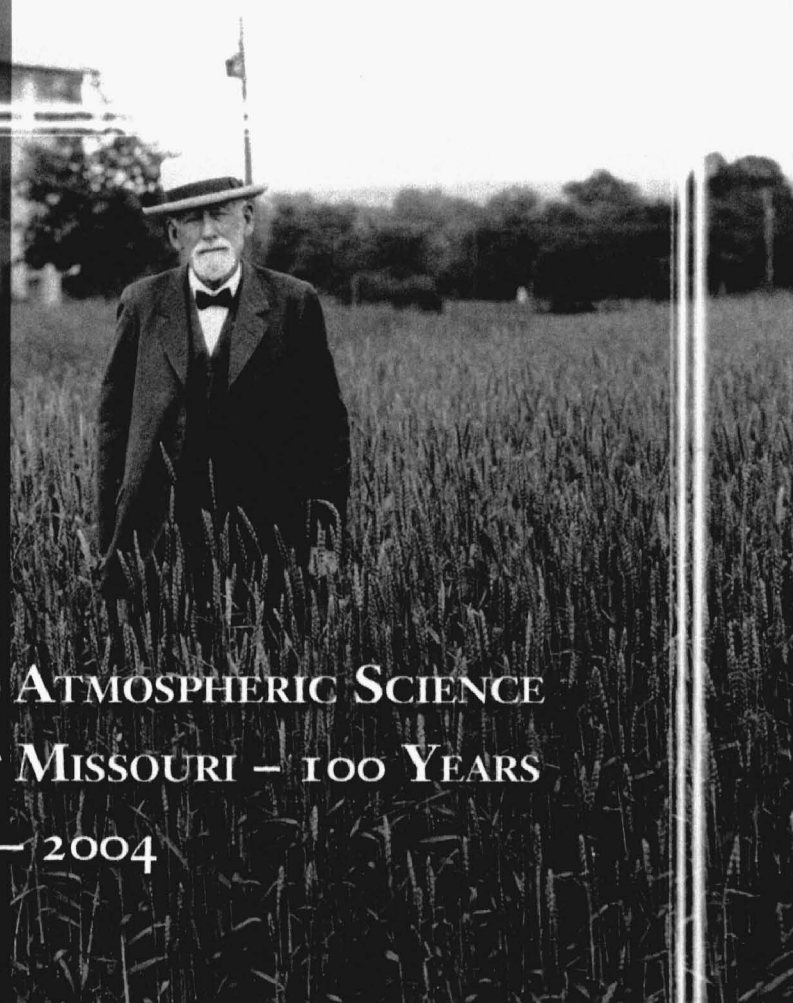



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AGRONOMY, SOILS AND ATMOSPHERIC SCIENCE
AT THE UNIVERSITY OF MISSOURI – 100 YEARS
1904 – 2004



CENTENNIAL CELEBRATION
JUNE 25 – 26, 2004

*Prepared by Roger L. Mitchell with major recognition
to three sources (Poehlman, Woodruff, Decker), which are
utilized extensively for the early history and with special thanks
to all the current faculty for their suggestions of major themes
and successes as well as assisting in a summary of their current work.*

Agronomy, Soils and Atmospheric Science
at the University of Missouri – 100 Years
1904 - 2004

Centennial Celebration
June 25 - 26, 2004

Special Report 554



College of
Agriculture
Food and
Natural
Resources

Missouri Agricultural Experiment Station

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Roger Mitchell accepts responsibility for any errors or omissions.

Special appreciation is expressed to Sharon Wood-Turley, Jim Curley, Ginger Berry and Jennifer Smith for their journalistic support and to Rita Gerke for her extensive assistance.

This abbreviated history provides a pleasant reminder that from the very beginning, the faculty in these disciplines worked closely with the citizens of Missouri. They worked especially with the agricultural community to develop new knowledge carefully adapted to their unique, site specific locations. Research, teaching, and extension brought to Missourians extensive new information about the soils, crops and environment that impact this high risk enterprise of food production. The faculty have always remained steadfast in their commitment to high quality teaching, research, extension and service.

This abbreviated history does not include the names and responsibilities of all the faculty who have been with these programs. Those lists in more complete detail are in the Poehlman and Woodruff references. It is my hope that all faculty members currently associated with one of these disciplines are noted here.

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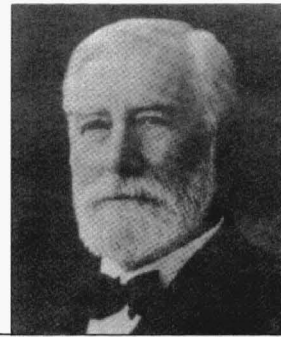
The organizational history of Agronomy, Soil Science, and Atmospheric Science at MU has taken several turns over these 100 years.

1. The Department of Agronomy was formed in 1904.
2. The Department was divided into Departments of Farm Crops (renamed Field Crops in 1920), Soils, and Agricultural Engineering in 1914.
3. The Departments of Soils and Field Crops were rejoined in 1967 as the Department of Agronomy with Atmospheric Science, Plant Pathology and Genetics leaving as separate departments. Genetics faculty moved to Biology in 1974; several returned to Agronomy in 1976.
4. When Resource Allocation Units were formed in 1989, Agronomy became a part of the Plant Sciences Unit, along with Entomology, Horticulture and Plant Pathology.
5. The Department of Atmospheric Science joined the Natural Resources Unit in 1991.
6. In 1990, teaching and research Soil Science faculty moved from Agronomy (Plant Sciences Unit) to a Soil Science Program in the Natural Resources Unit.
7. From 1992 to 2002 there was a Department of Soil and Atmospheric Sciences.
8. In 2003, a new Department of Soil, Environmental and Atmospheric Sciences was formed within the School of Natural Resources (Natural Resources Unit).

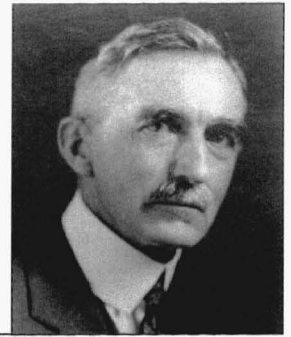
100 Years



M. F. Miller



J. W. Sanborn



Frederick B. Mumford

The University of Missouri was established in 1839 under the Geyer Act as the first public university west of the Mississippi River. Citizens of Boone County and the City of Columbia raised \$117,000 to win the competition among six central Missouri counties to place the University here.

In 2004, we celebrate the Centennial of the appointment of Merrill F. Miller as the first Professor and Chair of Agronomy. The Department was formed in 1904 when the Department of Agriculture was divided into Animal Husbandry and Agronomy. Preceding departments included: Horticulture, 1878; Veterinary Science, 1888; Agriculture, 1893; Agricultural Chemistry, 1894; Entomology, 1894; Home Economics, 1900; and Dairy, 1901.

The interest in Agronomy, Soil Science, and Atmospheric Science extends even further back than the establishment in 1870 of the College of Agriculture under the Morrill Act. The first Dean, George C. Swallow, had been a Professor of Geology since 1850. He tried to start an agriculture program in 1858, but it failed for lack of student interest.

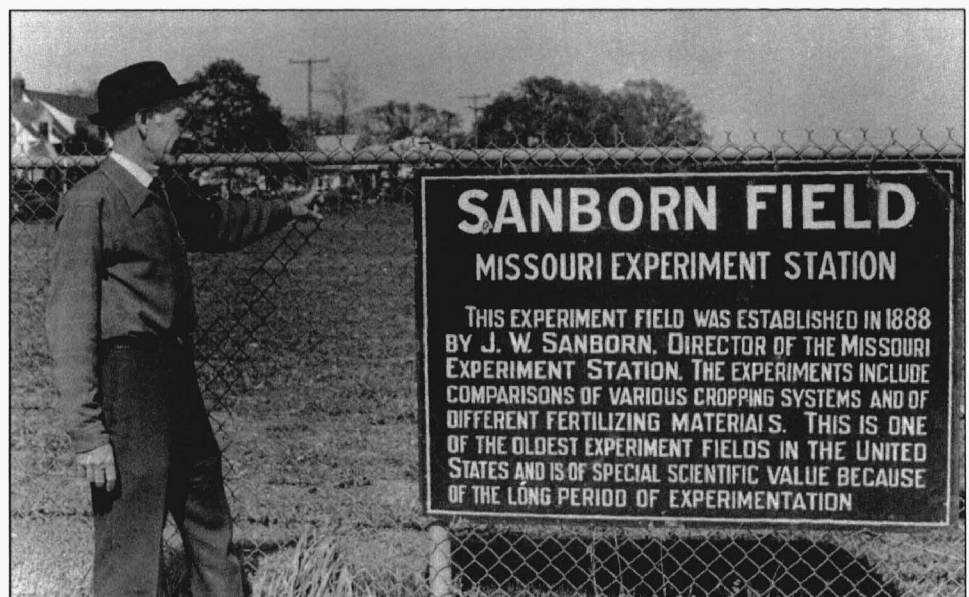
The Land Grant Act of 1862 was accepted by the Missouri General Assembly in 1863 but the College was not established until 1870. The first course taught by Dean Swallow was "Farm Crops: What should be culti-

vated; the management and culture of each".

As a consideration to locate the College in Columbia, Boone County and the city were required to give a bonus of \$30,000 and 640 acres of land, convenient to the present university grounds, as the agricultural college farm.

This was a clairvoyant requirement because the 1887 Hatch Act that established the Agricultural Experiment Station required that to receive the \$15,000 federal stipend annually, there must be a 25-acre farm where the students could observe and work with the professors as they did their research.

Jeremiah W. Sanborn became Dean in 1882 and served until 1889. Poehlman notes Sanborn's most important contributions were his numerous well-planned, practical experiments; the most memorable being the wheat plots established in the fall of 1888 on what is now Sanborn Field. (Sanborn Field was designated a National Historic Landmark in 1965 through the leadership of Dr. George E. Smith. Dr. Smith often said he wanted to prevent it from becoming a parking lot or a building site. When Mr. Jack Robinson from Boston was appointed as campus planning consultant in 1981, he emphasized that the historical significance and green



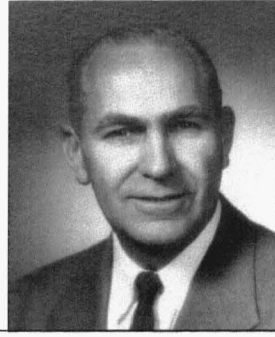
Clarence "Woody" Woodruff at Sanborn Field, Ca. 1950s. First cultivated in 1888, Sanborn Field has been the site of numerous long-range studies of crop rotation and fertilization.



C. F. Marbut



William Etheridge



J. M. Poehlman



Lewis J. Stadler



Ernie & Lottie Sears

space of Sanborn Field was a model for the rest of the campus.)

Sanborn started a Missouri State Agricultural Bulletin series in 1888. No. 1 was: "Announcement to Farmers: The So-Called "Hatch Bill Assent of Governor; Plan of Organization; Work and Experiments Proposed this Season: Personnel of Station" and No. 2, "A Study of the Life History of the Corn Plant and of the Physical and Chemical Conditions of Climate, Soil and Atmosphere, That Determine Its Profitable Growth."

By 1892 the agriculture teaching program was moved from the senior year of the B.S. degree to the first year. Poehlman notes the course offerings thereafter were nearly constant for more than 30 years.

Henry J. Waters (A native of Center, MO and an MU graduate) was appointed Dean in 1895 and served until 1909. The College flourished under his leadership.

Frederick B. Mumford came in 1895 as Professor of Agriculture. He served as acting Dean from 1903 - 1905 while Waters was on study leave. It was thus under Mumford's leadership that Merrill Miller was named the first Professor of Agronomy and the Department was formed. Miller had one assistant.

Poehlman notes that the 1897 - 98 course of study contained three titles: "The Soil" and "Principles of Manure

and Manuring (Subtitles: a) Constituents of Plants and b) Farm Crops.

The first use of the term Agronomy is found in the listings of 1902: (a) Agronomy A) Soils B) Fertilizer (b) Agronomy Farm Crops

Poehlman notes research was being more defined after forming the Department of Agronomy. The Annual Report of the Experiment Station in 1896 stated, "It is held that thorough and continuous work done along a few of the most important lines of investigation will be productive of the greater good to the agricultural interests than will be superficial and unscientific work covering many lines". This principle of choosing points of excellence and focus was important then and remains a guiding one to this day.

When the Department of Agronomy was established in 1904, College enrollment was 147 (72 in the winter course; 74 in the four-year collegiate course and one graduate student). Offices were in Switzler Hall on the Francis Quadrangle. In 1909 the offices were moved to the newly constructed Waters Hall.

Upon his appointment as Professor in 1904, Miller set the goal of "becoming familiar with the various soils areas of Missouri, the crops

adapted to them and the means for their improvement".

In 1905 the State appropriated \$5,000 to start a soil survey. C. F. Marbut, Professor of Geology, was appointed to lead this effort in cooperation with Agronomy and the Federal Bureau of Soils.

Included in the legislation was provision for establishing outlying experimental fields. This effort grew from 5 to 39 locations. The general rule was to rent 5 - 10 acres and establish a rotation. After 5 - 10 years, Miller felt more could be learned by closing one location and moving to another.

As the years progressed, other faculty members were doing cooperative experiments on farmers' fields. Studies of alfalfa, sugar beets, cowpeas, corn trials, field surveys of pastures, variety experiments on wheat, winter and spring oats and winter and spring barley were conducted. By 1912 there were 235 cooperative experiments in 108 of the 114 counties. This brought the research close to the people, a remarkable forerunner to extension work across this widely diverse state.

In 1902 students in the College of Agriculture Club proposed formation of an organization to promote seed corn and corn cultural practices. From this beginning the Missouri Corn Growers Association was formed in 1904. This organization flourished for

many years, then waned. In 1982 the corn growers reestablished a state-wide organization with the cooperation of the Agronomy Department. This group played a major role in bringing the home office of the National Corn Growers from Iowa to its present headquarters in St. Louis. In the early 1980s, this group also tried to establish a corn checkoff system for research and promotion, but were thwarted by the commercial hybrid companies.

The Missouri Soybean Association was formed in 1966. Again, with cooperation from the College, they played a major role in establishing a checkoff system for soybean research and promotion. Through these funds, research and extension projects were funded and the first Soybean Extension Specialist, Zane Helsel, was employed in 1980. The organization lobbied to obtain Federal funds for positions at MU and the Donald Danforth Plant Science Center in St. Louis in the 1990's. They endowed three chairs for soybean research and, more recently, they played a key role in working with Senator Christopher (Kit) Bond as he obtained \$33.3 million for the Life Sciences Center to be opened in 2004.

After Henry Waters went to Kansas State University as President, Mumford served as Dean from 1909 - 1938. He emphasized a principle that serves well to this day, "No hard and fast line is drawn between the College and the Station. All Staff will do some original investigation; those with unusual capacity for research will be encouraged to devote more time to investigation, those who exhibit special ability for teaching are encouraged to devote more time to teaching". This approach continues after 100 years to serve students of the College and research activities of the Station contribute to the welfare of all Missourians. It is a land grant prin-



William A. Albrecht, soil scientist, identified the soil on Plot 23 on Sanborn Field that became the source of Aureomycin, the world's second antibiotic.

ciple from which the entire University can benefit.

In 1914 C. B. Hutchison (a Missouri native and MU graduate), was serving on the Agronomy faculty. He received an appointment offer at Cornell University. As a consideration for him to stay at MU, Miller agreed to his request for a separate Farm Crops Department and split the Agronomy Department into three departments: Farm Crops, Soils and Agricultural Engineering. Two years later, Hutchison accepted a second offer from Cornell.

William C. Etheridge came to MU from Florida in 1916. He became Professor and Chair, a post he held for 39 years until 1955.

Thus, Miller and Etheridge set about building unique departments of Soils and Farm Crops (renamed Field Crops in 1920).

Poehlman (to whom the editor is deeply indebted for much of this early history) suggests that Miller and Etheridge charted widely different paths for their departments. (The editor honors this conclusion, but will develop a different one.)



An early soils science class.

Agriculture in Missouri entered a new era with the establishment of the College. F.B. Mumford, animal scientist and later dean of the College, devoted his life to establishing a strong research foundation. It was under Mumford's leadership that the Department of Agronomy was formed.



Miller, Poehlman notes, surrounded himself with colleagues like Albrecht, Bradfield, Jenny, Bauer and Marshall whose basic research brought a national reputation to the Soils faculty. However, as we shall see, the Soils faculty also developed soil survey, soil chemistry and testing, soil erosion, fertility and irrigation management that greatly benefited the Missouri farmer.

Etheridge, Poehlman notes, disdained the national scene; he remained steadfast to the principle that departmental research in field crops should be dedicated to improving the welfare of the Missouri farmer. He also filled his ranks from former students. It is true he made this local emphasis, but he also sought Federal funds which first supported Lewis J. Stadler (maize and barley genetics) and Ernest R. Sears (wheat genetics).

Stadler (funded by USDA and MU 50/50, 1930-1954) was appointed in 1917 and Sears (USDA) in 1936. Both earned National Academy of Science membership for their basic research. In sum, Etheridge often sought Federal funds for faculty positions. Professor Emeritus Lloyd Cavanah

tells this wonderful story. "I drove Prof. Etheridge – he didn't choose to drive a car himself. If I took him to Jefferson City and he couldn't get the funds he wanted, he'd get on the train and go to see Clarence Cannon, Speaker of the U.S. House of Representatives (Missouri). Mr. Cannon would often see to it that new Federal funds became available – a tradition Senator Christopher (Kit) Bond continues to this year of the Centennial.

Poehlman notes Miller brought faculty from many places; Etheridge filled his faculty from the ranks of former students.

The story of L. J. Stadler is a case in point. He was a St. Louis native, but earned his B.S. in Florida and took several classes from Etheridge when Etheridge was teaching there. Etheridge brought him to MU to pursue graduate studies on improvement of cereal crops with a scholarship funded by the USDA. Stadler attained a Ph.D. in 1923 and continued on the faculty for his career.

It is interesting to reflect that we sometimes now think our faculty members are unique because not all are

on State or Hatch/Smith/Lever funds. Records show that multiple sources of funds have been used throughout our history.

We are now ready to trace the history of individual program themes and their current status.

We have noted Miller's statewide efforts to study Missouri soils and the crops that were adapted to them across the state.

SOIL SURVEY GENESIS AND CLASSIFICATION

The Soil Survey, starting with \$5,000 of state funds, was led by C. F. Marbut from 1905 - 1916. When he left to head the Federal Bureau of Soils, H. H. Krusekopf (on the faculty since 1908) took leadership of the Soil Survey. Clarence L. Scrivner (1943 - 86) followed Krusekopf and gave foundational support to Soil Surveys. In recent years, R. David Hammer (1986 - present) has directed a State-funded, accelerated soil survey laboratory that places Missouri in the front rank of fully mapped soils.

SOIL MICROBIOLOGY

William A. Albrecht (1914 - 57) was a widely known and inspirational introductory soils teacher and developed a course in Soil Microbiology. He was employed by Miller to address nitrogen deficiencies in crop production through legume inoculation. In collaboration with Dr. Benjamin Duggar (a former MU faculty member) and the Lederele Laboratories in New Jersey, he identified the soil of Plot 23 on Sanborn Field that became the source of Aureomycin, the second antibiotic (after penicillin). A sample of soil from Plot 27 is stored in the Smithsonian Institution.

George Wagner (1957 - 1992) focused on the carbon cycle in soils and development of C14 measuring methods as well as teaching soil microbiology. Wagner served as Agronomy Director of Graduate Studies for 25 years and was Department Chair from 1983 - 84.

Robert Kremer (USDA) (1983 to present) studies ways to use natural soil microorganisms to suppress weeds. He teaches Soil Microbiology.

Gregory Buyanovsky (1981 - 95) generalized long-term data from Sanborn Field and found that more productive crop varieties since 1950 provide a very positive carbon balance.

Diann Jordan (1990 - 2000) served in the Soil Microbiology teaching and research effort and focused on earthworm communities.

SOIL CHEMISTRY AND SOIL TESTING

Work by E. R. Graham and C. M. Woodruff laid the foundation for an extensive county-based soil testing system. T. R. Fisher (1960s) provided major studies in soil testing and crop yield calibration studies as well as teaching soil fertility.

Robert W. Blanchar (1968 - 99) taught soil chemistry and conducted research using micro-electrodes for pH, pE, and ion activities as well as chemical equilibria in soil and water systems.

B. G. Volk (1984 - 90) served as Department Chair of Agronomy from 1984 - 90. In 1990, he assisted the University of Missouri and the USDA-ARS obtain the water quality grant

called the Missouri Management Systems Evaluation Area (MSEA) project.

A regional soil testing laboratory was established at the Delta Center paid for by subscription from the nine Delta counties in the late 1960's. J. R. Brown developed a second regional lab to serve the northern counties in 1977. Manjula Nathan (1994 to present) directs the Soil Testing and Plant Diagnostic Service Laboratories and is in charge of the Missouri Soil Testing Association's accreditation program.

SOIL FERTILITY AND PLANT NUTRITION

James R. Brown (1963 - 98) taught Soil Fertility and Plant Nutrition and did a wide range of soil fertility studies on both row and forage crops.

Earl Kroth (1959 - 80) gave special emphasis to forage fertilization and taught soil conservation..

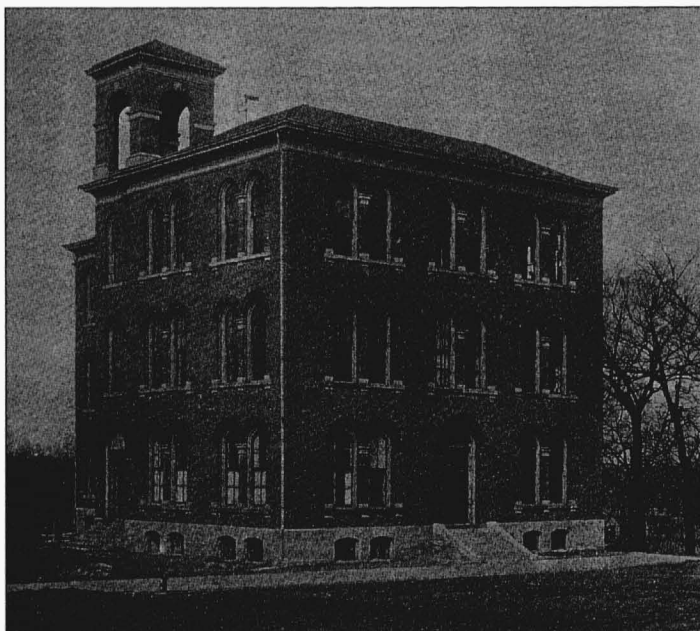
James Roth (Delta Center) (1953 - 81) provided soil fertility research on all Delta Center crops.

Peter Motavalli (1999 to present) teaches Soil Fertility and Plant Nutrition, Soils and the Environment, and researches nutrient cycling and nutrient management practices.

Gene Stevens (Delta Center) (1994 to present) conducts research and extension in soil fertility for all Delta Center crops.

Gary W. Colliver (1974 - 79), Daryl Buchholz (1980 - 91), Nyle Wollenhaupt (1985 - 89), Roger Hanson (1976 - 89) and Paul Tracy (Delta Center [1986 - 93]) each carried on soil fertility research extension roles.

Peter Scharf (1995 to present) develops and promotes methods to optimize nutrient application rates and



Agricultural Hall (now known as Switzzler Hall) on Francis Quadrangle, was the original home of the Department of Agronomy in 1904.

to minimize nutrient movement to surface and ground water.

John Lory, Commercial Agriculture (1995 to present), focuses on efficient use of nutrients to protect water quality and develops decision support for nutrient management planners.

SOIL EROSION, CONSERVATION TILLAGE AND PRECISION AGRICULTURE

Missouri was a pioneer in soil erosion studies. A student project by R. W. McClure (1915) was followed up by M. F. Miller, F. L. Duley (1915 - 28) and C. M. Woodruff. L. D. Baver directed the reconnaissance soil erosion survey in 1935. The original plots are commemorated near the University Hospital. Designated a National Historic Site in 1965, they spawned ten erosion stations across the U.S. to study soil erosion. Woodruff worked at the Bethany site in the early 1930's. In 1935, the McCredie site near Kingdom City (selected by Woodruff and Krusekopf) was purchased for the

claypan erosion station. R. E. Burwell (USDA) (1954) was an early leader at McCredie. The McCredie ownership was transferred from USDA to the Missouri Agricultural Experiment Station in 1957.

Clark Gantzer (1982 to present) studies tillage effects on erodibility, organic matter and soil structure using fractal x-ray computer tomograph, and teaches Soil Conservation.

Several USDA personnel continue this long tradition.

Newell Kitchen (USDA) (1990 to present) studies precision farming and water quality, soil fertility, crop nutrient management and site specific crop management.

Robert Lerch (USDA) (1991 to present) focuses on soil and water chemistry, and watershed vulnerability to losses of agricultural chemicals.

E. E. Alberts (USDA) (1979 to present) works on management systems for controlling soil erosion.

Michael Aide (SEMO) (2003 to present) works the areas of soil mineralogy and soil genesis and classification.

Claire Baffaut (FAPRI) (2002 to present) leads the Watershed Modeling Group in the Food and Agricultural Policy Institute.

Glenn Davis (1997 to present) studies optimizing spatial applications of fertilizer to promote use of precision agriculture.

Frieda Eivazi (Lincoln University) (1988 to present) does research and teaching in conservation tillage and agricultural sustainability.

CLAY MINERALOLOGY

The chemistry of colloidal clays (a major soils challenge in Northeast Missouri) was studied in depth by Richard Bradfield (1920 - 27), Hans Jenny (1927 - 36), L. D. Baver (1928 - 37), C. E. Marshall (1936 - 76), E. R. Graham (1937 - 77), and William Upchurch (1953 - 84).

SOIL PHYSICS

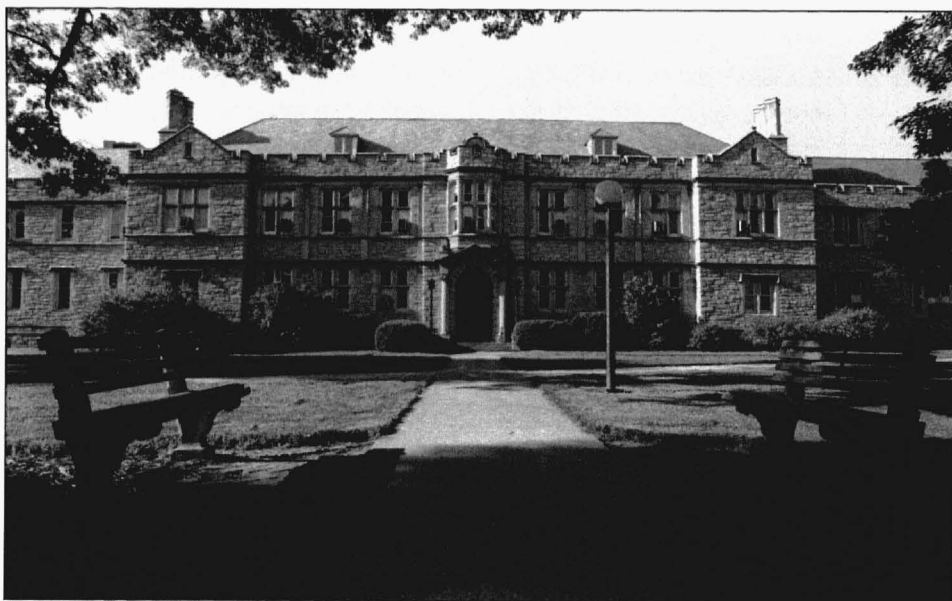
L. D. Baver (1928 - 37) worked on the influences of exchangeable cations on the structure of colloidal clay. After leaving Missouri, he wrote one of the early textbooks in soil physics.

C. M. Woodruff (1938 - 76) took ideas from Sanborn Field to establish claypan irrigation guidelines still in use today.

Joe Bradford (USDA) (1969 - 78) studied the mechanics of gully erosion and the effects of subsoil modification on plant growth.

Vernon C. Jamison (USDA) (1955 - 68) worked on soil and water conservation and management for claypan soil.

William Teague (1976 - 83) taught soil physics courses and worked on the concept of effective soil water potential for steady, radial-axial flow of water in root systems.



Waters Hall became the home of the Department of Agronomy when it was constructed in 1909.

Stephen H. Anderson (1985 to present; Department Chair) teaches Soil Physics and evaluates macropore-scale soil hydraulic properties and processes using x-ray computed tomography. He served as the Director of Graduate Studies for Soil Science for 14 years.

John Sadler (USDA) (2003 to present) is the research leader for the Cropping Systems and Water Quality Unit and works in precision agriculture.

SOILS EXTENSION

Extension support for soil testing work was provided by A. W. Klemme, Marshall Christy, Alva Preston and John Falloon.

C. J. Johannsen (1972 - 84) conducted extensive remote sensing studies of Missouri soils.

FOREST SOILS

Gray Henderson (1978 - 99) taught "Forest Soils" and "Natural Resources Management and Water Quality" courses and studied watershed management effects on water quality.

Felix Ponder works for the U.S. Forest Service and has had an adjunct appointment with the Soils Department since 1994. He is currently doing research in the area of disturbance ecology. He investigates how soil processes are affected as disturbed ecosystems recover or reach some level of stability.

SOILS TEACHING

Albrecht, Graham, Woodruff, Scrivner, Luther Hughes (1978 - 83) and Randall Miles (1983 to present) have carried the lead role in teaching Introductory Soils.

Randy Miles now serves as Director of the MO Small Flows Wastewater Research Training Center at Bradford Farm, coaches the MU Soil Judging Team and provides administrative leadership for Sanborn Field. He is also the Director of Graduate Studies in the Department of Soil, Environmental and Atmospheric Sciences.

Introductory Soil Science Lab is taught on a rotation basis with Drs. Blanchar, Anderson, Gantzer, Miles, Hammer, and Motavalli having taken turns in the past 10 years.

ATMOSPHERIC SCIENCE

The Atmospheric Science Program at MU began with a cooperative agreement between MU and the U.S. Weather Bureau in 1948.

Wayne Decker (1949 - 92) was appointed to the first agricultural climatology position in 1949 located in the Soils Department. Courses were initially taught in Geography in the College of Arts and Science. Decker served as Chair of Atmospheric Science from 1967 - 92).

Early focus was on climatic risk analysis. The M.S. and Ph.D. programs resulted from the National Defense Education Act in the 1960's.

Grant Darkow (1961 - 95) was appointed in 1961 to develop theory courses, advise graduate students and he developed a research program in the dynamics of severe storms.

James McQuigg, National Oceanic and Atmospheric Administration, was an active cooperator beginning in the late 1950's.

Ernest Kung (1967 - 1999) focused on the energetics of the atmosphere. He was Chair of the Department of Soil and Atmospheric Science from 1995 - 98.

James Harrington and Robert Livezy had short appointments followed by Stephen Mudrick (1976 - 99). He focused on the dynamics of mid-latitude frontal zones and cyclonic storms.

Christopher Ratley (1988 - 98) gave additional emphasis on undergraduate teaching and advising, and served as advisor to the undergraduate Meteorology Club.

The Department was first housed in a residence on Missouri Avenue, then from 1970 - 90 in a house on Hitt Street. They moved to Gentry Hall in 1990 and McReynolds Hall in 2002.

Wayne Decker was appointed State Climatologist in 1973. In 1995 Dr. Steve Hu followed and in 1998, Dr. Fikri A. Akyuz accepted this post.

Clarence Sakamoto (1975 - 88), Research Meteorologist, spearheaded USAID programs for assessing food security in developing countries.

The Cooperative Institute of Applied Meteorology (1985 - 92) formalized a long partnership of the Federal Government and MU.

Adnan Akyuz (1998 to present) teaches Climates of the World and Meteorological Instrumentation, is Director of the Missouri Climate Center and State Climatologist.

Pat Guinan (1996 to present) leads the Commercial Agriculture Automated Weather 21 Station Network.

Anthony Lupo (1997 to present) teaches Atmospheric Dynamics and researches large scale atmospheric dynamics, climate dynamics and climate change. He is now the Director of Graduate Studies for the Department of Soil, Environmental and Atmospheric Sciences.

Pat Market (1999 to present) teaches Synoptic, Mesoscale and Microscale Meteorology. His research focuses on weather systems that

generate copious rain and snow in a short period of time.

Neil I. Fox (2001 to present) teaches Introduction to Meteorology and Remote Sensing and currently advises the Meteorology Club : The Joint Student Chapter of the American Meteorological Society and National Weather Association. His research is on statistical thunderstorms nowcasting.

AGRONOMY

Field Crop Improvement has been a focus for many years. From the early variety and species evaluations begun by Miller, work evolved into plant breeding and now genomics.

Corn

Genetic work on corn by Stadler was followed by his former student, J. R. Laughnan (1954 - 55), who soon returned to the University of Illinois. M. G. Neuffer (1951 - 92) and Ed Coe (USDA) (1955 to present) continued corn genetics research. Their work on “Mutants of Maize” and genetic mapping was the foundation for a recent major NSF funded maize genome study.

Gregory G. Doyle (USDA) 1960 - 90) studied cytogenetics of polyploidy and inversions in maize.

Jack Beckett (USDA) (1963 - 90) carried out male sterility studies that contributed to amelioration of the Southern Corn Leaf Blight susceptibility and produced mapping tools for maize.

Russell Larson (USDA) (1964 - 90) researched genetic control of biochemical mechanisms.

Michael McMullen (USDA) (1993 to present) focuses on the genetic, biological and molecular basis of agronomic traits, particularly host plant response to pathogens and pests.



Mumford Hall.

Georgia Davis (1999 to present) does work on molecular mapping for fungal (*Aspergillus*) and insect (Southwestern Corn Borer and army worm) resistance. She also teaches “Current Topics in Genomics”.

Mary Polacco (USDA) (1995 to present) serves as curator of the Maize Genome Data Base.

Marcus Zuber (USDA) (1949 - 82) developed many outstanding inbred lines, developed methods for selection for stalk strength, improved white corn cobs for pipes and with his student Clarence Grogan (USDA) (1956 - 60) released widely used MO-17 inbred and other germplasm.

Peter Loesch (1960 - 73) collaborated with Zuber.

Larry Darrach (USDA) (1977 to present) focuses on corn root and stalk strength, food grade corn germplasm and serves as Research Leader for the Plant Genetics Research Unit, ARS, USDA since 1991. He teaches Applied Quantitative and Statistical Genetics.

David Willmot (USDA) (2001 to present) evaluates sources of corn rootworm and European Corn Borer

resistance, seed protein and stalk strength.

Zhanyuan Zhang (2000 to present) is Director of the Plant Transformation Facility for corn and soybeans to enhance the introduction of foreign genes.

Soybeans

Leonard Williams (USDA) (1951 - 65) was the first faculty member at MU to focus on soybean breeding. He released the widely adapted Williams variety.

Virgil Luedders (USDA) (19?? - ??) followed Williams and emphasized genetic studies of soybean cyst nematode resistance.

Williams’ student, Arnold Matson (1955 - 65), broke the link of black seed coat and resistance to soybean cyst nematode. Matson developed varieties at the Delta Center followed by Les Duclos (1966 - 75) and Grover Shannon (1974 - 76).

Sam Anand (1979 - 98) screened 10,000 cultivars of soybeans to find resistance to all known soybean cyst nematode races and released Avery Hartwig and Delsoy 5500 varieties



Curtis Hall.

among others. He continues work on superior oil compositions.

Grover Shannon (Endowed Professor) (1974 - 76; 2003 to present) develops productive cultivars, breeding methodologies for pest resistance and lines for special traits, e.g., modified fatty acids, tofu, hatto, high protein.

In 1988, the Missouri soybean producers called for a program to develop varieties for North Missouri.

Phil Owens (1989 - 94) found advanced material at Illinois and released Saline.

David Sleper (1974 to present) shifted his emphasis from grass breeding to soybeans in 1994 and focuses on resistance to soybean cyst nematode, Phytophthora root rot and other stresses as well as modifying oil and protein content. His releases include Mustang, Magellan, Maverick and 7 other varieties.

Paul Beuselinck (USDA) (1981 to present) works on soybean seed physiology with altered seed composition and effect on seedling growth.

Henry Nguyen (Endowed Professor) (2002 to present) studies genetics and physical mapping of traits

and genes controlling plant adaptation. He considers gene discovery and metabolic engineering for stress tolerance and value added traits.

Hari Krishnan (USDA) (1986 to present) seeks to improve the overall quality of soybeans and especially to increase methionine and lysine. He also studies biological nitrogen fixation.

Prakash Arelli (USDA) (1985 to 2001) (December 2001 to Present: Adjunct Professor) worked on finding new sources of resistance to the soybean cyst nematode and studying the inheritance of resistance.

Zane Helsel (1981 - 85) was the first full-time extension soybean specialist and was initially funded by the soybean checkoff.

Harry Minor (1978 - 2000) emphasized seed quality and variety evaluation methodology.

William Wiebold (1989 to present) followed him and built a comprehensive effort. A "Soybean Doc" regular column appears in *The Soybean Farmer* and he leads variety evaluation in soybeans and corn.

Dale Blevins (1978 to present) provides physiology leadership.

All of this soybean emphasis has led to plans for a federally designated National Center for Soybean Technology at MU.

Wheat Genetics and Breeding

The early work of Stadler on several species included wheat.

Ernest R. Sears (USDA) (1936 - 80) studied chromosome pairing and transferred rust resistance from rye to wheat, a feat that earned him (as Stadler before him) the prestigious Wolff Prize membership in the National Academy of Science.

Lottie Sears (1936 - 73) was a longtime associate of Ernie and examined chromosome behavior.

Gordon Kimber (1967 - 2001) studied a range of cytogenetic problems on wheat, participated in organizing the Stadler Genetics Symposium and taught cytogenetics.

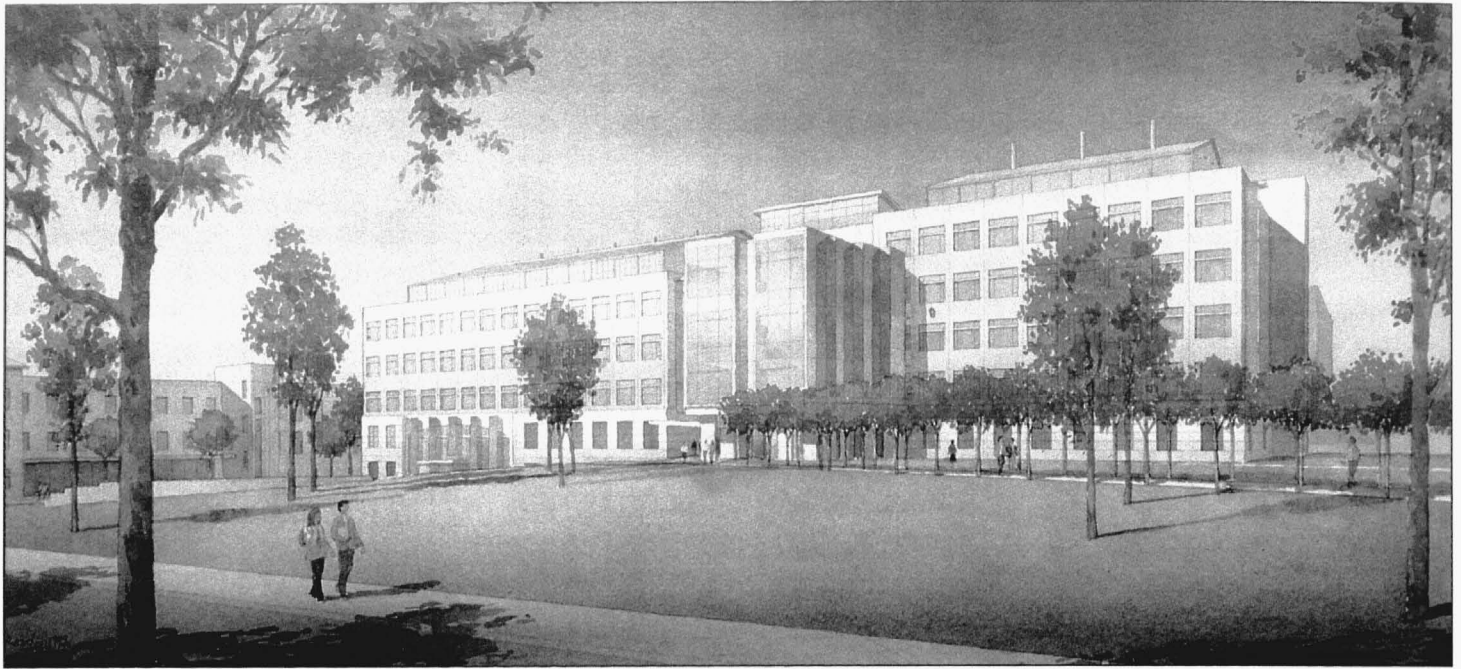
J. Perry Gustafson (USDA) (1981 to present) works on improved wheat tolerance on acid soils high in aluminum and gene expression in hybrids of wheat and other species, and has organized recent Stadler Genetics Symposia.

J. M. Poehlman (1936 - 80) released several varieties of wheat and published four editions of *Field Crop Breeding*, the last (1995) co-authored with D. A. Sleper.

C. Hayward was a collaborator on wheat breeding with Poehlman.

Dale Sechler (1955 - 60, 1967 - 86) followed Poehlman and released varieties as well as teaching plant breeding.

Anne McKendry (1987 to present) followed Sechler. She has released scab resistant Ernie and Truman (a national first) and teaches *Field Crop Breeding and Genetics of Agricultural Plants and Animals*.



The Life Sciences Center will be dedicated Sept. 17, 2004. Research programs housed in the Center will use new technologies to improve crop productivity, food safety, and animal health and reproduction.

FORAGE BREEDING AND MANAGEMENT

Emmett Pinell (1957 - 67) bred alfalfa and conducted variety trials.

Joe Baldrige (USDA) (1950s - 70s) researched lespedeza and birdsfoot trefoil; he released Dawn birdsfoot trefoil.

Marion Offut (1951 - 56) taught field crops and bred lespedeza.

Paul Beuselinck (USDA) (1981 to present) released Marion lespedeza and a rhizomatous strain of birdsfoot trefoil he found in Morocco.

Robert McGraw (1986 to present) evaluates a collection of native and introduced legumes for agroforestry uses. He teaches Introductory Plant Science and Forage Management.

Dwain Horrocks did alfalfa variety testing, research on corn production and extension corn, sorghum and soybean variety testing.

Kay H. Asay (1965 - 74) initiated the tall fescue breeding program.

David Sleper (1974 to present) focused on removing fungi endophytes in tall fescue and released no-endophyte MO-96 and several others.

Howell Wheaton (1968 - 85) developed extension programs in pasture management and economic fertility programs.

E. Marion Brown (USDA) (1938 - 61) researched a range of pasture management approaches.

A. G. Matches (USDA) (1961 - 82) pursued systems forage management, plant-animal interactions, added a number of native and introduced species and led an interdisciplinary forage management group of faculty.

J. C. Henning (1980s) provided leadership for forage management extension.

James Forwood (USDA) (1982 - 85) continued the forage management research.

Craig Roberts (1988 to present) provides extension knowledge for forage quality and grazing systems and leads work in forage quality evaluation

and natural defense proteins in tall fescue and birdsfoot trefoil.

James Gerrish (1981 - 2003) researched pasture management, introduced management intensive grazing and developed the concept of grazing schools at the Forage Systems Research Center in Linneus, MO.

Richard Joost (Southwest Center - 1990 - 93 and Columbia -1993 - 96) led the Southwest Center and conducted research on forage management.

Rob Kallenbach (1998 to present) emphasizes winter feeding systems for beef and dairy cattle including improved alfalfa hay production, stockpiled fescue and winter annuals to extend the grazing season.

C. Jerry Nelson (1967-2002 as full time, 50% time to present). Research activity was on photosynthesis, leaf elongation rates, and tillering of tall fescue; seedling growth of perennial warm-season grasses; and physiology studies on seedling establishment and persistence of alfalfa.

Richard Mattas (Southwest Center) (1965 - 99) supported a wide range of agronomy field studies.

COTTON

William Sappenfield (1948 - 51; 1956 - 88) developed short season cotton varieties for the Delta Center.

David Albers (1991 - 94) developed cotton production models and precision agriculture.

Bobby Phipps (1989 to present) has a comprehensive research/extension program: variety trials, irrigation, replanting, defoliation, fertilizers and growth regulators.

ARABIDOPSIS

George Redei (1957 - 91) introduced this plant from Hungary and laid the foundation for its present widespread research use. He taught Plant Genetics, initiated the Stadler Genetics Symposium and published a textbook Genetics, a Genetics Manual: Current Theory Concepts, Terms and an Encyclopedic Dictionary of Genetics, Genomics and Proteomics.

CROP PHYSIOLOGY was added as a disciplinary focus in Agronomy in 1967. C. J. Nelson (First Curators' Professor in Agriculture) (1967 - 2002) researched carbon metabolism and cellular dynamic associated with leaf growth of tall fescue and alfalfa persistence. He taught Plant Science Orientation and Crop Physiology and co-authored the two volume, 5th and 6th Editions of the resource book Forages.

David Johnson (1970 - 1977) researched soybean physiology and soybean production, including an integrated approach to soybean research involving multiple disciplines. He

taught an undergraduate course in Crops and Soils Management that integrated the principles of crop and soil science, a graduate-level crop physiology course, and coordinated graduate seminars.

Dale Blevins (1978 to present) studies plant nutrition and physiology with an emphasis on the role of boron and the effects of phosphate on magnesium uptake and transport. He teaches Plant Physiology and Nutrient Uptake and Metabolism in Plants.

Mel Keener (1970s) conducted corn modeling studies on corn with special emphasis on water stress.

Robert Sharp (1986 to present) (Department Chair) addresses regulation of root and shoot growth responses to drought (with special emphasis on abscisic acid) and teaches Advanced Plant Physiology.

WEED SCIENCE

O. Hale Fletchall (1948 - 85) established weed science research and teaching. He evaluated essentially all available herbicides.

Elroy Peters (USDA) (1956 - 85) researched weed management systems for legume establishment in pastures.

Harold Kerr (1967 - 92) first at the Delta Center, then at Columbia, researched herbicide and crop management systems for weed control.

Mike DeFelice (1985 - 94) expanded the commercial firms supporting his independent evaluation of herbicides and development of weed management systems. He innovated the use of computer and image technology in teaching weed science.

Bill Johnson (1995 - 2002) continued this program with emphasis on herbicide evaluation in no-till management systems.

Laurel Anderson (1965 - 85) offered a comprehensive extension program in weed management.

Andy Kendig (1992 to present) provides research and extension weed science support to Delta producers.

Richard Aldrich (1978 - 88) taught weed science and developed a textbook with Robert Kremer entitled Principles of Weed Management.



The Clover and Prosperity demonstration truck carried extension exhibits to 12 counties in 1922.

William Donald (USDA) (1989 to present) studies economical weed management to minimize surface and ground water contamination.

Reid Smeda (1996 to present) teaches Weed Science and researches alternative weed management systems as well as biology of new and problem weeds. He also serves as Plant Science Director of Undergraduate Studies Programs for Plant Science.

Kevin Bradley (2003 to present) evaluates new herbicides and weed management techniques. He studies the interactions that occur between weeds, insects, and diseases as well as herbicide resistant biotypes.

Shawn Conley's (2001 to present) applied extension and research program focuses on small grains production, alternative crops, and cropping systems management with a strong focus on winter wheat and alternative crop production systems.

For many decades the introductory crops course was taught by the depart-

ment chair. Introductory Crops Teaching was led in recent years by Charles Hayward, C. Jerry Nelson, Kenneth Larson, Diane Helsel, Kenneth Larson and Robert McGraw.

CROPS EXTENSION

Jay C. Hackleman (1917) was the first Extension Professor of Field Crops.

Viola Stanway (1941 - 79) served as the seed analyst for certified seed.

Lloyd Cavanah (1948 - 85) taught Seed Science, supervised the Bradford Farm, led the Foundation Seed Program and guided the Department's business management.

Wynard Aslin (1962 - 87) led the Missouri Seed Improvement Association.

Bill Murphy (1949 - 81) and J. Ross Fleetwood covered all aspects of field crops extension.

James Schaffer (1983 - 83) was the small grains extension specialist.

Joe Scott (1958 - 88) served the Delta producers in crops extension from 1958 - 82 and as Superintendent of the Delta Center from 1982 - 88.

R. Dwain Horrochs (1967 - 78) carried out expanded state-wide evaluations of corn and sorghum hybrids and soybean and alfalfa variety trials.

Harry Minor (1978 - 2000) directed the state-wide variety trials and provided multiple crop extension and research with Helsel on early season short-day hybrid corn. He also pioneered expanded variety testing.

Ken Kephart (1980s) carried out extension and research on small grains.

Fred Fishel (1996 to present) is responsible for the Integrated Pest Management and Pesticide Safety programs.

Harlan Palm (1999 to present) focuses on precision agriculture and leads a project to implement and validate sensor-based, site-specific crop management.

Shawn Conley (2001 to present) does extension and research on small grains, alternative crops and cropping systems management.

Paul Tracy (1986 to present) at the Delta Center and then MFA is Director of Agronomy Services for MFA Incorporated and collaborates with several faculty.

Rob Myers (1989 - 94; 1998 to present) first served in a Food for the 21st Century position on alternative crops and now is Director of the Thomas Jefferson Agricultural Institute which seeks to improve agricultural sustainability.

Kelly Nelson (Greenley Research Center) (2000 to present) researches integration of crop production systems with the economic realities of farm management.



J.W. Sanborn in Sanborn Field.

AGRICULTURE EXPERIMENT STATION

Gary F. Krause (1965 - 2003) served as Station Statistician and helped many faculty members develop their statistical design as well as teaching statistics to many of our students.

Sanborn Field (1888 to present), with its illustrious history, had the following faculty in charge:

1.	J. W. Sanborn	1888 - 1889
2.	H. J. Waters	1889 - 1904
3.	M. F. Miller	1905 - 1917
4.	F. L. Duley	1918 - 1925
5.	H. H. Krusekopf	1926 - 1936
6.	George Smith	1937 - 1982
7.	W. A. Albrecht	1942 - 1949
8.	George Smith	1949 - 1966
9.	C. M. Woodruff	1966 - 1976
10.	William Upchurch	1976 - 1984
11.	J. R. Brown	1984 - 1998
12.	Randy Miles	1998 to present

Bradford Farm (Agronomy Research Center) (1959 to present) had three leaders:

1. Lloyd Cavanah (with day-to-day support by Al Kastner)
2. John Poehlman
3. Tim Reinbott (present)

Department Chairs

<u>Name</u>	<u>Department</u>	<u>Time of Service</u>
1. M. F. Miller	Agronomy	1904 - 1914
2. M. F. Miller	Soils	1914 - 1938
3. C. B. Hutchison	Farm Crops	1914 - 1916
4. W. A. Albrecht	Soils	1938 - 1958
5. George Smith	Soils	1958 - 1967
6. William C. Etheridge	Field Crops	1916 - 1957
7. E. Pinnell	Field Crops	1957 - 1967
8. C. M. Woodruff	Agronomy	1967 - 1969
9. Wayne Decker	Atmospheric Science	1967 - 1992
10. R. L. Mitchell	Agronomy	1969 - 1972
11. L. Cavanah	Agronomy	1972 - 1973
12. E. C. A. Runge	Agronomy	1973 - 1980
13. R. Aldrich	Agronomy	1980 - 1981
14. R. L. Mitchell	Agronomy	1981 - 1983
15. G. Wagner	Agronomy	1983 - 1984
16. B. Volk	Agronomy	1984 - 1989
17. C. J. Nelson	Agronomy	1989 - 1991
18. R. Blanchar	Soil and Atmospheric Sciences	1992 - 1995
19. E. Kung	Soil and Atmospheric Sciences	1995 - 1998
20. David Sleper	Agronomy	1991 - 1999
23. R. D. Hammer	Soil and Atmospheric Sciences	1998 - 2002
22. Dale Blevins	Agronomy	1999 - 2000
23. Robert Sharp	Agronomy	2000 - present
24. Steve Anderson	Soil, Environmental and Atmospheric Sciences	2003 - present

To access current faculty and an expanded, current summary of their programs, see these websites:

<http://www.psu.missouri.edu/agronomy/faculty.stm>

<http://www.snr.missouri.edu/seas/faculty.html>

FACULTY IN NATIONAL SOCIETIES

National Academy of Sciences

L. J. Stadler
E. R. Sears

Presidents of Professional Societies

American Society of Agronomy

M. F. Miller (1924)
R. L. Mitchell (1980)
C. J. Nelson (1996)

Soil Science Society of America

W. A. Albrecht (1938)
C. E. Marshall (1946)

International Crop Science Society

C. J. Nelson (2000 - 2004 - Inaugural President)

Crop Science Society of America

R. L. Mitchell (1976)
C. J. Nelson (1988)
D. A. Sleper (2001)

American Genetic Association

E. H. Coe (1994)

Genetics Society of America

Ernest R. Sears (1978 - 1979)

FELLOWS

American Society of Agronomy

W. A. Albrecht	1937
D. G., Blevins	1992
L. L. Darrah	1994
J. P. Gustafson	1998
C. J. Johannsen	1981
N. E. Justus	1988
K. L. Larson	1978
A. G. Matches	1976
R. L. Mitchell	1973
C. J. Nelson	1978
E. C. A. Runge	1977
D. A. Sleper	1985
R. J. Volk	1985
G. H. Wagner	1980
C. M. Woodruff	1955

Soil Science Society of America

W. A. Albrecht	1937
R. W. Blancher	1985
J. R. Brown	1998
C. J. Johannson	1981
R. L. Mitchell	1973
E. C. A. Runge	1977
G. H. Wagner	1980
C. M. Woodruff	1955

Crop Science Society of America

D. G. Blevins	1992
E. H. Coe, Jr.	1993
L. L. Darrah	1990
K. L. Larson	1978
A. G. Matches	1976
R. L. Mitchell	1973
C. J. Nelson	1978
H. T. Nguyen	1999
D. A. Sleper	1986



*L - R, Row 1: Roger Mitchell, Patrick Market, Anthony Lupo, Stephen Muckrick
Row 2: Frieda Evazi, Robert Sharp, Larry Darrah, John Sadler, David Slexer, Grover Shannon,
Peter Scharf, Wayne Decker
Row 3: David Willmot, Perry Gustafson, Sam Anand, Robert Kallenbach, Jerry Nelson, Dale
Sechler, George Wagner, Howell Wheaton, Manjula Nathan
Row 4: Craig Roberts, Fred Fishel, Claire Baffaut, Kevin Bradley, Dale Blevins, Gerry Neuffer,
C. L. Scrivner, Clark Gantzer, Reid Smeda, Anne McKendry
Row 5: Henry Nguyen, Paul Tracy, Harlan Palm, Adnan Akyuz, Pat Guinan, William Wiebold,
Robert McGraw, Gene Stevens, John Lory, Peter Motavalli, Eugene Alberts
Row 6: John Yang, Robert Lerch, Newell Kitchen, Randy Miles, Steve Anderson, Zhanyuan Zhang*

