES in 1954, he and Hansbrough were given office space in Green Hall. In later years, Ralph cooperated with Dave French in the Department of Plant Pathology on blister rust races. Just before retirement, he worked with Neil Anderson on studies connected with the Little Sioux Burn in the Superior National Forest.

Another Department-trained pathologist to join the Station was Neil Anderson. From 1956 to 1959 Neil worked with two other Andersons - Ralph and Gerald - on Hypoxylon canker. For his doctorate in the Department he conducted research on sweetfern and Stalactiform rusts on jack pine. Since becoming a faculty member in Plant Pathology in 1959, Neil has collaborated with Mike Ostry and Gerald Anderson on the infection process of Hypoxylon and the nature of genetic disease resistance. He worked briefly as a mycology consultant on the Scleroderris project in 1966, and from 1978 to 1981 cooperated with Darroll Skilling at NCFES on the genetics of Scleroderris.

Gerald Anderson was smitten early by the contagion while taking an undergraduate forest pathology course from Dave French and Ralph Anderson back in 1951. In 1958 he earned a M.S. for his work on Hypoxylon and in 1963 received a doctorate via rusts of hard pines. He started an aspen breeding program with Neil Anderson that has shed light on disease and insect relations. Before Washington, D.C. spread the mycelial welcome mat, Gerald was an Adjunct Professor in the Department for several years. He is now staff director for forest service insect and disease research throughout the U.S.A.

Proving that you do not have to be an Anderson to study Hypoxylon, Mike Ostry worked on a M.S. degree from 1973 to 1978 in the Department, and since then, has lead the Hypoxylon cooperative study. He also investigated eastern

dwarf mistletoe with Tom Nicholls, using radio telemetry for the first time in studying vectors of a forest disease pathogen.

John Ohman, who now worries more about obligating funds than obligate parasites, writes from Washington, D.C., that he was Dave French's third or fourth graduate student after Dave joined the faculty. John, who received both his advanced degrees from the Department, eventually became NCFES Director in 1972, and renewed old ties and friendships with the Department, culminating in his appointment as Adjunct Professor. (He claims he still may be one since he did not resign nor was he fired after leaving St. Paul in 1978!). Correspondence with Dave French about Dutch elm disease demonstration projects has been his only contact with the Department since going to Washington, D.C. where he is Deputy Chief for State and Private Forestry, U.S. Forest Service.

Darroll Skilling, who received his doctorate from the Department in 1968, is another of the cadre of NCFES pathologists trained by the Department. Darroll's ties through the years have been through formal and informal projects, funding graduate students, and sharing facilities. He has also worked on several Department committees and on graduate students' exams.

International flavor was added to NCFES and the Department in March 1977 with the arrival of Dr. John N. Gibbs, who was a Visiting Scientist from the Forestry Commission, Pathology Branch, Forest Research Station, Alice Holt Lodge, England. He spent one year doing research on oak wilt and Dutch elm disease and in 1980 he returned to Minnesota to teach a course in advanced forest pathology in the Department of Plant Pathology and to advise graduate students.

Kathy Widin received her MS in 1977

for work done at the NCFES with Department alumnus Art Schipper (he is now a Staff Pathologist in the Forest Service's Washington office). Kathy researched the effects of *Melampsora* rust on fiber yield of hybrid poplars grown under intensive culture.

Marguerite Palmer got her MS in the Department, under advisor R.D. Wilcoxson back in 1977 when she completed her thesis on the development of stem rust. The diseases of hybrid poplars were her first challenge at the Station when she was hired in 1978 as a biological technician. Since 1980 and her promotion to plant pathologist, Marge has been working on the biology and control of diseases of forest tree nurseries and conifer plantations. The future holds a Ph.D. in Plant Pathology under guidance of Dr. E.L. Stewart.

George Hudler got his first real exposure to plant pathology in action in 1969 and 1970 when he worked as a technician with Tom Nicholls and Darroll Skilling on *Lophodermium* and brown spot at NCFES. George then went to the Department for mistletoe research, which led to work with Tom Nicholls on bird dissemination of the disease. George also has gone far afield to the Department of Plant Pathology at Cornell University, Ithaca, N.Y.

Mike Wingfield is the newest graduate student to be funded by NCFES. He is working with Tom Nicholls and Department advisor Robert Blanchette on a newly discovered (1979) disease, the pine wood nematode which is carried by wood borers.

Tom Nicholls, who has been the project leader of the NCFES's forest pathology project in recent years, minored in plant pathology at the Department and got his Ph.D. in ecology in 1973. Like others in the past, Tom serves as Adjunct Assistant Professor, lectures, advises graduate students and works on various committees in the Department.

By way of summary, cooperation between the Department and the NCFES continues alive and well. From 1972 to 1982 the NCFES developed cooperative agreements totaling \$97,000. These helped nurture research on pine wood nematode, oak wilt, eastern dwarf mistletoe, Hypoxylon canker,

Scleroderris, red pine root rot, ectomycorrhizae, and diseases of hybrid poplars.

With such an arsenal of diseases out there in the woods, may the NCFES's and Department's relationship always be symbiotic. □



FOREST DISEASE PROJECT, NORTH CENTRAL FOREST EXPERIMENT STATION

Back row, 1-r: Tom Nicholls, Project Leader, NC-2205; Robert Resendez, Biological Aide; Phyllis Moline, Secretary; Patricia McCoy, Clerk-Typist; Eileen Haynes, Forestry Tech; Marianne Kienzler, Microbiologist; Michael Ostry, Assoc Pl Pathologist; Arne Kemp, Asst Director, Res NW.

Front row, 1-4: Marge Palmer, Assoc Pl Pathologist; Leanne Egeland, Forestry Tech; Virginia Vaughn, Biological Aid; Darroll Skilling, Principal Pl Pathologist; Mary Beth Wacek, Secretary, Res NW.

Cereal Rust Laboratory

John B. Rowell

One of Dr. Stakman's major accomplishments was organizing and developing a successful pest management program for the control of wheat stem rust. The program grew from cooperative efforts supported jointly by the University of Minnesota and the U.S. Department of Agriculture. The federal part of the program, known informally for many years as the Federal Rust Laboratory, culminated in the Cereal Rust Laboratory, which presently is the national center for research on the stem rusts of small grains.

Stakman had great concern about the destructiveness of the stem rusts. He witnessed the devastating epidemic of wheat stem rust in 1904 and the economic losses and social costs it caused. In those days, wheat was the principal cash crop for many Minnesota farmers, and the crop failure due to rust meant financial ruin for many growers and reduced others to a bare level of subsistence. His PhD thesis research was entitled "A Study in Cereal Rusts: Physiological Races." In 1913 he initiated with F.J. Piemeisel a project on the identity of the biologic forms of Puccinia graminis on wild grasses. They soon discovered a variant among the isolates of P. graminis tritici that differed from the commonly isolated form in pathogenicity on some wheat hosts. This intriguing discovery attracted cooperative support of the project from the USDA in 1915. At that time Dr. Stakman was appointed a federal collaborator and Mr. Piemeisel became federal scientific assistant of the Office of Cereal Investigations in the Bureau of Plant Industry. Unfortunately, Piemeisel was drafted into military

1/ I gratefully acknowledge information gleaned from Laura Mae Hamilton's summary in the 1947 issue of *Aurora Sporealis* on the early personnel of the Federal Rust Laboratory.

service for World War I and never resumed his career in Plant Pathology. Subsequent federal appointments to the project in 1917 were M.N. Levine as a field assistant and J.H. Parker as a scientific assistant.

The results of this early cooperation between the University and federal personnel laid the foundation for a rational approach to the control of stem rust through the breeding of resistant cultivars. They showed that (1) rigorous procedures are required to prevent erroneous results (from contamination) in determining the pathogenicity of individual cultures of P. graminis, (2) the pathogenic specialization of cultures of P. graminis in the uredial stage is stable, (3) the pathogenicity of isolates of the fungus are not altered by repeated passage through partially susceptible hosts, (4) changes in the pathogenicity of the biologic forms of P. graminis are not so frequent as to interfere with breeding for resistance, and (5) forms with different virulence for wheat cultivars existed within P. graminis tritici. The latter discovery revealed the need for collecting specimens of rust over a wide geographic area to determine the virulence potential of the forms of the pathogen on the existing wheat cultivars. Such information on the spectrum of pathogenicity in the population of the rust fungus provides the basis for selecting effective sources of resistance for breeding programs.

The cooperative studies started in 1915 on physiologic specialization and the characterization of the virulence potential in P. graminis, generally called the race survey, was a key element in controlling rust with resistance cultivars. By 1922, 37 races of P. graminis tritici had been characterized, and by 1925, five races of P. graminis avenae were known. Federal cooperators involved in conducting the race survey were: F.J. Piemeisel (1915-17), M.N. Levine (1917-

25), D.L. Bailey (1920-23) J.M. Wallace (1925-28), Lee Hines (1928-34), R.C. Cassel (1934-38), W.Q. Loegering (1938-51), D.M. Stewart (1952-69), A.P. Roelfs (1970-present), and D.H. Casper (1976-present).

A cooperative program on breeding stem rust resistant varieties was started by E.M. Freeman shortly after the stem rust epidemic of 1904 while he was in the Office of Grain Investigations, USDA. Little progress was made initially because effective resistance could not be found in the common bread wheats. The discovery and identification of pathogenic races, however, enabled a systematic evaluation of sources of resistance and a rational basis for selecting resistant progeny in a breeding program. Thereafter, the cooperative Minnesota program on breeding wheat resistant to stem rust was under the joint direction of Dr. Stakman and Dr. H.K. Hayes, Head of the Department of Agronomy and Plant Genetics. Stem rust resistant cultivars released prior to the rust epidemics caused by race 15B had temporary effectiveness in controlling rust until a virulent race became prevalent.

Since 1955, however, the program has been successful in producing cultivars with enduring resistance and none of the major spring wheat cultivars released by Minnesota since then have been knocked out of commercial production by susceptibility to stem rust. Furthermore, the Minnesota program produced about 80% of the wheat lines rated as elite germplasm for stem rust resistance by tests in the International Spring Wheat Rust Nurseries. Federal cooperating wheat breeders in the Department of Agronomy and Plant Genetics were: A.A. Potter (~1909-20), O.S. Aamodt (1919-1928), K.S. Quisenberry (1928), E.R. Ausemus (1929-1964), D. Anderson, Earl Gillmore (1964-

65), R. Heiner (1965-1977), and R. Busch (1978-present). The federal cooperating plant pathologists in the Department of Plant Pathology were E.C.

Johnson (~1910-12), J.H. Parker (-1918-21), L.W. Melander (1920-45), E.B. Hayden (1950-55), J.D. Miller (1953-65), and D.V. McVey (1965-present). Federal plant pathologists B.J. Roberts (1953-66) and P.J. Rothman (1966-present) cooperated with Matt Moore and University of Minnesota oat breeders to develop oat cultivars resistant to stem and crown rusts.

Cooperative rust nurseries are an important accessory to a successful breeding program. The Rust Lab has participated in the various national and international nurseries throughout their existence. Bill Loegering kindly supplied the following summary gleaned from H.A. Rodenhiser on the origins of these nurseries.

"The Uniform, International, and Puerto Rican Rust Nurseries resulted from the vision of E.C. Stakman even though he is seldom given credit. He actually had little to do with their operation other than constant encouragement and advice. The reason for this was that as Head of the Department of Plant Pathology he had no personnel or money for national or international programs and as an Agent with the Bureau of Plant Quarantine he had no responsibility for testing programs.

"The first Uniform Rust Nurseries (URN) were planted near barberry infested areas to determine the effect of aerial inoculum on selected cultivars. The success of these nurseries created interest in the Cereal Investigations Branch of the USDA. As a result, M.N. Levine was stationed at St. Paul and, as part of his responsibilities, expanded the program. Later T. Johnson, a student of Stakman, came into the program and the URN was expanded to Canada.

"In 1950 race 15B became prevalent. Stakman foresaw the potential danger. He was aware that a similar race occurred in South America. Again his vision came into play and he marshalled his former

students in 1951 to start the International Rust Nurseries (IRN). H.A. Rodenhiser at Beltsville put together an extensive set of cultivars from the World Collection. These were planted and observed by former students in Mexico (N.E. Borlaug), Peru (Garcia-Rada), Chile (R. Cortaza), Argentina (J. Vallega), and Brazil (A.R. daSilva). Out of this first nursery grew the IRN program.

"At the same time the Puerto Rican Program was started. It was too dangerous in 1951 to use race 15B for artificial field inoculations in the continental U.S. Stakman went to I. Tervet (a former faculty member) who was with the Biological Warfare (BW) unit of the US Army and encouraged him to do the needed testing. The first nursery was grown at an army base in Puerto Rico and inoculated with the U.S. race 15B. This nursery was confidential so little is known about it, however, since Stakman had security clearance as an advisor to the BW unit, it seems likely he had a big hand in it. Out of this effort the Puerto Rican Rust Nursery program grew."

Epidemiological studies on stem rust also commenced in 1915 under Stakman and Piemeisel. Initial effort was concerned with observations on the development and spread of rust from south to north and the determination of geographic distribution of races. During each growing season these observations on rust development were summarized and disseminated to interested parties in periodic issues of the Cereal Rust Bulletin, which is still issued by the Rust Lab. Many Old Timers were employed by the USDA for a season or two to participate in field surveys and the collection of rust samples for the race survey. Federal cooperators with long term involvement were: W. Butler (1920-41), E.B. Lambert (1924-28) J.J. Christensen (part-time 1924-37), H.G. Ukkelberg (1929-32), Ward Marshall (1931-35), Ralph Cotter (1935-64), A.P. Roelfs (1965-present) and D.L. Long (1975-present). In recent years Jim

Burleigh (1964-70) and Merle Eversmeyer (1971-present) participated in these epidemiological studies as federal cooperators located at Kansas State University.

The aerobiological aspects of the epidemiological studies were initiated in 1921 in an effort to detect the early transmission of stem rust. Many departmental personnel were involved in these studies and many fledging plant pathologists supplemented their meager stipends by counting rust spores trapped on slides exposed at various locations throughout the "Puccinia Pathway". Helen Hart, J.H. Craigie, J.M. Wallace, Lee Person, Jr., and J.M. Walter were in charge of slide examination and data analysis for various seasons from 1921 to 1932. Thereafter, R.U. Cotter (1932-64) and A.P. Roelfs (1965-68) were in charge of this program. Statistical studies, or the correlation between the number of spores trapped and the incidence of rust in the general area of the trap, convincingly demonstrated that the trapped spores were of local origin. Experimental studies with traps exposed within plots of susceptible wheat supported this conclusion and demonstrated that spores generally did not appear on traps until sporulating rust lesions were present within the plot. Routine spore trapping to detect long range transmission of rust inoculum has been discontinued, but spore trapping within plots of susceptible wheat is a useful tool for following rust development and is in use to detect sites of rust overwintering. Initial rust infection within an area oftentimes is established by rust spores washed from the air and deposited by rain. Presently Dave Long routinely analyzes a limited number of rain samples for the presence of uredospores.

Dr. Stakman, with Dr. Bolley and others, were prime shakers and movers in convincing the Federal Government to initiate a barberry eradication program in the north central wheat-growing states. Dr. Stakman took leave from the

University in 1918 to direct the federal program in it's first year. In Minnesota the barberry eradication program was a joint cooperative effort between the USDA, the Minnesota Department of Agriculture, and the University of Minnesota and the project was headquartered in the Agricultural Botany Building until it's demolition in 1971. Federal directors of barberry eradication in Minnesota were: E. M. Freeman (1918-20), L.W. Melander (1920-45), T.H. Stewart (1945-62), H. Graber (1962-64), D. Fitchett (1964-70), and John Haywood (1970-1979). This highly successful program cleared over a million Minnesota properties of barberry bushes and no spreads of stem rust to commercial grain fields have been found in over 27 years. The Federal program was terminated in 1979 even though some bushes remain in wild areas remote from commercial fields.

In addition to eradication of susceptible barberries from the north central states, a quarantine was imposed to prevent the reintroduction of susceptible bushes. Nurserymen were permitted to grow and sell only immune cultivars of Berberis, Mahonia, and Mahoberberis. New selections are approved for nursery use only after immunity to P. graminis is established by extensive tests of several years duration by federal personnel at Minnesota. This testing was conducted by Ralph Cotter (1924-64), A.P. Roelfs (1965-75), and D.L. Long (1975-present).

The interstate shipment of living spores of the stem rust fungus is also regulated under the Plant Quarantine Act to prevent the introduction of potentially dangerous races of rust into new areas. The Cereal Rust Laboratory has a blanket permit to receive live collections of stem rust. Shipments of live spores to individuals that need rust isolates for teaching or research require a permit issued by Plant Protection and Quarantine, APHIS.

Federal personnel with research

projects on various aspects of stem rust including host resistance, biology and physiology of the pathogen and chemical control were: C.R. Hursh (1920-24), Helen Hart (1924-33), M.N. Levine (1925-55), E.B. Hayden (1950-55), J.D. Miller (1953-65), B.J. Roberts (1953-66), J.B. Rowell (1955-80), R.W. Romig (1963-69), W.B. Bushnell (1960-present), D.V. McVey (1965-present), P.G. Rothman (1967-present), and A.P. Roelfs (1965-present).

Special federal cooperators were Gilbert D. George who served as illustrator from 1919 to 1940 and Laura Mae Hamilton who managed the administrative details from 1921 to 1968.

Until his retirement in 1953, Dr. Stakman directed the federal personnel assigned to these cooperative projects. Over the years, however, the federal affiliations of these cooperative projects changed within the USDA as federal administrators played musical chairs with the boxes on organization charts. During the 1970s alone there were three reorganizations that affected the operations of the Rust Lab. For many years the race survey, epidemiological survey, aerobiological studies, and barberry testing were supported by the Barberry Eradication Program in the Bureau of Entomology and Plant Quarantine and the research projects were supported by the Bureau of Plant Industry. The various bureaus of the USDA were abolished in 1955 and their activities were reorganized into the Agricultural Research Service. Thereafter, research projects were administered by the Crops Research Division and regulatory projects, which included the Barberry Eradication Program, by the Plant Pest Control Division. Under this arrangement, federal administrators assumed more direct management of field personnel. The cooperative activities within the Department of Plant Pathology supported by these ARS divisions were covered by a Memorandum of Understanding between ARS

and the University of Minnesota. In 1962 the Crops Research Division and Plant Pest Division executed with the Minnesota Agricultural Experiment Station an amendment to the Memorandum of Understanding that integrated the federal budget and personnel into the Cooperative Rust Laboratory (later changed to the Cereal Rust Laboratory) under the direction of a federal leader. J.B. Rowell served as Acting Leader until R.W. Romig, previously with the Rockefeller Wheat Project in Chile, was appointed leader in 1963. Bob left in 1969; J.B. Rowell was the Leader from 1969 through 1980; A.P. Roelfs was Acting Leader for 1981; and Jack Schafer was appointed Leader in January, 1982.

The laboratory was headquartered in the aging and condemned Agricultural Botany Building where most of the previous cooperative federal work had been performed. When the University scheduled demolition of Agricultural Botany to make room for new construction, no replacement space was available on the St. Paul Campus to house the federal activities of the Rust Lab. Don Fletcher, formerly of the Conference for the Prevention of Grain Rust and at that time Executive Vice President of the Crop Quality Council, convinced Congress of the need to appropriate funds in 1965 to construct a Cereal Rust Laboratory. The timing was terrible, however, as the federal budget was strained by the wars on poverty and Vietnam. Twice when plans were ready to be issued for bid invitations, federal construction funds were frozen under Presidential order. Each time the freeze was lifted, inflation had increased construction costs above the appropriated funds. Meanwhile, strong sentiment developed within the USDA to construct the laboratory at the University of Nebraska in Lincoln because stem rust had been epidemic in the northern hard red winter wheat region during the 1960s. The federal administrators, however, were convinced to keep the laboratory at St. Paul by evidence that showed this location was

more suitable than Nebraska for field research on the rusts of small grains. Environmental conditions here are favorable almost every year for development of a severe rust epidemic, and the climate is favorable for growing both spring and winter wheats as well as oats and barley. Furthermore, the urban location of experimental plots on the St. Paul campus permitted rust experimentation in the field that did not jeopardize commercial grain fields. Ag Botany had to be vacated in 1971, and the Rust lab was moved across the street to temporary quarters in the old Horticultural Building (the original home of the Department of Plant Pathology and Agricultural Botany) and greenhouse.

Finally construction was started on the 10,000 ft² Cereal Rust Laboratory that was completed and occupied in 1972. Additional funds for construction of the two 7200 ft² glasshouses built in 1973 and 1975, were obtained with the assistance of Vance Goodfellow, the present Executive Vice President of the Crop Quality Council.

The Cereal Rust Laboratory is presently the national center for research on the stem rusts of small grains with the mission to investigate the stem and leaf rusts of small grain cereals and develop information and principles useful in the control of these diseases. When the Animal and Plant Health Inspection Service phased out the Barberry Eradication Program during the mid-1970s, they planned to terminate support for their projects at the Rust Laboratory. Again an intensive education effort, aided by Vance Goodfellow, was needed to convince administrators of the essentiality of these programs. Ultimately the positions, personnel, and budget were transferred to ARS in toto, except that testing of new bayberries for reaction to stem rust is continued under a contract with APHIS.

Some of the major accomplishments during the past 20 years of the federal

cooperators in the Cereal Rust Laboratory are:

1. Participation in the development of Era wheat, resistant to stem and leaf rusts, which has brought an estimated \$337 million in additional income to Minnesota farmers from 1971 to 1980.

2. Conversion of the system for race identification to the use of "single-gene" differentials, which enables determining the frequency of virulence or avirulence on individual host genes for resistance, the stability of combinations of virulence in the pathogen, and the early detection of new virulence combinations potentially hazardous to commercial wheat production.

3. Assemblage of a collection of stem rust cultures with identified combinations of genes for virulence and avirulence that are useful for identifying resistances in wheat cultivars.

4. Development of linear regression equations for forecasting wheat stem and leaf rust severities and losses.

5. Improvements in methodology of storing stem rust inoculum, inoculation procedures, and infection which have increased the efficiency and reliability of greenhouse and field investigations.

6. Demonstration of the feasibility of controlling leaf rust on spring wheat by seed treatment with triazbutil, a highly specific fungicide.

7. Confirmation of the in vitro culturability of the wheat stem rust fungus and demonstration of the high variability of this trait in North American stem rust cultures.

8. Development of methodology for studying the live interactions between fungal haustoria and host cells, which has revealed new phenomena and improved understanding of the host reaction in both susceptible and resistant hosts.

10. Identification of new sources of stem and crown rust resistances in exotic species of Avena and progress in moving such resistances into germplasm for cultivated oats.

Current projects and personnel at the Cereal Rust Laboratory are:

1. Control of cereal rusts with emphasis on durability of resistance

J.F. Schafer, Research Leader and Supervisory Research Plant Pathologist, ARS and Professor, Department of Plant Pathology

B.A. Hitman, Agric. Research Technician, ARS

Gail T. Bullis, Secretary Stenographer, ARS

Brenda Anderson, Clerk Typist

2. Physiology of host-parasite interaction

W.R. Bushnell, Research Plant Physiologist, ARS and Professor, Department of Plant Pathology

Colleen Curran, Biological Technician, ARS

3. Epidemiology

A.P. Roelfs, Research Plant Pathologist, ARS and Associate Professor, Department of Plant Pathology

D.J. Long, Plant Pathologist, ARS

D.H. Casper, Research Technician, ARS

LuAnne M. Martell, Research Technician, ARS

4. Resistance to stem and crown rusts of oats

P.G. Rothman, Research Plant Pathologist, ARS and Associate Professor, Department of Plant Pathology

Mark Hughes, Agricultural Research Technician, ARS
Lucy Wanschura, Laboratory Technician

5. Resistance to stem and leaf rust of wheat

D.V. McVey, Research Plant Pathologist, ARS and Associate Professor, Department of Plant Pathology

Kay Hamilton, Laboratory Technician, ARS

The pest management program that grew under Stakman's guidance has

successfully controlled wheat stem rust. No stem rust epidemics have occurred since 1955 on the hard red spring wheats of the north central states where this disease has been destructive most frequently in the past. The durum wheats grown in this area also have been free of stem rust attacks since 1963. Furthermore, no races have been found in the U.S.A. that have the virulence prerequisite for attacking the prevalent resistant cultivars of spring wheat planted in this area. In the northern hard red winter wheat region, which was the second most vulnerable area to attack by stem rust, the disease has not been epidemic since 1965. This success is a credit to the foresight and planning of Dr. Stakman and of the dedication and productivity of the many cooperators that participated in the diverse aspects of the management program.

1:1



The Plant Disease Clinic

Ward C. Stienstra

Public demand (needs) prompted the establishment of the Plant Disease Clinic (PDC) in 1956. Herbert G. Johnson, Extension Plant Pathologist, organized the Clinic and was supervisor of it until 1970 when Ward Stienstra took on the position. Then, as now, the functions of the Clinic include diagnosing plant diseases, and providing information on disease development and prevention. The PDC now handles samples from homeowners, county agents, commercial and private growers, and consultants. The PDC also has provided "hands on" experience to undergraduate and graduate students of the Department. Since its establishment, the PDC has served a vital function in disseminating plant disease information, and has become a "window to the public".

In the summer of 1956, Roy D. Wilcoxson was the first graduate student director of the PDC. He recalls answering telephone calls at the rate of two to ten per day. Usually two to three questions were about plant identification and culture, and not about diseases. Calls were transferred to the proper Department, or the requested information was obtained and forwarded to the inquiring party. It is further reported that the Clinic

relieved the Department of many Clinic-type duties, reduced interruptions, and thus enabled the routine work of the staff to run more efficiently. However, some of the staff still received many telephone calls, local and long distance. For instance, Dr. French answered 233 telephone calls on trees, and 25 on other miscellaneous subjects. Dr. Louise Dodsall cut down her Clinic work to about half that of previous years. Other staff members made similar reports. In its first season of operation, the Clinic handled 667 contacts. The Department received many favorable comments from University personnel and the public.

The Clinic has continued to enjoy a slow, steady growth as seen in Table 1. In 1959, the number of leaf spot diseases increased, as did the number of calls regarding oak wilt. In 1960, 74.5% of all telephone calls dealt with tree disease and problems. The six most "popular" disorders in 1960 were: oak anthracnose, oak wilt, apple scab, elm anthracnose and other elm problems, and 2,4-D herbicide damage. These categories accounted for 34.5% of all contacts.

The Clinic workload increased in 1961, a response to the discovery of Dutch elm disease (in St. Paul and Monticello), and the installation of a Clinic phone (which accounted for 73% of the contacts). By 1963', the State

← CEREAL RUST LABORATORY

Back row, l-r: John F. Schafer, Director, CRL & Prof; David Casper, Res Tech; Kay Hamilton, Lab Tech; Mark Newberry, Lab Tech; Mark Hughes, Res Tech; Bruce Hitman, Res Tech; Donald V. McVey, Res Pla Pathologist & Assoc Prof; Brian J. Steffenson*, R A; Alan P. Roelfs, Res Pla Pathologist & Assoc Prof; Paul G. Rothman, Res Pla Pathologist & Assoc Prof.

Front row, l-r: Colleen Curran, Biological Tech; Lucy Wanschura, Lab Tech; David Long, Pla Pathologist; William R. Bushnell, Res Pla Pathologist & Prof; LuAnne Martell, Res Tech; Gail Bullis, Secretary, Brenda Anderson, Clerk-Typist.

Absent: A. Martinez-Barreras*, Suleiman M. Alkherb*, Brahim Ezzahiri*.

RA=Research Assistant

*=Graduate Student

Department of Agriculture had established a Dutch Elm Disease Laboratory, which may account for the drop in Clinic contacts. A new record high number of contacts occurred in 1963 when the Clinic phone number was listed in the St. Paul and Minneapolis phone books for the first time. Also, Dutch elm disease was found in Minneapolis and St. Paul, and both Hennepin and Ramsey counties accounted for 77% of the case load. The summer of 1964 was hot and dry, and poor for disease development. In 1965 the spring was cool and tree leaf "anthracnose" problems abounded. In 1966 "good disease weather occurred" and a record high of 4,110 contacts was recorded. This increase was also precipitated by the increase in Dutch elm disease and oak wilt, publicity about PDC services, and "repeat customers". In 1967 a dry spring reduced the number of contacts, but the overall upward trend continued.

By 1970 approximately 100 calls per week were received. Southern corn leaf blight (SCLB) was found in the state, but the epidemic was not as severe here as it was in some regions of the Corn Belt. In 1971 a record high of about 200 phone calls per week were handled, with elm and oak problems and SCLB being popular subjects. A second phone line was added in 1972, and another record number of public contacts was recorded.

Computers were first used in 1973 to summarize and record public contacts. The Clinic shifted to operating throughout the year rather than during the summer. Also, this was the first of 3 years that the Mobile Plant Disease Laboratory was on the roll. The 22-foot mobile home was designed as a disease diagnostic laboratory. It was run by graduate students and was stationed at various parks, shopping centers, and other highly visible areas in the Twin Cities area and throughout the State.

In 1974, PDC contacts apparently decreased, due in part to inadequately filled-out computer record forms. Both

1975 and 1976 showed record numbers of contacts (using the computer record system). In 1979 there was a noticeable increase in individuals walking into the Department with samples.

By 1980 approximately 60% of the contacts were by phone, 25% by mail, and 15% by "walk-ins". County agents represented about 7% of the total number of contacts. In 1981 it was estimated that about 80,000 requests for Clinic advice were received in the departments of Plant Pathology, Entomology, and Horticulture.

Since establishment of the Clinic, graduate students have been actively involved in its daily operations. Each season from 1956 to 1980, it was directed full-time by a graduate student (Table 1). Since 1961, one or more graduate students have worked in the Clinic on 50% time throughout the summer as paid assistants. Some of these students went on to pursue successful careers in agricultural extension and consulting. Initially, all graduate students were expected to assist in the Clinic on an informal basis. Later, students were required to work half days for one week each summer. Most students cooperated, some of them grudgingly accepting the duty; a few of the most resistant students managed to avoid "clinic sere ice". In 1974 the first undergraduate Plant Health Technology (PHT) student assisted in the Clinic. Nine PHT students worked 20 hr/wk in 1975 as part of a course requirement for Clinical Plant Pathology 5-650; this course was taught by Jim Groth and the number of students ranged from 3-17 each summer through 1980. In 1980, Jill Pokorny, a PHT graduate, took charge of the Clinic with the rank of Junior Scientist. For the first time in its history, the Clinic was directed by a full-time (non graduate student) employee of the Department. Now all Clinic positions are filled by paid employees.

I hope that you will enjoy the following quotes from former Clinic directors.

"It has been a quarter of a century since I served in the Plant Disease Clinic. The following three things are still vivid in my mind:

1) I used to sign about 20-25 letters per day as "Herbert G.

Table 1. Clinic directors and number of contacts per year from 1956-82*

Year	Director	Number of Contacts
1956	Roy D. Wilcoxson	667
1957	George G. Papavizas	693
1958	Arthur M. Elliot	1187
1959	Francis A. Wood	1828
1960	William Merrill	2449
1961	George A. Bean	2793
1962	David B. Schroeder	2331
1963	Robert L. Norgren	3809
1964	Harrison L. Morton	2638
1965	David B. Sauer	3223
1966	Eugene E. Saari	4110
1967	Joseph M. Vargas, Jr.	3794
1968	H. Edwin Carley	3825
1969	Robert J. Slattery	2366
1970	Robert J. Slattery	3765
1971	Barry J. Jacobsen	6565
1972	Barry J. Jacobsen	7265
1973	Barry J. Jacobsen	7499
1974	Joseph Southern	7043
1975	Klara H. Nelson	8816
1976	Laura E. Sweets	8727
1977	Laura E. Sweets	9903
1978	Laura E. Sweets	9881
1979	Laura E. Sweets	10074
1980	Jill Pokorny	11230
1981	Jill Pokorny	10500
1982	Jill Pokorny	9000

In 1956, the Clinic was open from July 1 to September 15; from 1957-72 it operated from June 1 to September 15; and in 1973 the Clinic began to function throughout the year.

Johnson". I thought I was going to lose my identity, especially since the middle initial G was also my first name's initial.

2) I received a piece of diseased bark one day about 1 inch square and a long letter from a St. Paul lady. She wanted to know what was wrong with her 20 foot maple tree. She described the symptoms in one paragraph, and also wrote two pages explaining all the problems she had with her husband.

3) A man called me one day and wanted to know what was wrong with his pine tree. I asked him to let me know what kind of pine tree he had, so he went out and came back and told me that he had a one-needle pine tree. When I politely suggested that it was not a pine tree he got so mad, that he used a chain of four-letter words against the University bureaucrats. ,

"The PDC has been one of the greatest experiences of my graduate career. I learned that making diagnoses of plant diseases and recommendations for their control was what I wanted to do. The Clinic broadened my understanding of and knowledge about many plant diseases . "

"Managing the PDC was an invaluable experience in several ways. First and foremost, it was on the basis of that experience that I was confident that my desire to get into teaching and research was the direction I wanted my career to go, rather than some combination of extension and teaching or extension and research. Secondly, I learned a tremendous amount about plant pathology, specific plant diseases, and how to deal with the public. It was in the PDC that I was initially confronted with the problem of having to make a recommendation regarding a specific problem with the distinct possibility that the decision could also have legal implications. I have been confronted with a number of similar problems since the summer of '59. Finally, the experience of managing the PDC for a

summer has been invaluable in the subsequent development of educational programs. Managing the PDC for a short time period provides one with an understanding of how important that kind of 'hands-on' educational experience really is . "

" One of the most interesting problems had to do with the insistence on the part of one individual that he had discovered a new green parasite of plants. This episode occurred in early spring. Upon further discussion it was learned that the new green parasite was in fact the male flowers of the oak tree, the male catkins. We had a request for information on the removal of lichens from a gravestone."

"One very strong recollection that I have regarding the Clinic goes back to almost the first day on the Clinic that I was the graduate student in charge. As

I recall it was early enough in the year that no other graduate students were working on the Clinic on a rotating basis. I was answering letters, phone calls, and diagnosing diseases and writing answers. There was one particular specimen that had me stumped. I didn't recognize it and I was sure that it must be something extremely rare. As I passed Matt Moore on the second floor landing he very nonchalantly and casually turned and said, 'Well, I see the fire blight is already out'. I coughed and spluttered a few times and replied 'Yes, it looks like it's going to be a good year'.

"Overall I remember it as a taxing, tiring, challenging, educational, rewarding, fantastic, wonderful experience. Yes, I think all of those adjectives fit, and then some. Getting into the job was a real baptism of fire. I'm sure everyone in that job remembers the fruit-cake calls from local citizens, some of whom just wanted someone to talk to. One caller had a neighbor who was always 'out to get him'. He thought the neighbor's latest

plot was to kill his trees slowly, probably with some kind of poison. One tree was already looking strange and had spots on the leaves. Could we run some test to prove the neighbor was poisoning his trees? I should have kept a journal to record such calls . "

"I spent two summers working in the Clinic and in retrospect it was one of the most valuable learning experiences I had as a graduate student. Sometimes diagnosis can be exciting. Several years ago I told an individual that the injury to several foundation plants was caused by either salt injury or a gas leak. It turned to be the latter and a potential problem was averted. The Clinic is also an excellent way to learn basic epidemiology. From 1966 to 1969 we saw the number of Dutch elm diseased trees go from one or two per year to well over one hundred per year in the Twin Cities area. After several years in the Clinic, one is acutely aware that certain diseases predominate in May, and are displaced by other diseases as the growing season progresses. I recall getting calls from people requesting information on chemicals to kill unwanted trees. In short order we realized a problem, as all refused to use a saw or axe to accomplish the required task. Generally a neighbor's tree dropped leaves into their yard or the tree was leaning on a property line fence and they decided to have the tree in question 'mysteriously die'. The moral of this story is simply to get all the facts before venturing any recommendations. The PDC frequently received insect specimens which were promptly forwarded to the Entomology Department. Generally a large armyworm or tomato budworm would be placed inside a letter and mailed. The postal service's automatic cancelling machine would smear the insect across the contents of the envelope making the enclosed insect almost unidentifiable and the letter unreadable. Similarly, mushrooms (Coprinus or Phallus species) mailed in plastic bags had to be the work of a pure sadist ."

"I remember when the St. Louis county agent found we had isolated the first case of Dutch elm disease in Duluth, and when I isolated the first case of southern corn leaf blight in Minnesota. While the Clinic was a chore at the time, I treasure the experience it provided ."

"The PDC was the best learning and growth experience of my professional training. I also learned that part of being a phytopathologist is to be a 'psycho-phytologist', particularly when dealing with urban problems. I have memories of the hundreds of calls in May on oak anthracnose, the agony of people who bought high priced wooded lots only to find their oaks dying of Oak wilt or construction/fill damage, the agony of Dutch elm disease, and the new diseases of commercial crops.

"During the summer of 1972, when the Department was away at the APS meetings in Mexico City, I received a call from an aerial applicator in Renville County who asked why the beans were dying. I went through all the common diseases, root rot, bacterial blight, questions on insects, herbicides, etc., but nothing fit. He said this was serious and he would bring in a sample. On observation it was easily diagnosed as rust. As you can remember, that epiphytotic killed approximately 5000 A of beans and damaged another 20,000 to 30,000 A. I, a graduate student, was faced with the industry clammering to do something, and all my Minnesota 'elders' were elsewhere in Mexico. The literature said maneb/zineb were effective but suppliers said there was only enough for 5000 A. After calling HLB long distance in Mexico, who said 'No problem', and calling Rohm and Haas and the EPA, an emergency label was obtained for Dithane M-45 within 48 hours (I believe this is still a record for EPA response) of the first contact with the aerial applicator. This experience and a series of follow-up visits to Renville Co. showed me the importance of expecting the unexpected, the importance of

epidemiology, a sound feel for crop loss assessment, the factors needed in making sound chemical control recommendations, and the critical need for experience.

"I have many happy memories of the fellow students I was able to work with and the special friendships that were developed particularly with paid assistants. I remember my clinical experience as a great learning experience and an apprenticeship for my chosen trade. It was a trial by fire but one which I wouldn't change . "

"It was the diversity of plant pathological problems and the opportunity to interact with people to solve those problems that provided me with the greatest degree of satisfaction while serving in the Plant Disease Clinic . "

The Plant Disease Clinic completed 27 growing seasons in 1982. Budget cuts imposed in 1982 are forcing the Clinic into processing contacts with fewer people and with fewer resources. The Clinic will begin an experimental telephone charge system in 1983, and will provide information by computer and newsletter to subscribers in an effort to generate revenue to maintain the Clinic services. An IBM personal computer was added in 1982 to assist in maintaining Clinic records, summarizing information, and preparing weekly reports of disease incidence for those that desire to subscribe. □

Keep on Running

Exercise has been running rampant among the faculty, Mirocha running at noon (around the track in the Ag gym - not rampant) and Kommedahl and Neil Anderson after 5 PM. Kommedahl may have ulterior motives as indicated by his quotation, "He who runneth around in circles, the same shall become a Big wheel" .

--From Aurora Sporealis, Vol. 46, 1975

Plant Pathology Farm at Rosemount 1961-1983

Orville Bielenberg

I started working at the Plant Pathology farm in Rosemount on September 1, 1961 as a Research Plot Coordinator.

In 1961, the Department had approximately 90 acres. The land impressed me as being very weed free and level. The facilities and equipment were very limited - every time anyone wanted a drink of water it was necessary to start the gas engine on the pump. The old windbreak mainly consisted of Chinese elm with a scattering of brush. The buildings consisted of an office with an oil stove, and a combination shop and machine storage area. The floor in the machine storage area and areas around the buildings, were covered with old railroad bedrock which made it nearly impossible to walk, much less move machinery about.

The only spray equipment on the farm at that time were two spray tanks mounted on a wheelbarrow and a John Bean sprayer used by Dr. Eide on potatoes. The Department had an International 140 and an International Cub on lease; these tractors were purchased in 1964 and are still in use at St. Paul and Rosemount, respectively. Other equipment was an 8 ft John Deere Drill (which we still use), potato planter, digger, iron wheel field cultivator, 5 ft disk, and Dr. Eide also had an Allis G tractor for his potato work.

Fields for continuous cropping and crop sequences had been established in 1959 and consisted of 10 acre plots in a five year rotation. Rye had been grown as a cover crop the year preceding establishment of these plots.

An area was set aside for an Atomic Energy Commission (AEC) project under Dr. Sudia and a building for the project was being equipped.

A planting of fruit trees for Dr. King was located in the northeast area of the farm. He also had raspberries and strawberries. The fruit trees and shrubs were removed in 1963 and that area of the farm was turned back to General Farm. Dr. Eide and Dr. Curran (Horticulture) had two fields for a melon rotation which they carried on until 1972.

In 1963, we began seeding alfalfa with wheat and using alfalfa as a cover crop until the land was used for experimental plots. This practice is still maintained at the present time.

Upon my arrival at Rosemount in 1961, a well for irrigation and to provide water to the building area was drilled. Pumps were installed in 1962 and water was piped to the AEC building. A hydrant was installed in the shop area. In 1963, 4 inch irrigation pipes and risers were purchased which would carry water for irrigation to nearly all areas of the farm.

In 1963, a four-row cone planter was built by the St. Paul farm shop and mounted on Dr. Eide's Allis G tractor. A used Allis G was purchased for use on potatoes. These two tractors are still used a limited amount during planting time. Need for a new cone planter was evident in the mid 1970s and the Cereal Rust Laboratory and Dr. Wilcoxson joined in purchasing four John Deere planter units with mounting assembly. The units were adapted with cones and can be used on the John Deere 1020 tractor.

We did not have a pickup in 1961 so the supervisor used his car for errands to the general farm for picking up gas and supplies. In 1965, a Ford pickup was purchased for Rosemount for \$1,920. This truck was used until 1981 when we replaced it with a new pickup.

In 1965, Dr. Anderson started a planting of aspen trees. This planting has been added to periodically and now totals about 3 acres. Another 3 acres has been set aside for the future.

Michael Ostry also has established a planting of poplar trees and has expanded that area to about 3 acres.

During the years 1962-64, tools such as an air compressor, vacuum, lawn equipment and many other items were purchased to make the job easier. Other capital expenditures made in 1965 were a John Bean Boom sprayer for general use and we put a concrete floor in the storage shed.

In 1966, Dr. Radcliffe from Entomology started doing insect studies on the Plant Pathology farm. He leased a John Deere 1020 tractor and we leased a 7 ft disc and 8 ft field cultivator. Upon expiration of the leases in 1968 the tractor and equipment were purchased by the Department and are still in use.

The year 1966 was one of great progress at Rosemount. The old windbreak was removed and new trees and shrubs were planted. The landscaping of the Plant Pathology yard and design of the windbreak were done by Dr. Kernkamp and Jane McKinnon of Horticulture. An overhead gas tank was installed, ending the many trips for gasoline. A Simplicity garden tractor and rototiller were purchased which enabled us to maintain the yard and roadways and to clean up plot alleys and borders. With the influx of new equipment, it was necessary to build a new shed. This also was completed in 1966.

In 1968, Dr. Radcliffe obtained a 2040 John Deere Diesel tractor and a John Bean sprayer for his potato work. Also, we added 60 acres to the farm on the west side. In 1968, the new area was planted totally to soybeans, and Dr. Kernkamp, Dr. Wilcoxson and I evaluated the weed problems. The acreage was heavily infested with nutsedge, velvet leaf and giant foxtail. In 1969, the field was divided into 10 acre fields and grass roadways were seeded. It was necessary to summer fallow some strips to control nutsedge, but with chemical control and cultural practices we were

able to progressively reduce the weed population. An enlarged crop sequence consisting of nine crops and two replications was established in 1975, replacing the previous crop sequence. This area has provided large-sized fields for Dr. Radcliffe's potato work and aerial spray plots; it has been extensively used the past 7 years. A permanent disease garden was established with the same crops as in the crop sequence. This has been very useful for many different plots and projects. In 1968, a chemical and seed storage building, together with a cement pad for rinsing and filling sprayers, was constructed. Water was piped across the road and an approved septic system was installed.

In 1970, a new mower and garden tractor were purchased for \$880 plus trade. A gas heater was installed in the office making it much more comfortable.

In 1971-72, a flail mower and Howard Rotorsator were added to the machine line for about \$1,200. The first plot combine at the Rosemount Station was purchased in 1971. The Chain combine and trailer cost about \$5,800. Considerable time was spent remodeling and rebuilding to make it a workable unit but we have used it extensively for the past ten years at Rosemount, other stations, and plots throughout the state.

In 1973, the first wild rice paddies were constructed within the windbreak at Rosemount. These have been reconstructed several times over the years and at the present time, consist of two paddies, a misting system, piped-in water, and bird nets.

A tractor mounted harrow, and a 140 International tractor with cultivator and mounted corn planter were purchased in 1975. Modernization came to Plant Pathology in Rosemount in 1975 with the construction and addition of modern toilet facilities - sink, shower, and hot water. This improvement cost

approximately \$11,500, but was a much needed facility.

In 1977, the General Farm and Plant Pathology combined to expand the irrigation system with an underground 4 inch pipe and also extended 4 inch pipe to other parts of the farm; 14 hydrants were installed.

About 1978, Entomology, Plant Pathology and Horticulture joined in the purchase of a two-row potato planter and also a potato harvester. These machines are also used at other stations and have speeded the planting and harvesting operation.

A number of John Bean sprayers have been added periodically since 1965. We now have three 50 gallon John Bean sprayers with stainless steel tanks and booms. In 1980, we had a new sprayer built by Minnesota Wanner consisting of four 10 gallon and one 50 gallon stainless steel tanks. This sprayer is adapted for use on potatoes and grain and has greatly speeded up the plot spraying procedure. This sprayer cost \$4,800. The spray facilities were upgraded in 1980 by adding a pad for sprayer flushing and filling by the AEC building and by installing holding tanks by both pads. This permitted us to operate separately from Entomology in handling of chemicals.

In 1980, we added an additional 40 acres to the western side of the Plant Pathology farm. Roads were established and steps taken to control the weeds. These areas are already used for isolated plots and a fertility plot is being established.

A number of areas have been set aside as permanent plots for various studies including: peas (Pfleger), soybeans (Stienstra), potatoes (Bissonnette and Teng), nematodes (MacDonald); Fusarium wilt of alfalfa (Frosheiser) and an ergot nursery (Baumer). In the fall of 1982, 5 acres

were laid out and set up for a tillage study for Dr. Baumer and Dr. Wilcoxson.

Despite the extremely high cost of equipment the Department was able to provide a new Ford pickup in 1981 and a new 656 Ford tractor in the fall of 1982. These two pieces of much-needed equipment cost over \$20,000.

Additions of land (current size of the farm is 240 acres) and equipment over the past 20 years have been timely and adequate. They have helped to make the Plant Pathology farm the fine place it is to work and do research. When I first arrived at Rosemount, the shop area was filled with wheel hoes, marking wheels, hoes and numerous types of hand tools. Over the years, we have attempted to modernize and develop new methods to make the job faster and easier. I recall in the early 1960s, Dr. Rowell and people from the Rust Lab, spending a whole day measuring fields for isolated plots. With Dr. Rowell's help we developed methods whereby we could use a tractor as a marker to outline plots. This method was expanded and practiced in the layout of many plots. At present, practically all field plots are marked by tractor. We also have made use of the Howard Rotovator and flail mower to trim plots and prepare them for harvest, eliminating nearly all hand trimming.

From 1961 thru 1979, the Rosemount farm operated with myself as coordinator, and one part-time person from April 1 to September 15. Due to the increase in acreage and inability of the General Farm to provide equipment and labor, we hired two assistants in 1980 and succeeding years. We also assumed a larger amount of field preparation and all of the plowing. We have had excellent help over the years and although it was necessary to train new help nearly every year, we were able to accomplish the necessary work.

Extension Plant Pathology From Then To Now

Howard L. Bissonnette

Extension work by the Division of Vegetable Pathology and Botany was started before there was an Extension Plant Pathologist. In 1914 and 1915, E. C. Stakman and A. G. Tolaas, in cooperation with the county extension agent, planted demonstration plots of potatoes in Clay county to show the beneficial effects of seed selection. Tolaas, the first Extension Plant Pathologist, was appointed to the position in 1916. He held the job through 1919 when he resigned to take charge of the potato certification program in the Minnesota State Department of Agriculture.

Frank Frolich followed Tolaas for a few months in 1919-20 and R. C. Rose (MS 1915) took the position in 1920. Rose retired in 1956.

Potatoes continued to be one of the principal concerns of the extension pathologist. When Rose came on the scene Minnesota was growing 367,000 acres of potatoes, which averaged 70 bushels per acre. One of his first projects was to set up 789 plots in 23 counties (with the cooperation of the county agents) to demonstrate the effects of disease-free seed. Later seed indexing plots were started.

In 1921 he introduced the hot formaldehyde potato seed treatment to replace corrosive sublimate to help control scab and Rhizoctonia. Potatoes were treated on five farms in 1921 and because it was so successful, treatment was practiced on 279 farms in 1922. Seed treatment demonstrations were continued in 1923 and treatment centers grew in numbers. In 1927 the average yield of potatoes was about 100 bu per acre, but growers using clean seed and disease control practices were growing 200 to 300 bu per acre. A "Better Seed Train", which started with a 4-H demonstration in Aitkin county, showed the

hot formaldehyde method in the baggage car of the train at various stops on the route.

In 1928 a 3-day potato school was introduced. Over a period of three months the school held a one-day meeting at each town on the schedule. The 4-H clubs were encouraged to demonstrate the use of clean potato seed and the Twin Cities Potato Association offered to provide 40 sacks of certified seed to new 4-H members for potato work in Isanti and Kennebec counties.

Potato demonstration plots continued to be useful during the 1930s. In 1935 such plots were put out in six counties in the Red River Valley and three in southern Minnesota. As many as 84 lots of seed were used and differences in yield from the best and the poorest seed averaged 200 bu per acre.

Improvement of potato seed was provided in 1935 with the organization of the St. Louis County Certified Potato Seed Growers Association. St. Louis County was ideal for potato seed production but very little had been done to develop this potential because acreages were small, marketing facilities poor, and most of the farmers were Finnish immigrants and spoke very little English. Through the cooperation of Leo Knuti, Agricultural Supervisor for the schools, and county agents and extension specialists, the organization was started. The Association had 58 members cropping 100 acres; 27 of these growers did such a good job that their crops were acquired as foundation grade seed.

Ground sprayers were introduced into several potato-growing areas in 1923 and Bordeaux mixture was used to control blight and certain insects. Late blight was destructive in 1941, especially in the northeastern part of the state, but spread later to the Red River Valley. Blight warnings were issued but copper fungicides were scarce due to the war effort coming on. In 1942 blight was again destructive, and spread throughout the state by August.

Resistant cultivars were uncommon although seven growers in Carlton and Pine counties had 6 to 7 acres of certified seed of the cultivar Sebago, which has a fair degree of field resistance. This seed had increased from a half bushel that Rose provided in 1939.

Other potato problems included hair sprout, yellow dwarf and ring rot. The latter first appeared in Minnesota in 1938. These diseases and their control were principally the responsibility of the state seed potato certification organization, but Rose was involved, especially in the disinfection of storage houses, which was hampered by shortages of potassium permanganate, formaldehyde and copper sulfate.

Covered smut of wheat was the other problem that demanded much of Rose's time. It caused heavy losses in 1925 and 1926 and a \$2.5 million loss in 1927. Rose helped a committee of Minneapolis grain companies and line elevators to promote seed treatment. There were at least ten types of seed treaters available which required

demonstrations at meetings. Ninety exhibits were distributed throughout the state.

In spite of this effort, 20% of the durum wheat in Minnesota and 62% of the spring wheat was classed as "smutty" by elevators in 1929. In 1930 a new race appeared which attacked cultivars previously resistant. A seed train was used to hold 30 meetings to demonstrate seed treatment.

In 1930 Rose, assisted by George Starr (Ph.D. 1932) and Carl Eide (Ph. D. 1934), made a smut survey of 300 wheat fields in Redwood, Wilkin and Polk counties. Dr. R. J. Haskell, Chief of the Federal Extension Service, made some trips with Starr and Eide. His presence probably indicates the importance of the smut problem and the value placed on the program Rose had initiated.

A relatively new seed treatment

chemical, Ceresan, came into use in the early 1930s. Much of the wheat seed treating was done in elevators, and by 1935 covered smut was reduced appreciably as indicated by field surveys and grain inspections at terminal elevators. Ceresan sales increased several hundred

percent. There were no reports of serious injury from the use of this mercury seed treatment. Rose was assisted in 1935 by C. C. Allison in establishing seed treating stations and writing newspaper articles.

Although there were 67 grain elevators in Minnesota with commercial seed treating equipment, the homemade "Minnesota" (Matt Moore) seed treater was popular as a result of 50 meetings in 18 counties in 1936. Plans for making the treater at a cost of \$4 were

distributed. It received widespread publicity in newspapers and agricultural magazines. In 1935 covered smut caused only an estimated 1% loss to the state's wheat crop.

During this period loose smut of barley also was destructive and seed treatment with hot water was recommended at 28 demonstrations in six counties. Smut was reduced from 8.8% to 1.4%.

Diseases of fruits and vegetables provided a greater diversity of problems than did cereals and potatoes, although they were not so important economically. Most of them were solved by applying existing knowledge. During the growing season the Department received letters, specimens and telephone calls as well as personal visits from people trying to raise vegetables, fruits, flowers and trees. There was no plant disease clinic and Rose was out in the state a good deal of the time. Consequently these problems were dealt with by the research and teaching staff. During the growing season as much as 40% of the time of some staff members might be occupied with such duties.

Extension work with orchard diseases was reported for the first time in 1923 when a spray calendar was

prepared by Rose and A. G. Ruggles, Entomologist. Most Minnesota orchards were small home or farmstead plantings of one or two trees to 5 or 6 acres. The extension work probably was stimulated by the county agent at Winona, who was concerned because people were buying apples from Wisconsin while the local crop rotted on the trees. Rose worked extensively with "spray rings" organized by growers; he trained spray rig operators and conducted educational meetings. By 1925 there were 24 spray rings in 23 counties.

During the 1930s unemployment helped to stimulate interest in growing vegetable gardens and fruit. In 1933 63 meetings emphasizing these crops were held in 17 counties, and were attended by 2,876 people. Practically all of the ordinary diseases were prevalent to some degree, and in 1935 nematodes were found on cucumbers grown in a greenhouse.

Cabbage was grown commercially in ten counties and in some places yellows became prevalent. Rose introduced yellows-resistant cultivars with good results, which were duly publicized by field trips and newspaper articles.

Rose also helped cabbage growers learn to treat seed with hot water to control blackleg and black rot. When he supervised the process at Hollandale the results were a great success. The following year the grower hired a man to do the job. He let the water get too hot and killed the seed. It was reported that he had very poor eyesight and couldn't read the thermometer.

Among the commercial vegetable crops were navy beans, grown principally in Isanti county. When bacterial blight, anthracnose and a mosaic started to become destructive Rose introduced new cultivars and started a seed certification plan. By 1942 four growers were raising 30 acres of certified seed.

Ornamentals were not ignored. In 1942, an epidemic of *Phytophthora* blight

on peonies was followed by newspaper articles, radio talks, and spraying demonstrations and meetings in 19 counties. He also demonstrated that asters could be protected from yellows by growing them in greenhouses.

Rose was a pioneer in extension work in plant pathology and must have had to work out many of his teaching techniques without precedents. However, he was highly effective. He seemed unhurried but managed to accomplish a great deal, enlisting the cooperation of news media and businessmen as well as that of growers and county agents. His view of plant disease was not that they were interesting phenomena but the cause of lost income and his objective was to eliminate that loss. Rose raised potatoes on a farm near Forest Lake. The soil was peat and when common scab increased to the point of making the venture unprofitable he sold his potato machinery and planted the acreage to Reed canary grass. The crop was good. He hired local farmers to cut and stack the hay. It was a dry year and livestock raisers came and hauled the hay away at a good profit to R. C. Rose.

After Rose retired Herb Johnson (Ph.D. 1953) became Extension Pathologist in 1956. Herb had had a lot of experience with ornamentals at Yoder Brothers in Ohio and with canning crops at the Minnesota Valley Canning Co. in southern Minnesota. Although he was the only full-time extension pathologist for over 10 years, Herb's burden was eased somewhat by the establishment of the Plant Disease Clinic in 1956 (see elsewhere in this Aurora). He also had an assistant, starting in 1966 - a position held successively by Jim Froyd (Ph. D. 1967), Bob Nyvall (Ph. D. 1969) and Thomas Kucharek (Ph. D. 1969). In 1959 he started publishing the Fact Sheet series of 2 to 4 pages, which describe individual diseases and their

control. This made the work of the Clinic less complicated.

Herb was involved in the creation of several formal organizations or

meetings that were held several years in succession. These included plant disease clinics held at Branch Stations, starting in 1958; regional meetings of Extension Plant Pathologists, 1959; and the Minnesota Agricultural Chemical Association, organized through the efforts of Extension Specialists Johnson (Plant Pathology), Lofgren (Entomology) and Otto (Agronomy). In 1974, pesticide training meetings were started as part of compliance with revised federal laws. These are described later.

In 1968 Howard Bissonnette (Ph. D. 1964) reluctantly left North Dakota to join Johnson on the extension staff. Later additions were Ward Stienstra (Michigan State) in 1970 and Frank Pflieger (Oregon State) in 1974. John Mizicko (MS, Colorado State) started in the Department as Research Specialist in 1973, becoming Assistant Extension Specialist working with pesticides in 1977. He resigned in 1978 and was followed by Fred Morgan (MS Penn State), who resigned in 1981. Asimina Gkinis (Ph.D. Wisc.) became Assistant Extension Specialist to work on tree diseases in 1978. She resigned in 1981 and her place was taken by Fred Baker (Ph.D. 1981).

When Bissonnette started in 1968 it was agreed that Johnson would cover the southern half of the state, with principal responsibility for diseases of corn, soybeans, alfalfa, and small fruits. Bissonnette took wheat, barley, oats, potatoes, sugar beets, wild rice and vegetables in the north. He also got the fishing.

When Stienstra started he was on half time extension with responsibility for turf diseases (on which he spent the other half of his time in research). Later he had to take over trees and shrubs and, when Johnson retired, he became the corn and soybean specialist. Frank Pflieger began as a vegetable disease specialist, but by 1980 was involved with diseases of ornamentals as well. Dick Meronuck started in 1973 as a specialist in grain storage problems at 30% time, increasing gradually to

100% in 1982. He now covers grain storage problems, diseases of dry beans and is training coordinator for pesticide applicators in Minnesota.

There has been no shortage of problems since Herb Johnson began in 1956. Cereal rusts had been virtually stopped for the time by resistant *c u l t i v a r s* as were most smuts. Exceptions: an epidemic of leaf rust of barley in 1972 and a persistent problem of loose smut of barley. The latter stimulated the development of a technique for testing seed for embryo infection by the smut, a procedure that has been taken over by the State Department of Agriculture. Leaf spot diseases of cereals, principally Septoria, became more prevalent (perhaps because they were more visible in the absence of rust). In 1962 this brought demonstrations of airplane applications of fungicides, in cooperation with Bissonnette, who was then in North Dakota. Bissonnette pioneered in this work and was asked to demonstrate his techniques for determining coverage by sprays (spray patterns) in several parts of the U. S. A. Nearly a million acres of cereals are now treated annually by airplane applicators.

In 1970 there was an epidemic of southern corn leaf blight which was less destructive in Minnesota than in some other corn growing areas. Nevertheless a leaf blight watch was initiated in 1971, and a high altitude infra-red photography survey was made by NASA, assisted by Johnson. Bissonnette and Stienstra made ground surveys. Cereal crops workshops were started, giving growers two days of new information about cereal crops production.

Head smut of corn was found in the state in 1980 by Erik Stromberg (APHIS, PPQ, USDA). Ward Stienstra, Stromberg, various corn seed companies, the Minnesota Department of Agriculture, and corn disease investigators in the Department of Plant Pathology, cooperated in developing a large scale testing nursery near Staples, Minnesota.

Diseases of other field crops appeared for the first time or assumed added importance. These included *Phytophthora* root rot of alfalfa and soybeans (1963) and soybean cyst nematode (1978). A new race of *Phytophthora* on soybean was identified in 1978. *Cercospora* leaf spot of sugar beet started to appear in 1978. By 1980 the crop sustained a major epidemic of the disease in the state. As a result, an extensive research program has been started to find control methods. Bissonnette, Percich and Teng are involved.

In 1972 rust became destructive to the newly-developing dry bean industry. Bissonnette and Johnson worked out a crop loss assessment system to aid growers in deciding how to use control practices. Beans were also damaged by white mold, which was prevalent on sunflower too. Sunflowers were also infected with mildew and *Verticillium* wilt.

Potatoes did not receive as much attention as they did when Rose was extension pathologist. Not because there were no problems, but because most of these were handled by the potato certification and research personnel. Extension specialists put hygrothermographs in potato fields in several parts of the state to aid in predicting blight development and in 1972 made aerial infra-red surveys to detect incipient epidemics. Bissonnette tested fungicides for blight control in plots at Rosemount for 10 consecutive years.

Other vegetable diseases included blackleg of rutabaga at Askov; under Johnson's direction this problem was successfully controlled by hot water seed treatment and rotation in 1956 and continued thereafter. Onion smut was controlled with formaldehyde (1961) and *Aphanomyces* root rot of radish lead to the establishment of a disease nursery and eventual release of two resistant cultivars. Root rot nematodes caused a loss of about a third of the carrot

crop, and parsnips were rotted in storage. These became the responsibility of Frank Pflieger when he joined the staff in 1974.

Most of the fruit problems apparently were taken care of by the Clinic, although virus-free strawberry plants from Grand Rapids were mentioned in annual reports.

Ornamentals received more attention. Azaleas were found to have a nematode problem (1962), and a control program for bacterial stem rot of geranium was implemented, reducing the 30% annual loss caused by the disease. Stienstra found in 1974 that growing poinsettia successfully was related to the presence of mycorrhizal fungi in the soil. In cooperation with entomology specialists, Pflieger identified the cause of a bulb mite problem affecting Easter lily. Herb Johnson's experience and know-how was demonstrated in solving a problem that plagued greenhouse growers of *Schefflera* spp. Herb found the trouble was due to high salt content of the soil, which he identified by wetting his finger, touching the soil and tasting the salt on his finger. Genius.

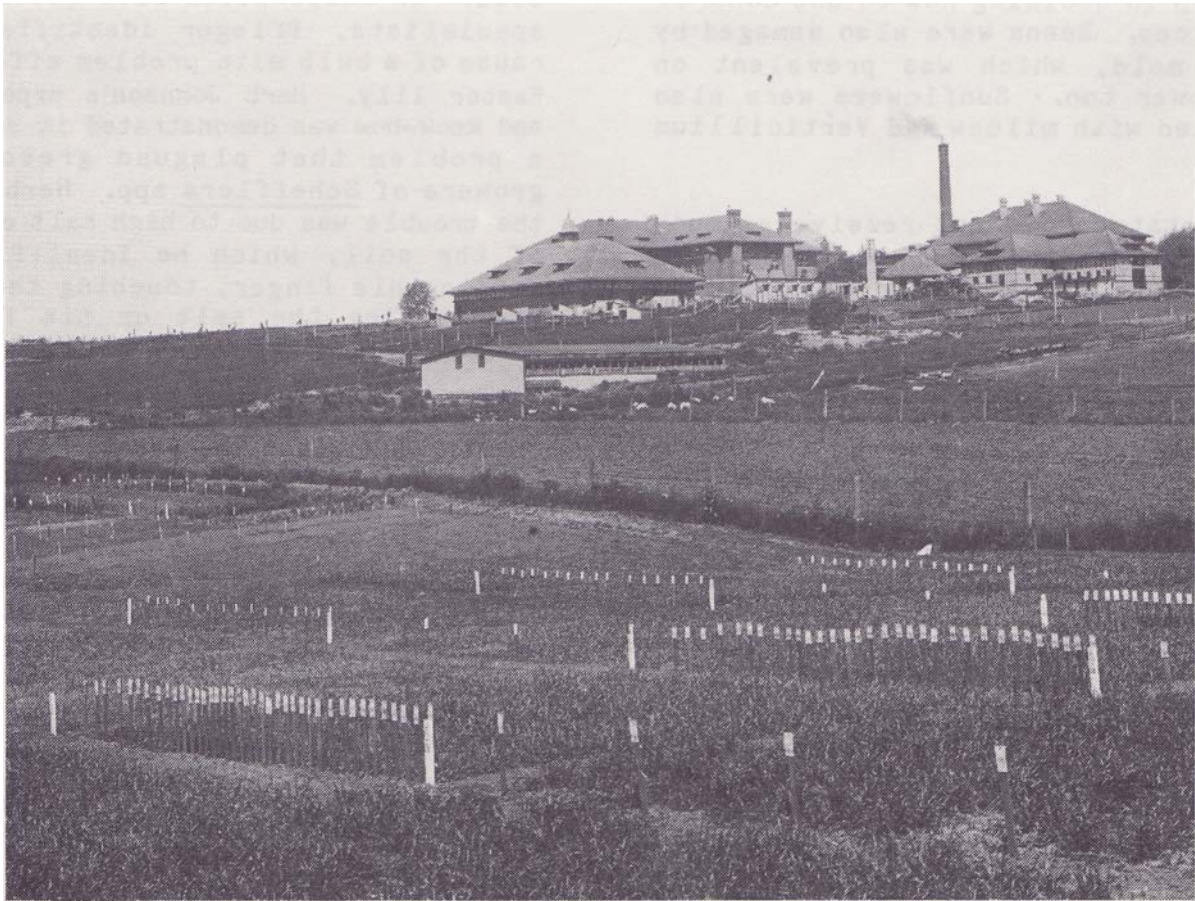
Other ornamentals included trees. Dutch elm disease was identified in the state in 1961 near Monticello. Concerned citizens in all walks of life wanted to rise up and wipe out the disaster, but lacked knowledge. When Asimina Gkinis came on the job she assumed the major part of the job educating the state and local personnel to identify the disease and carry out such control measures as were known. Rumors of quick cures and impatience with the progress of sound science must have made her job a real challenge in human relations.

The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) was amended in 1974 to require applicators of these pesticides to know what they are doing. The Minnesota State Department of Agriculture certifies applicators, but

it has been the task of extension personnel to train applicators so they can pass the tests. John Mizicko and Fred Morgan spent most of their efforts in this capacity, but the job still takes a considerable amount of time of the Extension staff. Dick Meronuck is now Training Coordinator for the instruction of applicators of all pesticides in Minnesota.

The University of Minnesota Agricultural Extension Service became involved in an Integrated Pest Management (IPM) program in 1979. The initial program included three crop areas: corn, sunflowers and potatoes. By the third year the program had

expanded to include soybeans, wheat and alfalfa. Herb Johnson was advisor for plant diseases on corn, soybeans, and alfalfa until he retired in 1981, and then Ward Stienstra assumed the job. Howard Bissonette covered diseases of sunflowers, potatoes and wheat. The IPM program included a 2 week scout training workshop consisting of identification and control of plant pathogens (18 hours), weed and insect problems, and various types of sampling techniques. Each year 60 to 80 persons have taken the training program. Most of these people were hired by the extension service crop pest management program (which was terminated in 1982), or by private consulting firms. □



Rust plot, circa 1910. Looking northwest toward Coffey Hall in the middle background. This plot was near the intersection of present Commonwealth and Gortner Avenues.



PLANT DISEASE CLINIC: Jill Pokorney, Jr. Scientist; Debra Baden-Drange, Sr. Secy; David R. Johnson, Lab Technician. Absent: Ward Stienstra, Prof. & Clinic Supervisor.

OFFICE STAFF: Angela Carver, Secy; Barbara Edstrom, Asst Administrator; Debra Baden-Drange, Sr Secy; Kelly Sieg, Accts Specialist; Ann Arendt, Sr Secy. Front: Connie Post, Accountant; Marguerite Clemens, Secy.; Absent: Patti Sebesta, Secy.



Eric Biever, Librarian



Ben Lockhart, Assoc Prof. On leave in Morocco



Carl J. Eide, Professor Emeritus



Cheri Olson, Research Plot
Technician, Rosemount



Orville Bielenberg, Field Plot
Coordinator, Rosemount



Dann Adair, Field Plot
Coordinator, St. Paul



Field House, St. Paul

Plant Health Technology

James V. Groth

Around 1972, the Department began to realize that a great opportunity was being missed. Not only was there a growing job market for Baccalaureate-level plant pathologists, but the College Office was encouraging the Department to develop a major that was (at least mostly) our own. Prior to this time, undergraduate teaching in the Department was considered to be a service function whereby we provided students in other majors with a enough plant pathology so that they could go out and spread the gospel. Unfortunately, the good word never seemed to get spread. In addition, students in other majors obtained jobs that should have been filled by more thoroughly trained pest specialists. While the quality of teaching was excellent, a single course in plant pathology could hardly be considered "in-depth" training.

In the early years (approximately the 1930s through the 1950s) there was an undergraduate plant pathology major on the books. Enrollment was not exactly impressive, and a total of one or two students in the major was not unusual. Helen Hart served as advisor with some assistance from other faculty members. The change came in 1973. Drs. Wood and Kommedahl developed the new curriculum following some well-conceived guidelines, one of which was known as the RICOP (Resident Instruction Committee on Policy) Report ^{1/}. The incentive for this action was mainly from Dr. Wood, who deserves most of the credit for bringing a viable undergraduate major to the Department. Once the initial organization of the curriculum was finished, other faculty members were called on to contribute ideas. This committee assembled a program that included existing and newly proposed courses in the Department and existing courses from other disciplines. The Department elected to work alone in

Plant Health Technology, a name which was conceived by Dr. Art Schipper. It also should be noted that this followed about ten years of previous involvement in an inter-departmental (Plant Pathology and Entomology) plant protection major that included additional courses in other departments; however no students registered for this program. Other departments were concerned that the title of Plant Health Technology was overly ambitious and threatening. After all, aren't healthy plants the goal of all plant science disciplines? Actually, most of the objections came from departments that already had large undergraduate enrollments, and they were not keen on assuming an additional teaching burden in a new and "dubious" endeavor. In the end, the wisdom of the Department prevailed. A student representative of the College of Agriculture Curriculum Committee was instrumental in gaining the acceptance of that important body. The student argued convincingly that the Plant Health Technology major would be attractive to students and employers alike.

In the fall of 1973, the new official major began, and it attracted five to six students. Dr. Tom King advised the students through 1974. When I assumed this duty in early 1975, student enrollment was beginning to creep upward. The first student graduated in spring, 1976, when the total number of registered students was over 30. Enrollment climbed steadily, reaching a peak of 70 students in the halcyon days of 1978-79. Since then, the number of students has decreased to around 40, which follows a trend occurring in most plant science majors.

1/ An unpublished special report by the RICOP Committee on Plant Protection from the workshop for the development of educational concepts for an integrated approach to economically and ecologically sound pest management and plant protection, St. Louis, Missouri, June 1972.

Not all students enrolled in the program graduate (for a variety of reasons) but our current total number of graduates stands between 60 and 70.

There is a philosophy behind having a major that is run by a single department (which is admittedly competent in only one of the several aspects of plant health). The Plant Health Technology major does not attempt the impossible task of teaching mastery of diagnosis, prognosis and control of all biotic and abiotic causes of plant un-health in a mere 4 years. Rather, it exposes students to a variety of plant health problems. We attempt to provide depth in plant disease and sufficient breadth in other plant problems to allow students to pick up what they need later to deal with them independently. This assumes, and it is disputed by some, that certain unifying principles of pest management apply across the board. Of course, if unifying principles do not exist, neither can truly integrated and interdisciplinary management of pests. We believe that a degree of integration is possible. If it is still less than ideal, it is not because of the nature of the subject, but rather because of human and institutional failings. Because Plant Health Technology students must assimilate so much information, there is not much provision in the major, except through a few elective courses, for specialization by crop. Students interested in vegetables, forest trees, field crops, ornamentals, or other miscellaneous groups of plants are encouraged to pursue their interest by considering a double major, as many have done. A double major usually takes about 5 years.

A unique feature of the major is the six credit "clinic" course. Each student, upon nearing graduation, is required to spend nearly 200 hours in the Plant Disease Clinic. Here they are exposed to the realities of diagnostic plant pathology. Because the public is not always able to determine whether a plant health problem is caused by insects, fungi, herbicides, or other

causes, students are exposed to the entire range of plant problems. Guidance is provided by extension clinic personnel and the course instructor. Students are expected to diagnose specimens, deal with people, seek control measures, and write recommendations. It is the ultimate in utilizing classroom knowledge. Not only does it "finish" the student, but it builds confidence and competence in handling the difficult business of being a plant health specialist. We are now in the process of changing this clinical course by providing more field experiences.

Students who major in Plant Health Technology are interesting people. They are wise, as exemplified by their choice of career. Aside from this, they are often older students, who have been around a bit (or as the University so delicately puts it, they are "nontraditional" students). Most do not have, nor do we insist upon, farm backgrounds. About 40% have been women. Never have more than two freshmen been in the major at any one time. Transfer students come from very diverse backgrounds. Some have even earned another degree recently, or much earlier, in an area in which they could not obtain employment. To be honest, my view is that advising such students has always been a delight for which being paid seems criminal.

Graduates in Plant Health Technology generally have been successful in finding employment. Private industry has been the largest category of employer, followed by public institutions. Some students have gone on to graduate school, nearly all in plant pathology. Employers are interested in the broadly trained individual, but at the same time they indicate that they need people with some depth, as well. The Plant Health Technology graduate clearly fills this need. In this program, we offer them a compromise candidate, with an emphasis on "promise". Consequently, our primary goal is to ensure that students obtain

the background necessary to be able to learn what is needed independently. If the major is designed so that this "critical mass" of knowledge is learned by the students, we have done our job, and the students have invested their time well. □

An Editorial

Wherein is set forth a plethora of platitudes
But may we take heed of them nevertheless

"By their fruits ye shall know them." Thus sayeth the Good Book. The best fruits of an institution of learning are the men and women who have absorbed knowledge, derived inspiration and developed mental power in it. Trite but true. The Division of Plant Pathology of the University of Minnesota is an institution. It is bigger, more lasting, more important than the individuals in it; but its success is measured by the stream of individuals who make it. It is dynamic, and its power is generated by the composite intellectual stimulus of those who compose it, past, present, and future. The impetus which drives it on comes from without as well as within. Some of us are officially within and some without. But we all have a common interest - progress in an intensely interesting and impellingly important branch of science. The success of the institution reflects credit upon us; our success reflects credit upon the institution. Let's all work together for the highest scientific ideals, for the greatest possible scientific accomplishment and for the richest scientific associations - may Minnesota symbolize all of them! And may the symbol help us keep the scientific faith and find our greatest joy in it. Maybe the Aurora Sporealis will help.

E.C. Stakman

--From Aurora Sporealis, Vol. 1, No. 1, 1924

The Coffee Break

Coffee drinking might be considered an essential part of the science of plant pathology were it not equally a part of almost every other occupation in the U.S. of A. Coffee breaks are important items in union contracts, but in Stakman Hall the "break" seems to have been largely forgotten and the first thing some folks do on arrival at work is to get a cup of coffee to support their efforts at work or learning. Nevertheless there are still a few well-defined "coffee hours" and the following sketches record what might be considered the early, medieval and modern versions of this important aspect of Minnesota Plant Pathology.

The Beginning was recorded by Dudley Preston, PhD 1947, in the Historical Supplement of Aurora Sporealis, Vol. 25, 1947.

"The beginning of the coffee hour is clothed in antiquity, but a few of the hoary Old Timers will recall that this noble enterprise was started during the Christmas vacation of 1938 by Ted Wright and Dudley Preston, in an effort to stave off the pangs of starvation wrought by the going wages prevailing at that time on the dusty Mezzanine of the Tottering Tower. Wright and Preston stayed behind while the other inmates journeyed to the meetings in other climes. Keeping all the neglected cultures alive made them thirsty; besides, they were fresh out of funds, Wright's mother came through with a fruit cake, and Preston's sister came through with a roast chicken and trimmings. Thus regally endowed they purchased the oft-maligned loaf of bread and a pound of coffee. Only by the strictest rationing of these comestibles were these gentlemen able to survive the holiday season.

"When the other inmates returned there was still some of the first pound of coffee left. Andy Downie joined them in a gusty effort to use it up. Since all three thrived, the noble experiment

continued - even drawing gulps from the then current edition of the QCF.^{1/} The venture was pursued, and Wright, Preston, and Downie carried the burden for a long, long time. Gradually other members drifted in for a taste of the brew that lifted them to greater heights of endeavor. The fact that the coffee hour survived the first rigorous years was due almost entirely to the generous donations of Wright, Preston, and Downie. A few of the more enlightened visitors discovered that nickels and dimes would help to provide more and better cookies, but many never seemed to learn this fact - indeed made payment with gripes. In those days the cups were well filled and another pot could always be brewed in a few minutes.

"In those days the rules were simple. Preston made the coffee; anyone who could stand the stuff drank it; Wright, Preston, and Downie cleaned up the mess, and paid for it. Later Stakman and Andrews did the talking, which has eventually led to the present lofty discourses which pervade the atmosphere at these sessions."

Memories of the medieval period are recalled by an anonymous faculty member:

"During the administrations of J.J. Christensen and M.F. Kernkamp (circa 1953-72) there were several and varying coffee hours in different parts of Stakman Hall and at different times of the day. One of the more formal was held at 10 AM in the narrow room next to the main office, at that time a storage area for supplies, now the financial center. It was run by and for the office staff. However, senior faculty members were welcome but irregular paying guests.

"As might be expected, when the Head and several faculty were present, official business often came into the conversation and medium-level secrets disclosed and discussed. The Head could share his burdens and profit by the

1/ "Fourth floor front" - office on the 4th floor of the Tottering Tower.

advice of colleagues whose opinions were often influenced by the fact that they didn't have to make the decisions. It was a sort of Inner Circle and not hampered by the presence of the office staff, who knew all of the secrets and were bored.

"But sometimes only one or two faculty showed up. Then the conversation changed. There was more 'women talk' which was very enlightening at times. Inconsiderate faculty and students were identified, explicitly or otherwise, and damned. Several regulars were married and the various aspects of family life and parenting frequently came up. Two owned riding horses, which furnished food for discussion. Having colts and children apparently involves similar biological problems. One stenographer, like Jim Percich, apparently lived a life of continuous adventure and could describe said adventures in language that was colorful and often downright spicy. To the enlightened and sometimes slightly embarrassed faculty member the thought occurred 'What couldn't a man learn from this bunch if they were drinking rum and coke instead of coffee'?"

"Wood converted the coffee/storage room into a plush 'Conference Room', which soon became office space for the growing financial manipulations of the Department. An interesting, if significant era ended."

Alan Pierce, Assistant Scientist, describes the Modern version:

"When I arrived at Stakman Hall in September, 1974, I discovered that MORNING COFFEE was an activity in which participation was 'expected'. This ritual meeting was then held in room 411 from 10-10:30 AM MORE or less. The initiator of this event, department head F.A. Wood, made it a point to attend whenever he happened to be in town. Attendance was normally about 20, including two former heads, E.C. Stakman and M.F. Kernkamp, and at least one future head, D.W. French.

"Coffee time conversation was often lively, sometimes heated, and more often than not, had nothing to do with plant pathology. The only topic avoided (by an uneasy consensus) was the Vietnam Conflict. Since the termination of that conflict a free exchange of ideas has raged. It is no secret that this phenomenon was enhanced by the addition of many young, and often vociferous, staff members in the mid 1970s. Regulars became quite adept at noting each other's pet causes, peeves, and vulnerabilities. Howard Bissonette must be singled out here for performances that amazed the uninitiated.

"Threats to the integrity of our ritual were repelled, or endured. Some of these were: the painting of 411 in a yellow so garish that for some, the second cup of coffee was no longer necessary; the replacement of the 'real' wooden table with one of those 'photo finish' jobs; and, in 1982, the moving of our show out of 411 (following a

successful coup mounted by computer keyboards - probably attracted by the decor - which expropriated our space).

"At present, we meet in the old seminar room, 401. A recently acquired (and highly suspect) coffee dispenser delivers anywhere from one-quarter to a full cup of coffee for ten cents, when it delivers at all (the mean is about two-thirds of a cup). Attendance is down somewhat from a decade ago with around 10 normally participating. However, the quality of these gatherings has improved, that is if the noise level is an accurate criterion for quality. I find it fitting that we are now convening amidst the volumes and memorabilia of the Department. Our table is bracked by the E.C. Stakman Memorial Softball Game trophy (1975), and the U of M Interclass Kittenball Championship cup (1925), with Professor Emeritus Carl J. Eide ('Anyone knows one cup of coffee ain't coffee.', CJE, Aurora Sporealis, Vol. 9, 1933) presiding as toastmaster."



Intercampus Street Car, headed east, June 18, 1953. The tracks were on what is now Folwell Avenue. The North Central Forest Experiment Station now occupies the site of the apple orchard to the left.