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## PROGRAM REVIEW 1993: Self Study Report Department of Biometry

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# **PROGRAM REVIEW 1993**



**Self Study Report  
Department of  
Biometry**



*University of Nebraska-Lincoln*

## Executive Summary

The CSRS review team applauds the statistical expertise of the Biometry Department which began as the Statistical Laboratory in 1957 and culminated with the current academic Department of Biometry. This enhancement has been highlighted by a significant increase in the number of faculty and staff, the initiation of a Master of Science program, and the provision of graduate assistant stipends. With the presence of seven faculty, the imminent increase from seven to fifteen graduate students, the establishment of statistical consulting with numerous IANR faculty, and the diverse research and teaching expertise of the faculty, the department is poised to provide greater service to the University. Future goals may include: (1) establishment of a statistical department worthy of national recognition by joining the faculties of the Department of Biometry and the Division of Statistics from the Department of Mathematics and Statistics, and (2) the formation of a PhD program in Statistics that encompasses biometry and theoretical statistics.

It is apparent that the faculty is capable of conducting statistical research of a more theoretical nature. However, securing research grants as principal investigators or as co-investigators with other UNL faculty is required to fully support those research endeavors. With successful grant activity a greater portion of research results should be published in statistical journals.

Based on discussions, consultations on experimental design and data analysis are appropriate and much appreciated by IANR faculty. While personal consultations have been highly beneficial, the initiation of a "Help Desk" provides rapid and accurate response to straightforward statistical questions; thereby relieving the Biometry faculty for personal consultation on more complex statistical issues. The help desk provides valuable and "real world" training for graduate students.

Courses taught as a service to undergraduate and graduate IANR students appear to be appropriate in number and content. With a master's program successfully started, more formal policies for recruitment, selection, advising, and placement should be initiated. Further attention is required to provide space, computers, and advisers for graduate students.

Faculty expressed an appreciation for the strong support provided to Biometry by the administration from the Head, Deans, and Vice Chancellor. The team however, notes several management concerns including: the lack of faculty meetings; inadequate communications among Head, faculty, and graduate students; the need for continual curriculum improvement; and the lack of sufficient office and laboratory space. Concern is also raised about the potential over-commitment to international consulting at the expense of performing departmental functions.

The team is reluctant to recommend the immediate initiation of a PhD program in the Biometry Department. Establishment of a successful master's program before pursuing the doctoral program appears prudent. The merger of the two UNL statistical groups into one department would position UNL for a strong PhD program.

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## Comprehensive Review Schedule

July 5-8, 1993

### Monday, July 5

6:00 - 8:30 p.m. Review team organizational meeting {Cornhusker} *on calendar* John Meadows

### Tuesday, July 6

7:30 - 9:00 a.m. Breakfast with IANR administration {ECU} *on calendar* David B. Marx  
9:00 - 9:30 Break  
9:30 - 11:00 Department overview {ECU} David B. Marx  
11:00 - 12:00 Departmental Professional Staff {ECU} Eugene Boilesen  
12:00 - 1:30 p.m. Lunch {NCCE} Linda Pavlish  
1:30 - 2:00 Faculty {ECU} David B. Marx  
2:00 - 2:30 Faculty {ECU} Walt Stroup  
2:30 - 3:00 Faculty {ECU} Linda Young  
3:00 - 3:15 Break Stephen Kachman  
3:15 - 4:15 Graduate Students {ECU}  
4:15 - 4:45 Animal Science Department {ECU}  
6:30 - 8:30 Dinner with faculty and administration {NCCE} David B. Marx

### Wednesday, July 7

8:30 - 9:30 a.m. Assoc. Vice Chancellor Academic Affairs {Adm} David Brinkerhoff  
9:30 - 10:30 Dean College of Arts & Science {1206 OldH} John Peters  
10:30 - 11:30 Math Department {827 OldH}  
12:00 - 1:30 p.m. Lunch with Department Heads {ECU}  
1:30 - 2:00 Faculty {ECU} Kent Eskridge  
2:00 - 2:30 Faculty {ECU} Carol Gotway  
2:30 - 3:00 Faculty {ECU} Anne Parkhurst  
3:00 - 3:30 Support Staff {ECU} Leona Barratt  
3:30 - 4:00 Agronomy Department {ECU} Jon Borton  
4:00 - 5:30 Review team report preparation {ECU} Donna Seefeld  
*on calendar* John Meadows

### Thursday, July 8

8:00 - 10:00 am Exit report to IANR administration {ECU} John Meadows  
10:30 - Noon Exit report to faculty {ECU} John Meadows

## **Review Panel**

**Dr. John Meadows**  
Cooperative States Research Service  
U.S. Department of Agriculture  
Washington, D.C. 20250-2200  
Phone: 202.401.6602

**Review Panel Chair**

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**IANR Representative**

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**Graduate Student Representative**

## A. INTRODUCTION

This 1993 self-study report will build upon the most recent evaluation of the department done in 1985. The Department of Biometry continues to respond to the needs of the Institute of Agriculture and Natural Resources (IANR). However, with the development of a Masters degree program the department has become more diversified and acquired a broader perspective for its mission with IANR. We begin by reviewing the previous study and amplify the mission stated therein.

In 1985 a self-study and review of the programs of the Biometrics and Information Systems Center (BISC) was made. This report begins with a definition of Biometry which is instructive here: "Biometry is a subject matter discipline concerned with strategies for the observation of biological phenomena, and with designs for the collections of biological data and their subsequent statistical analysis and interpretation. Biometry, as a subject matter discipline, is a member of the area of statistics, much as agronomy is a member of the area of botany or animal science is a member of the area of zoology. Biometry is unique among the statistical sciences in that it involves the active practice of statistical design and analysis of biological research."

During the past four years the Department of Biometry has grown from four faculty to a total of six faculty and has become an academic department within IANR and UNL. The current graduate degree program in Biometry is

Population breeding in sorghum (with W.M. Ross and P.T. Nordquist). Seventh Biennial Grain Sorghum Research and Utilization Conference, Grain Sorghum Producers Association, Lubbock, TX, March 2-4, 1971.

Discussion of papers by Hugh Doggett, A.B. Maunder, and N.G.P. Rao. International Symposium on Sorghum in the 1970's sponsored by the Rockefeller Foundation, Indian Council of Agricultural Research, Indian Agricultural Research Institute, and the Andhra Pradesh Agricultural University, Hyderabad, India, October 27-30, 1971.

Development of superior populations of sorghum and their role in breeding programs. International Symposium on Sorghum in the 1970's sponsored by the Rockefeller Foundation, Indian Council of Agricultural Research, Indian Agricultural Research Institute, and the Andhra Pradesh Agricultural University, Hyderabad, India, October 27-30, 1971.

Breeding systems and techniques useful in population improvement programs and methods for predicting progress expected from each breeding system. Rockefeller Foundation sponsored class of international trainees from southeast Asia, Farm Suwan, Thailand, November 4, 1971.

Utilization of genetic variability induced by mutation breeding of cross fertilized plants. Mutation Breeding Workshop sponsored by the University of Tennessee Agricultural Experiment Station, United States Atomic Energy Commission, and the Southern Regional Education Board, Knoxville, TN, January 17-18, 1972.

The role of quantitative genetic investigations and the development of breeding procedures for the improvement of varieties, lines and hybrids in maize. International Center for Maize and Wheat Improvement, Mexico City, Mexico, April 11, 1972.

The role of quantitative genetic investigations and the development of breeding procedures for the improvement of varieties, lines and hybrids in maize. Graduate College, National School of Agriculture, Chapingo, Mexico, April 15, 1972.

Results of selection and breeding systems applied to a random mating population of corn. Seminar presented at University of Coahuilla, Saltillo, Mexico, April 18, 1972.

Increasing efficiency in breeding partially outcrossing crop plants. Presented by K.O. Rachie, Senior Author, Grain Legume Workshop, International Crops Research Institute for the Semi-Arid Tropics, Hyderabad, India, January 13-17, 1975.

Development of random-mating populations and population improvement in sorghum through recurrent selection methods. International Crops Research Institute for the Semid-Arid Tropics, Hyderabad, India, April 15, 1975.

Population improvement in maize. International Maize Symposium, Genetics and Breeding '75, Urbana, IL, September 8-12, 1975.

needed not only by IANR and UNL, but by the State of Nebraska and our country. There are very few programs which offer degrees in Biometry especially with an emphasis in biological and agricultural statistical consulting.

Biometry is a dynamic field that is progressing at a rapid pace. The demand for state-of-the-art statistical advice is ever increasing as more and more biometrical applications in agriculture and the biological sciences become apparent. To meet the need for trained statistical consultants, the Department of Biometry offers a Master of Science degree in Biometry.

A biometrician must have knowledge of not only the latest theory and methodology in statistics, but must also become familiar with applications of statistics to subject matter in many areas. In addition, the biometrician must develop interpersonal skills so that technical expertise will be understood and used correctly. This program is designed to provide students with knowledge of statistical techniques and experience in handling both the technical and non-technical aspects of statistical consulting.

This is the second comprehensive review of this unit (the first being the 1985 self-study review of BISC) and will serve to clarify the expanding mission and goals of the department and to define a plan of action to meet those goals. We invite the review team to examine these goals and provide guidance in judging their merits and making recommendations on how to achieve them. The major goal is to allow our active faculty access to doctoral students and for them to have input into the program leading to the Ph. D. in Biometry.

## **B. PROGRAM GOALS AND RATIONALE**

The mission of the Department of Biometry is to provide biometrical services to enhance the quality, credibility, and quantity of research conducted in the Institute of Agriculture and Natural Resources, to provide for the biometrical education of its students and in-service training of its staff, and to provide statistical data processing services in the support of teaching, research, and extension programs of IANR. The goals established to fulfill this mission are:

- a. To facilitate the use of statistically sound and feasible research strategies beginning with the design and culminating with the analysis and report of the study and to develop creative applications of statistical design and analysis as required in IANR research.
- b. To teach classes in biometry at both the undergraduate and graduate levels and to provide for continuing education of IANR staff to keep abreast of the latest advances in biometry.
- c. To provide for professional growth and development of the members of the department and thereby enhance their effectiveness as members of the IANR faculty by giving them the opportunity and rewards of applying their skills creatively and encouraging the involvement of biometrists as full-fledged members of interdisciplinary research teams.

Isozyme patterns in original and selected populations of corn and sorghum and their possible use in plant breeding. Mid-America State Universities Association Honor Lectures presented by invitation at the following universities:

University of Missouri at St. Louis, March 7, 1983.

Kansas State University, March 23, 1983.

Oklahoma State University, March 28, 1983.

A quarter century of progress from mass selection in corn: Genetic studies involving original and improved populations. Mid-America State Universities Association Honor Lectures presented by invitation at the following universities:

University of Missouri at Columbia, March 8, 1983.

Iowa State University, March 14, 1983.

Kansas State University, March 22, 1983.

Oklahoma State University, March 27, 1983.

University of Nebraska, September 22, 1983.

Progress in yield improvement and changes in isozyme patterns in maize populations improved by mass selection. Central American cooperative Program for the Improvement of Food Crops, XXIX meeting, Panama City, Panama, April 8, 1983.

The mechanics of population improvement in sorghum. Sorghum Workshop, International Center for Maize and Wheat Improvement, El Batán, Mexico, April 14, 1983. (Presented by W.M. Ross, Senior author.)

Use of electrophoresis as a tool in maize and sorghum population studies. International Center for Maize and Wheat Improvement, El Batán, Mexico, April 15, 1983.

Some use of electrophoresis in maize population studies and maize breeding. School of Biological Sciences, University of Nebraska, Lincoln, NE, February 8, 1984.

Selection theory and practice. Illinois Corn Breeder's School, University of Illinois, Urbana, IL, March 6-8, 1984.

Important considerations in planning an effective and efficient maize breeding program. Seminar given to trainees and staff, International Center for Maize and Wheat Improvement, El Batán, Mexico, February 14, 1986.

Recurrent selection for cold and freeze tolerance in maize (*Zea mays* L.) at the University of Nebraska. Invitation paper presented to staff and graduate students, Agricultural University, Peshawar, Pakistan and to personnel involved in TIPAN (Transfer and Integration of the Provincial Agricultural Network) project, USAID/University of Illinois, September 1, 1986.

- d. To provide statistical data processing services for IANR by helping in the development of statistical computing hardware and software and providing continuing education in statistical computing for all faculty, staff and students.
- e. To offer an advanced degree in biometry, including the involvement of students as intern consultants and TA's in biometry courses and to encourage students in other biological disciplines to pursue research into biometrical aspects of their major areas.

#### 1. Undergraduate education

The teaching activities in the Department of Biometry consist of course offerings at the undergraduate and graduate levels and in-service training for IANR staff. The department offers no undergraduate degree and has no plans to offer one in the near future. Most employment opportunities for biometrists require a graduate degree. There is one undergraduate level course offered by the department which is used by many departments within IANR to fulfill a requirement for mathematics or statistics. This course gives the students a basic understanding of biometrical methods and the relation of statistics to biological systems. The enrollment for this course has remained high and more sections could be offered in the future.

## **2. Graduate education**

The Department of Biometry currently offers fifteen graduate level courses ranging from a beginning graduate level survey course to advanced courses in biometrical theory. The latter courses are currently taken by both biometry majors and non-majors with a serious interest for statistical applications in their own discipline. The biometry department currently offers its graduate students the opportunity to participate in a two semester consulting sequence with a one semester course followed by a one semester practicum. All students take a group of six core courses (two of which are taught by the Mathematics and Statistics Department) and have as options courses taught in several other departments including Agronomy, Animal Science, Mathematics and Statistics, Industrial Engineering, and Educational Psychology, as well as Biometry. We feel that in order to continue to advance our own expertise in statistical methodology and to provide IANR with the highest level of statistical consulting possible, that a doctoral program is necessary for our department.

## **C. HISTORY**

### **History of Biometrics and Information Systems Center**

The nucleus of the present-day Department of Biometry was organized in 1957 under the directions of Dr. Charles Gardner, who held an academic appointment in Agronomy and also served as the Agricultural Experiment Station Statistician. This original administrative unit was called the Statistical Laboratory and was funded by the Agricultural Experiment Station to provide design, analysis, and data processing services to researchers. At that time the Statistical Laboratory did not have a teaching function. In 1968, Dr. Wilfred Schutz came to UNL to head the Statistical Laboratory. The staff at that time included one faculty member (Dr. Robert Mumm), a data processing programmer, a computer operator, data entry personnel and a secretary. Both faculty members (Schutz and Mumm) held academic appointments in Agronomy and taught the Agronomy courses in statistical methods and experimental design. The Statistical Laboratory moved to its present location in Miller Hall in 1970 and in 1972 the statistics courses were transferred from Agronomy to the Statistics Laboratory. Several new faculty were added to the staff during the next seven years in response to the growing demand for additional courses and consulting services. In 1978 the unit's name was changed to the Biometrics and Information Systems Center (BISC). In 1987 BISC was divided into the Biometrics Center and the IANR

Computing with separate heads and budgets. The Biometrics Center became the Department of Biometry in 1989 and all faculty from the previous Biometrics Center now hold academic appointments in that department.

### 1985 Program Review

A comprehensive review of the Biometrics and Information Systems Center occurred in 1985. In that self-study, assembled for that review, we recommended the establishment of a separate Department of Biometry and Information Processing Center. This has been accomplished. The second proposal was to establish a graduate degree program administered by the Department of Biometry. What we proposed in 1985 is now done - an M.S. in Biometry.

In the study plan the following highest needs were outlined:

- a. form a Department of Biometry (accomplished, 1989)
- b. establish a graduate degree program (accomplished in 1991)
- c. the addition of 2.00 FTE's (accomplished in 1990)
- d. addition of four graduate assistant stipends
- e. at least double the current space and facilities available in Miller Hall (accomplished in 1989)

- f. addition of statistical programmers (one was added in September, 1989)
- g. additional operating support for equipment, travel and software.

It is extremely pertinent to this document that the space needs were documented in this study plan in 1985. The plan was developed by administrators and statisticians from outside the department and university.

#### **D. LOCATIONS AND FACILITIES**

##### **Miller Hall**

All of the faculty offices and support staff offices are located in Miller Hall on East Campus. Total office space for eight faculty (including the Head) is approximately 717 sq. ft. Office space for five professional staff totals 448 sq. ft. There is also a small computer room for an Assistant Programmer and office space for two statistical programmers. These rooms in total occupy about 595 sq. ft. six graduate student assistants share three office areas. There are two reception areas for clerical staff and two conference/meeting rooms. At this time there is a great need for additional space to accommodate graduate students and meeting space for consulting. In the fall of 1993 we expect to have 15 graduate students in the Masters degree program. This sizeable increase from seven in the fall of 1992 will increase the need for more office space.

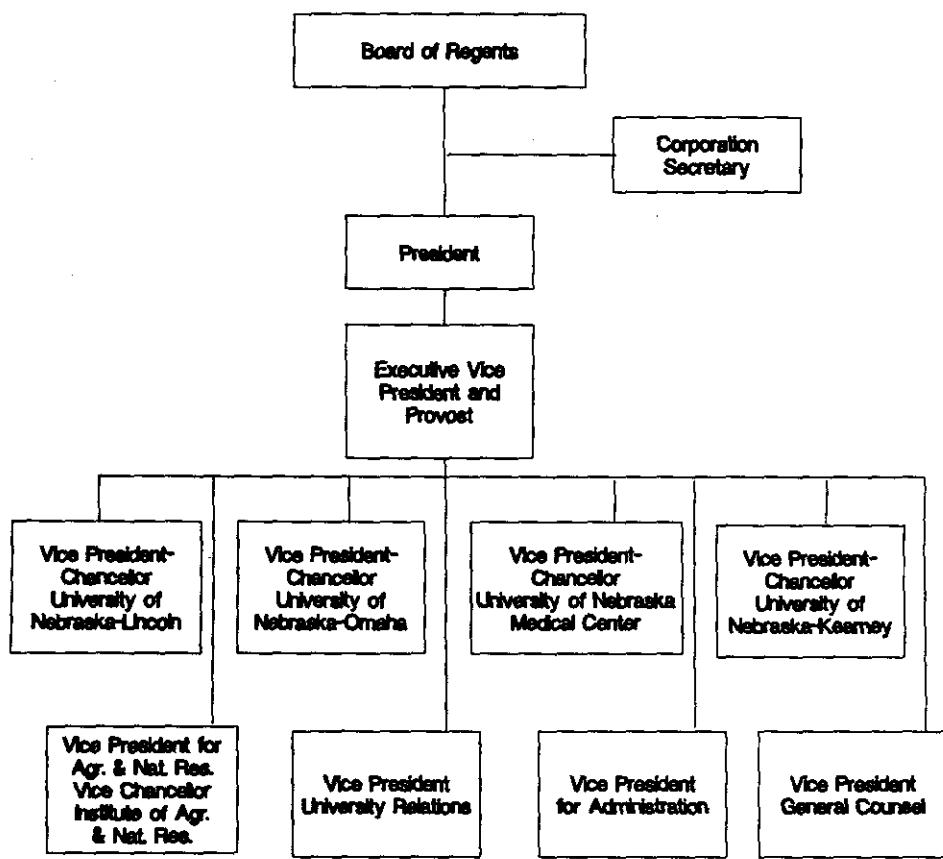
Given the visit by Physical Plant there may be serious health implications involved in adding to crowding given the fact that the ventilation system as is appears to be at most 60% adequate for the existing people.

## **E. ORGANIZATIONAL STRUCTURE**

### **Administrative Structure for the University of Nebraska**

The University of Nebraska system is comprised of four components, the University of Nebraska-Lincoln, and the University of Nebraska-Kearney, the University of Nebraska-Omaha, and the University of Nebraska Medical Center-Omaha. The chief executive officer for the entire system is the President. Each of the four major components is headed by a Chancellor. The Institute of Agriculture and Natural Resources is a separate component of the University of Nebraska-Lincoln. It is headed by a Vice Chancellor. The position is unique in the University in that it also is a Vice President in the University of Nebraska system and serves on the President's Executive Council with the four Chancellors.

## **Administrative Structure University of Nebraska**



**University of Nebraska-Personnel**

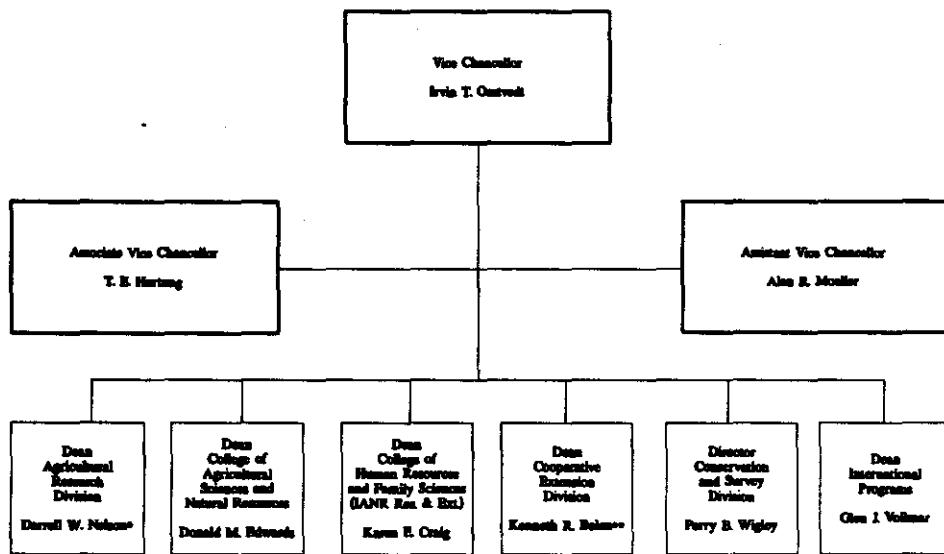
<b>Board of Regents</b>	Robert M. Allen Don S. Blank Nancy Hoch Nancy L. O'Brien John W. Payne Margaret Robinson Rosemary Skrupa Charles S. Wilson
<b>Corporation Secretary</b>	James B. Milliken
<b>Student Regents</b>	Pamela Kohlmeier Jennifer Newhouse Andrew Sigerson Andy Stock
<b>President</b>	Martin A. Massengale
<b>Executive Vice President and Provost</b>	Lee B. Jones
<b>Vice President-Chancellor, University of Nebraska-Lincoln</b>	Graham B. Spanier
<b>Vice President-Chancellor, University of Nebraska-Omaha</b>	Del D. Weber
<b>Vice President-Chancellor, University of Nebraska-Medical Center</b>	Carol A. Aschenbrener
<b>Vice President-Chancellor, University of Nebraska-Kearney</b>	William R. Nester
<b>Vice President for Agriculture &amp; Natural Resources &amp; Vice Chancellor for IANR</b>	Irvin T. Omtvedt
<b>Vice President for University Relations</b>	Lee O. Rupp
<b>Interim Vice President for Administration</b>	James C. Van Horn
<b>Vice President and General Counsel</b>	Richard R. Wood

<b>Chancellor</b>	.....	Graham B. Spanier
<b>Associate to Chancellor</b>	.....	Herbert E. Howe, Jr.
<b>Vice Chancellor for Research</b>	.....	William E. Splinter
<b>Vice Chancellor for IANR</b>	.....	Irvin T. Omtvedt
<b>Senior Vice Chancellor for Academic Affairs</b>	.....	Joan R. Leitzel
<b>Vice Chancellor for Student Affairs</b>	.....	James V. Griesen
<b>Vice Chancellor for Business and Finance</b>	.....	John W. Goebel

### **Administrative Structure for the Institute of Agriculture and Natural Resources**

The institute of Agriculture and Natural Resources is headed by a Vice Chancellor. Three major divisions of the Institute are the a) College of Agricultural Sciences and Natural Resources (teaching), b) Agricultural Research Division (research), and c) Cooperative Extension Division (extension) and each are headed by a Dean/Director. The other three components are headed by Deans and/or Directors - College of Human Resources and Family Sciences, International Programs Division, and Conservation and Survey Division. This figure shows the current organizational structure of IANR. Departments are administered by Heads who report to the respective Deans for each program area represented in the Department. Thus, the Head of the Department of Biometry reports to Dean Edwards for teaching and Dean Nelson for research.

**Organizational Structure**  
**Institute of Agriculture and Natural Resources**  
**University of Nebraska-Lincoln**



\* *Director of Agricultural Experiment Station*

\*\* *Director of Cooperative Extension*

## IANR ADMINISTRATIVE UNITS

ACADEMIC DEPARTMENTS	INTERDISCIPLINARY CENTERS & PROGRAMS	PRIMARY EXTENDED CAMPUS LOCATIONS
AGRICULTURAL ECONOMICS <i>Sam M. Cordes</i>	CENTER FOR ADVANCED LAND MANAGEMENT INFORMATION TECHNOLOGIES (CALMIT) <i>Donald Rundquist</i>	AGRICULTURAL RESEARCH & DEVELOPMENT CENTER - Mead <i>Dan Duncan</i>
AGRICULTURAL LEADERSHIP EDUCATION & COMMUNICATION <i>Allen G. Blezek</i>	CENTER FOR BIOLOGICAL CHEMISTRY <i>Marion O'Leary</i>	NEBRASKA COLLEGE OF TECHNICAL AGRICULTURE - Curtis <i>Bill J. Siminoe</i>
AGRICULTURAL METEOROLOGY <i>Blaine L. Blad</i>	CENTER FOR BIOTECHNOLOGY <i>Donald P. Weeks</i>	NORTHEAST RESEARCH & EXTENSION CENTER - Concord <i>Robert D. Fritsch</i>
AGRONOMY <i>Robert C. Shearman</i>	CENTER FOR LEADERSHIP DEVELOP. <i>Allen G. Blezek</i>	PANHANDLE RESEARCH & EXTENSION CENTER <i>Burton A. Weichenhal</i> <i>Interim</i>
ANIMAL SCIENCE <i>Elton D. Aberle</i>	CENTER FOR RURAL COMMUNITY REVITALIZATION & DEVELOPMENT <i>Sam M. Cordes</i>	SOUTH CENTRAL RESEARCH & EXTENSION CENTER - Clay Center <i>Charles L. Stonecipher</i>
BIOCHEMISTRY <i>Marion H. O'Leary</i>	CENTER FOR SUSTAINABLE AGRICULTURE <i>Charles A. Francis</i>	SOUTHEAST RESEARCH & EXTENSION CENTER - Lincoln <i>Loyd L. Young</i>
BIOLOGICAL SYSTEMS ENGR. <i>Glenn J. Hoffman</i>	CENTER FOR WATER AND ENVIRONMENTAL PROGRAMS <i>Bob G. Volk</i>	WEST CENTRAL RESEARCH & EXTENSION CENTER - North Platte <i>Pete Jacoby</i>
BIOMETRY <i>David B. Marx</i>	COMMUNICATIONS & COMPUTING SERVICES <i>T.E. Hartung</i>	
ENTOMOLOGY <i>John E. Foster</i>	FOOD PROCESSING CENTER <i>Stephen L. Taylor</i>	
FAMILY & CONSUMER SCIENCES* <i>Shirley L. Taylor</i>	INDUSTRIAL AGRICULTURAL PRODUCTS CENTER <i>Milford A. Hanna</i>	
FOOD SCIENCE & TECHNOLOGY <i>Stephen L. Taylor</i>	NEBRASKA FOREST SERVICE <i>Gary L. Hergenrader</i>	
FORESTRY, FISHERIES & WILDLIFE <i>Gary L. Hergenrader</i>	NEBRASKA STATEWIDE ARBORETUM <i>Paul Read, Acting</i>	
HORTICULTURE <i>Paul E. Read</i>		
NUTRITIONAL SCIENCE & DIETETICS* <i>Marilyn Schnepf</i>		
PLANT PATHOLOGY <i>Anne K. Vidaver</i>		
TEXTILES, CLOTHING & DESIGN* <i>Rita C. Kean</i>		
VETERINARY & BIOMEDICAL SCIENCE <i>John A. Schmitz</i>		

\*Includes only extension and research programs in IANR.

**F. CURRENT DEPARTMENT OF BIOMETRY**

The Department of Biometry was approved by the Regents of the University of Nebraska in June of 1989. The Masters degree was approved about a year later. The department now has a total of seven faculty, (including Department Head) and five support staff. Currently we have eight graduate students with an increase for the fall of approximately seven more. The department currently offers seven course selections every semester with a total of eighteen different courses being offered over a two to three year span.

**FTE DISTRIBUTION**  
**Department of Biometry**  
**as of January 1, 1993**

<b>FACULTY</b>	<b>ADMIN.</b>	<b>TEACHING</b>	<b>RESEARCH</b>	<b>REVOLVING</b>
Eskridge, Kent		.40	.60	
Gotway, Carol		.35	.65	
Kachman, Steve		.25	.75	
Marx, David	.60	.20	.20	
Parkhurst, Anne		.50	.50	
Stroup, Walter		.50	.50	
Young, Linda		.25	.75	
<b>TOTAL</b>	<b>.60</b>	<b>2.45</b>	<b>3.95</b>	<b>.0</b>
<b>PROFESSIONAL STAFF</b>				
Boilesen, Eugene			1.00	
Pavlish, Linda			.76	.24
<b>TOTAL</b>	<b>.0</b>	<b>.0</b>	<b>1.76</b>	<b>.24</b>
<b>TECHNICAL STAFF</b>				
Barratt, Leona			.20	.80
Frenzel, Joan				.25
<b>TOTAL</b>	<b>.0</b>	<b>.0</b>	<b>.20</b>	<b>1.05</b>
<b>SECRETARIAL STAFF</b>				
Borton, Jon		.50	.50	
Seefeld, Donna		.50	.50	
<b>TOTAL</b>	<b>.0</b>	<b>1.00</b>	<b>1.00</b>	
<b>GRAND TOTAL</b>	<b>.60</b>	<b>3.45</b>	<b>6.91</b>	<b>1.29</b>

**Department of Biometry  
Appropriated Budget Support  
(Excluding fringe benefits)  
1988-1993**

<b>Program</b>	<b>Year</b>	<b>Faculty</b>	<b>Graduate Assistant</b>	<b>Support Staff</b>	<b>Operating</b>	<b>Total</b>
<b>Research</b>	1988-89	123,880	6,740	61,203	11,505	203,328
	1989-90	138,079	7,443	65,568	14,455	225,545
	1990-91	185,743	8,213	70,931	14,455	279,342
	1991-92	245,869	8,213	73,765	14,455	342,302
	1992-93	261,495	18,213	76,398	23,255	379,361
<b>Teaching</b>	1988-89	123,879	12,518	14,510	7,680	158,587
	1989-90	153,903	13,824	16,153	7,680	191,560
	1990-91	173,462	15,253	18,288	7,680	214,683
	1991-92	155,376	15,863	19,019	7,680	197,938
	1992-93	181,640	15,863	19,327	7,680	224,510
<b>Totals</b>	1988-89	247,759	19,258	75,713	19,185	361,915
	1989-90	291,982	21,267	81,721	22,135	417,105
	1990-91	359,205	23,466	89,219	22,135	494,025
	1991-92	401,245	24,076	92,784	22,135	540,240
	1992-93	443,135	34,076	95,725	30,935	603,871

**Department of Biometry  
Research Revolving Budget Expenditures  
(Excluding fringe benefits)**

<b>Year</b>	<b>Faculty</b>	<b>Graduate Assistant</b>	<b>Support Staff</b>	<b>Operating</b>	<b>Total</b>
1988-1989	.0	.0	34,571	2,100	36,671
1989-1990	.0	.0	31,086	.0	31,086
1990-1991	.0	.0	39,272	.0	39,272
1991-1992	.0	.0	40,100	500	40,600
1992-1993	.0	.0	22,453	900	23,353

**ANALYSIS OF FISCAL YEAR 1993 RESEARCH  
BUDGET FOR THE DEPARTMENT OF BIOMETRY**

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Listed below are research budget data for the Department of Biometry and the average of all units in the Agricultural Research Division for fiscal year 1993. The base data included in the calculations were budgeted faculty and support staff FTE. Revolving, grant, and contract funds are not included, nor are funds for diagnostic laboratory activities.

Characteristics	Department of Biometry	ARD Average
Faculty research FTE	3.95	6.26
Faculty salary, \$/FTE	58,910	63,045
Manager/Prof employ., fte/FTE	0.45	0.61
Manager/Prof. salary, \$/FTE	12,927	15,914
Office/service employ., fte/FTE	0.37	1.00
Office/service salary, \$/FTE	6,414	20,788
GRA salary, \$/FTE	5,877	9,524
Hourly employee wages, \$/FTE	-0-	1,429
Fringe benefits, \$/FTE	18,097	22,033
Operating, \$/FTE	6,141	21,433
Total support, \$/FTE	49,456	91,120
Total investment, \$/FTE	108,366	154,165
Total investment rank in 20 units	19	----

Please note that all data are normalized to faculty research FTE in the unit to allow comparison of support across all units. Differences in support among units are due to many factors including differential cost of research in varying disciplines and historical factors. Some of the historical factors are long-term unit productivity and decisions on the nature of budget reductions taken in previous years. For example, some units elected to cut operating, GRA stipends and support staff rather than faculty FTE during the 1980's and the current biennium. On the other hand, some units have volunteered to give up faculty FTE to gain additional operating and support staff.

**Department of Biometry Faculty**

**ESKRIDGE, Kent M., Associate Professor**

B.S. 1976, University of Missouri  
B.A. 1976, University of Missouri  
M.A. 1981, University of Missouri  
Ph.D. 1987, University of Nebraska

Decision analysis, design of experiments, and biological modeling.

60% Research, 40% Teaching, initial appointment 1987.  
Graduate Faculty Fellow

**GARDNER, Charles O., Emeritus Professor**

B.Sc. 1941, University of Nebraska  
M.B.A. 1943, Harvard University  
M.S. 1948, University of Nebraska  
Ph.D. 1951, North Carolina State University

Quantitative genetic traits, statistical genetic models, recurrent selection studies, prediction equations

Graduate faculty fellow.

**GOTWAY, Carol A., Assistant Professor**

B.S. 1984, Bradley University  
B.S. 1984, Bradley University  
M.S. 1986, Iowa State University  
Ph.D. 1989, Iowa State University

Stochastic simulation, spatial statistics, and geostatistics.

65% Research, 35% Teaching, initial appointment 1992.

**JOHNSON, Blaine E., Courtesy Professor**

B.S. 1971, University of Nebraska

M.S. 1973, Oregon State University

Ph.D. 1986, University of Nebraska

Graduate Faculty Fellow

**KACHMAN, Stephen D., Assistant Professor**

B.S. 1981, Michigan State University

M.S. 1986, University of Illinois

Ph.D. 1988, Montana State University

Mixed linear models, breeding and genetics.

75% Research, 25% Teaching, initial appointment 1990.

Graduate Faculty Member

**MARX, David B., Professor and Head**

B.A. 1968, College of Wooster

M.A. 1970, University of Missouri

Ph.D. 1977, University of Kentucky

Administrative Head, spatial variability, design of experiments, linear models, and geostatistics.

60% Administrative, 20% Research, 20% Teaching, initial appointment 1989, tenure 1989.

Graduate Faculty Fellow

**PARKHURST, ANNE M., Professor**

B.A. 1962, University of Virginia

M.S. 1965, Yale University

Ph.D. 1992, University of Nebraska

Chaos-modeling dynamic biological systems, multivariate analysis, and time series analysis.

50% Research, 50% Teaching, initial appointment 1972, tenure 1979.

Graduate Faculty Fellow

**SCHUTZ, Wilfred, M., Professor**

B.S. 1957, University of Nebraska  
M.S. 1959, University of Nebraska  
Ph.D. 1962, North Carolina State University

Graduate Faculty Fellow

**STROUP, Walter W., Professor**

B.A. 1973, Antioch College(Ohio)  
M.S. 1975, University of Kentucky  
Ph.D. 1979, University of Kentucky

Design of experiments, generalized linear models, and statistical practice in developing countries.

50% Research, 50% Teaching, initial appointment 1979, tenure 1986.

Graduate Faculty Fellow

**YOUNG, Linda J., Associate Professor**

B.S. 1974, West Texas State University  
M.S. 1976, West Texas State University  
Ph.D. 1981, Oklahoma State University

Sampling, biological modeling, statistical inference, and statistical ecology.

75% Research, 25% Teaching, initial appointment 1990, tenure 1990.

Graduate Faculty Fellow.

*The highest priority for the Department of Biometry is a Ph.D. program.*

During the past several years, the department has progressed from being a primarily service unit with four faculty, to a multi-faceted academic department with seven faculty, all of whom have active research interests. A M.S. program was established in 1991. The logical next step is a Ph.D. program. The benefits of a Ph.D. program are numerous.

- a. Enhanced recruiting of graduate students. Good graduate students are more likely to be interested in a program which offers the possibility of continuing for a Ph.D, rather than a terminal M.S. program.
- b. Enhanced ability to do research. All of the Biometry faculty have more statistical problems suggested by their consulting than they can possibly address on their own. Many faculty will tell you that they have problems which have "gathered dust" for years. With good Ph.D. level graduate students, these problems stand a better chance of being addressed.
- c. Enhanced consulting. This occurs on two ways. The first is related to the point just made. Many consulting problems raise novel statistical questions for which there is no established standard approach. Finding a good approach often involves research. Graduate students can greatly

extend our ability to provide good statistical approaches for novel problems. The second way is that advanced graduate students can do routine statistical consulting on their own. This improves everybody's access to statistical consulting and frees the faculty to concentrate on more difficult consulting problems. In Spring semester, 1993, Biometry instituted a "Help Desk" staffed by a graduate student. The response has been very good; she has been very busy with a variety of problems.

Enhanced teaching. Biometry has a number of classes with labs. We are constantly struggling to place graduate students with an appropriate background as lab instructors. For example, our M.S. students are required to take BIOM 802 (Experimental Design), which has a lab. They cannot teach the lab until they have had the course themselves. Many universities have open statistical help labs, many with computers, where students come to do assignments or work on data analysis. These labs are typically staffed by advanced graduate students who can field a variety of questions. M.S. level graduate students lack the maturity and breadth of statistical background to be effective in such situations. In general, Ph.D. level graduate students can make a variety of contributions to the teaching program that faculty do not have the time to make and M.S. students lack the background to make.

- e. Enhanced professional development opportunities for faculty. With the ability to concentrate on "quality not quantity" in consulting, and with the ability to work with graduate students on research problems, and with graduate students able to handle some of the more mundane tasks, the "breathing space" required for faculty to take advantage of professional development opportunities is greatly improved.

Enhanced value of Biometry to IANR, UNL, and Nebraska. In addition to improving Biometry's ability to fulfill its teaching-research-consulting mission, a Ph.D. program benefits the university and the state in additional ways. The impact of W. Edwards Deming, the guru of statistical process control and "Total Quality Management," on Japan and, more recently, on the U.S., clearly demonstrate the capacity of a strong statistics program to contribute to economic prosperity. A Ph.D. program would put Biometry in a position to make meaningful contributions to Nebraska's future. Moreover, it would provide a pool of qualified graduates to Nebraska employers.

Historically, there have been a number of attempts to start a Ph.D. program in statistics involving the Biometry faculty. In the early 1970's, there was a discussion of an area program in statistics involving the statistical faculty from the Department of Mathematics, the Biometrics Center (now the Department

of Biometry), the Department of Educational Psychology, and other departments having faculty statisticians. In 1985, a committee was formed to study the feasibility of combining the statistical faculty of the Department of Mathematics & Statistics and the Biometrics Center into a Department of Statistics. In 1991, the faculties of the Math & Stat Department's Division of Statistics and the Department of Biometry signed a petition to the Dean's supporting, in principle, a combined Department of Statistics. At that time, there was also discussion of an area program in statistics and of adding a Biometry option to the existing Ph.D. program in Mathematics and Statistics. For various reasons, none of these initiatives has gone anywhere.

In theory, there are several ways in which Biometry participation in a Ph.D program could occur.

- a. A stand alone Ph.D. program in Biometry.
  
- b. An area program in "Quantitative Studies" involving faculty from Biometry, Plant and Animal Genetics, Quality Control (in Food Science & Technology and Biological Systems Engineering), Econometrics, and Environmental and Ecological Studies.

- c. Allow the Biometry faculty to be advisors to Ph.D. students in Mathematics and Statistics.
- d. An area program in Statistics involving, primarily, the faculty of the Math & Stat Department's Division of Statistics and the Biometry Department. Interested faculty from other departments could also participate.
- e. An area program similar to (d) but also involving separating the Division of Statistics into a stand-alone department in Arts & Sciences.
- f. A Department of Statistics combining the Division of Statistics and Biometry. Faculty from other departments might have joint or courtesy appointments.

The small faculty sizes and fiscal reality probably rule out options (a) and (e). In addition, a stand-alone Biometry Ph.D. program would be weaker academically than one which draws on *all* the statistical resources at UNL. To a lesser extent, this would also be true of option (b). Option (c) might be acceptable on a short-term, transitional basis (i.e., assuming a commitment was made to establish a statistics department, until the department came into official

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existence). However, it allows the Biometry faculty no input into curriculum decisions nor participation in teaching core courses. The best one can say about this arrangement is that it hampers effective advising and discourages recruiting graduate students. Thus, option (c) is not an acceptable solution. This leaves options (d) or (f). Both of these draw on the combined expertise of *all* UNL statistics faculty. Both involve all faculty in teaching, advising, and curriculum decisions. Both allow streamlining core courses with resulting economies of scale. Both have stalled in the past because of several issues, the main ones being location (City or East Campus) and tenure and promotion criteria. However, the Biometry faculty are open to either.

**To repeat, the establishment of a Ph.D. program is our highest priority, and we are open to any reasonable means of obtaining that end, including alternatives not listed above.**

#### **Future Requirements and Challenges Facing Biometry**

As stated earlier, with faculty, trained graduate students, support staff, and teaching loads at current levels, Biometry can sustain the following activities:

1. Involvement in a limited number of collaborative research projects (at most 5-10 per faculty member, perhaps less depending on complexity).
2. Limited advisory consulting. Each teaching faculty can afford a maximum of 10 contact hours a week for all consulting. Subtract what is taken by collaborative research and whatever is left is available for advisory

consulting. This time includes participation on project reviews. Whenever demand for this activity is particularly heavy, available contact time is further reduced.

3. Tutorial activity in the form of perhaps one seminar per semester, presented either at the department, IANR, or professional society level. These may lead to intermittent publication.
4. Consulting and/or teaching loads have been reduced since 1989 reduced, allowing for innovative activity in Biometry documented by publication. However, the department can not sustain an increase in these areas without hindering our professional development. This development would greatly be enhanced by the addition of a Ph.D. program.

With current staff and teaching commitments, any expansion of services is not reasonable. Any increase in one form of consulting or research activity will require either an increase in consulting resources or a reduction in some other activity. Yet the demand for statistical consulting and collaborative research is extensive at IANR. Any compromise in the quality of service provided by Biometry would translate as an immediate loss in the quality and quantity of research possible at IANR. As mentioned earlier in this report, it is extremely difficult to achieve excellence in teaching, collaborative research, advisory consulting, basic methodological research, etc. simultaneously. The goals are

often mutually exclusive. This expectation is even less feasible without a sufficient number of graduate students and/or ample technical assistance.

The challenge Biometry faces is how to 1) maintain the quality of the services it presently provides, 2) make these services available to researchers who are currently frustrated by Biometry's limited resources, and 3) develop a nationally recognized Biometry program. There are three choices: 1) maintain the status quo; 2) maintain the program as is but add staff; 3) expand the program by adding a Ph.D degree program, either with or without a joint department of statistics.

Maintaining the status quo will result in a decline of the quality of Biometry services. The decline will occur because of professional stagnation and because of exhaustion. Biometry faculty can only respond to a finite number of requests for their services. They are currently at that limit. Moreover, much of the service requested is of a technical nature. Faculty have been trained to be creative and have entered the academic profession with the opportunity for creativity as a primary attraction. The most effective role for a faculty level biometrician is one which encourages this creativity. Yet much of what Biometry faculty actually do is mundane. This is because the mundane aspects of consulting are of more short-term urgency. If an MS candidate has to graduate next week and can't remember the interpretation of an orthogonal contrast, Biometry faculty have to drop what they are doing to answer that question. Any

experienced Ph.D. graduate student in Biometry could answer such a question with equal competence (and considerably more patience under the circumstances!) but Biometry faculty must do it instead because there is no one else. Inevitably, the mundane aspects crowd out the creative. It is cavalier to expect Biometry faculty simply to say "no." Failure to provide this is contrary to the department's mission and will disenfranchise clientele. Moreover, the mere act of having to say "no" often and repeatedly is itself destructive to creative energy. However, not saying "no" to a large number of consulting requests is also destructive to creativity. Thus, one way or another, the status quo guarantees the erosion of Biometry services.

Biometry has added staff without altering the structure of its program in the past. The effect has consistently been to increase demand so that the per capita workload has actually increased and the problem of creative paralysis has remained unsolved. A partial solution would be to add technicians to assist in consulting. However, there is really limited incentive for such positions. The university cannot pay salaries competitive with what these individuals could get in private industry. Without a Ph.D. there is little opportunity for such individuals to advance within the university system. Without the possibility of earning a Ph.D. degree in Biometry, there is little to keep such individuals long enough to become accomplished consultants. Moreover, investment in technicians is a nearsighted approach. They must be paid far more than graduate assistants, they will become restless and move on, and they will have to be replaced.

Without a Ph.D. degree program, where do the replacements come from?

The third alternative is to initiate a Ph.D. degree program. The effect of this on the stimulation of faculty creativity is obvious. Ph.D. graduate assistants would allow faculty to pursue their creative interests in Biometry while dramatically extending the quantity of advisory consulting services Biometry could provide. Graduate assistants bring a level of enthusiasm into mundane consulting that faculty have long since lost; in this sense they are actually more effective than faculty at this level. This would free faculty for the more creative and complex issues of research consulting, further enhancing the quality of services provided.

A graduate Ph.D. program in Biometry is not a panacea. Workload will still be heavy. New problems will arise. Many statistics departments have tended to become increasingly theoretical and divorced from their original mission. This is a danger against which this department would have to be wary. It is well to realize, however, that many times the problem is not the amount of work but the kind of work. If the work has become repetitive and lost its challenge and there is a lot of it, that is a more difficult situation than if there is a lot of work to do and much of it has never been done before.

## **II. PROGRAM ACTIVITIES**

### **THE RESEARCH AND CONSULTING PROGRAM**

#### **Personnel**

##### **Faculty:**

Eskridge, Kent  
Gotway, Carol  
Kachman, Steve  
Marx, David  
Parkhurst, Anne  
Stroup, Walt  
Young, Linda

##### **Professional Staff:**

Boilesen, Eugene  
Pavlish, Linda

##### **Graduate Students:**

Bazubwabo, Jean Pierre  
Karle, Valerie  
Gardner, Chuck  
Gibson, Ann  
Haderbach, Driss  
Milliken, April  
Yuelong Yang

## **ABSTRACT**

Research activities of the Department of Biometry include statistical consulting, participation by staff as collaborators in Experiment Station research, innovation of new biometrical and statistical methods, adaptation of existing statistical theory and methods to novel experimental situations, investigation of the suitability of biometrical practices for various research applications, and the monitoring of the statistical quality of Experiment Station research. These activities are quite diversified compared to the original activities of the Statistics Laboratory, the unit upon which the current Department of Biometry is based. Reasons for this diversification are 1) increased realization of the importance of statistically sound design as a prerequisite to analysis, 2) increased emphasis by subject matter journals on proper use of statistics in published research, and 3) increased availability and diversity of statistical computing packages. The nature of statistical consulting has changed; there is far less emphasis on post-experiment data processing and interpretation and far more emphasis on creative input into all phases of Experiment Station research projects. There is more appreciation for the biometrician as fellow scientist and scholar rather than as mere technician. In terms of the magnitude and variety of its contributions to the quality of Experiment Station research and the extent to which it has been able to raise the

statistical consciousness of IANR researchers, the Department of Biometry is a spectacular success.

There are, however, serious problems. The most obvious problem is that the success of the department has created a severe imbalance between the demand for statistical services and the department's ability to deliver. The second problem, less obvious, but in the long run more serious, is the lack of a Ph. D. degree program in biometry and the effect this has on research activities of the department. Between the lack of graduate student research assistants and the heavy workload, Biometry Department faculty are not in a position to respond effectively to IANR research projects which raise non-routine statistical problems requiring creative solutions. Moreover, technical support is commonly provided by graduate students; it serves as valuable practical education for them and relieves faculty of the mundane details of consulting. Without it, faculty are required to respond to IANR consulting demands, major or minor. This is taxing, disruptive to creative efforts, and thus further dilutes the quality of the services available. Furthermore, the expectation of indiscriminant consulting activity (and the suppression of creative energy which is its inevitable consequence) is not a wise use of faculty. The "help desk" instituted in 1993 has proved a success and will be enhanced with a Ph.D. program.

The purpose of this section is to clarify the goals of the research component of the Department of Biometry, to review the history of its activities, to assess the current state of the department, and to make recommendations for

maintaining the enhancing its excellence and the quality of service it provides to IANR.

## THE RESEARCH AND CONSULTING PROGRAM

### Introduction

Consistent with the mission of this department, the Department of Biometry's involvement in research is focused on insuring the proper implementation of biometry in IANR projects from initial design through publication and developing a nationally recognized Biometry program. Four specific activities are necessary to fully accomplish this mission. They are defined as follows:

1. Collaborative research is activity in which the biometrician participates as a member of the research team. The biometrician is responsible for all statistical aspects of the research. This activity usually leads to junior authorship in a journal appropriate for the primary subject matter of the research. Under faculty supervision, advanced Biometry Ph.D. graduate assistants could be involved in collaborative research.
2. Advisory consulting is activity whose purpose is to resolve specific questions with regard to a research design or data analysis. The biometrician provides an opinion or suggests a direction but is not systematically involved in the research. This activity rarely leads to publication. Participation in Experiment Station

project reviews is one of the activities associated with advisory consulting. Trained Biometry Ph.D. students could provide substantial support in advisory consulting. (except in project reviews)

3. Tutorial activity is defined as the presentation or publication of statistical philosophy or methodology for an audience principally composed of non-statisticians. The subject matter need not be original from a statistical viewpoint. The purpose is to make researchers aware of state-of-the-art statistical practices or of perceived abuses of statistical methodology in their discipline.

4. Development of novel or innovative applications in Biometry is activity which includes the development of a novel design or analysis, a novel application of existing theory or methods, or a study of the advantages and disadvantages of a design or method of analysis. Biometry Ph.D. students clearly would stimulate and broaden faculty productivity in this area.

These activities are listed in order of importance with respect to the mission of the Department of Biometry, that is, to provide statistical support for IANR research. Since each of these four activities are essential, ideal Biometry Department would treat all four with equal priority. However, with limited resources, this is not possible.

To understand the ranking of these priorities, it is necessary to understand the dilemma faced by practicing biometrists in the academic world. To understand the challenges faced by the Department of Biometry in the future, it

is essential to understand the risks invited by the underemphasis of any of these activities.

Like any member of the academic profession, a biometrician must show evidence of productivity. This evidence is usually in the form of journal articles. In general, the two means by which a biometrician publishes are collaborative research or development of novel applications. Unfortunately, unless the consulting load is kept very small, these activities are mutually exclusive. Collaborative research demands extensive knowledge of non-statistical subject matter and interaction with members of the research team, whereas the development of novel applications demands intensive knowledge of statistical theory as well as the time, space, and solitude typical of creative activity. Given that the Department of Biometry exists to serve a very large demand for statistical services, members of the department staff must necessarily choose to emphasize consulting activities, which means that for professional survival, collaborative research has top priority.

There is further logic to assigning top priority to collaborative research in addition to the need for publication. It is the best way to insure proper design, analysis, and interpretation since it requires the biometrician's involvement throughout the research project.

Advisory consulting is also important. Many researcher's needs are not extensive enough to justify the involvement of a biometrician on a full-time basis. However, many advisory consulting activities amount to nothing more than

resolving quick and often basic questions. There is a danger in this type of consulting. Questions are often presented out of context of the research problem, thus increasing the likelihood of an inappropriate answer. The biometrician with a large advisory consulting load cannot possibly have complete familiarity with every experiment and thus some advice is bound to be superficial. Collaborative research alleviates this problem. Moreover, most advisory consulting questions do not require faculty level expertise to answer; they could be easily handled by support staff or graduate assistants. It is important that a small faculty be protected from an excessive amount of this activity to allow them to concentrate their efforts on the aspects of consulting, research, and teaching which require their creativity and expertise.

The state of the art in biometry is rapidly evolving. To ensure that IANR researchers are using the most refined statistical tools available, tutorial activity is vital. Much informal tutorial activity occurs in the process of collaborative research and advisory consulting. Nonetheless, there is a need for formal tutorial activities so that researchers whose current activity does not lend itself to contact with the Department of Biometry may be exposed to recent developments in biometry. Moreover, Biometry Department faculty have an obligation to share their insights via publication with the scientific community at large.

### Historical Background of the Research and Consulting Program

The Department of Biometry originated as a Statistical Laboratory, or "Stat Lab." with close ties to the Agronomy Department. The Stat Lab had its roots in the concept of the "experiment station statistician." Researchers brought their data to the Stat Lab where experts in statistical computing performed the analysis and helped the researcher interpret these computations. In its time, the experiment station concept made sense. Computers and calculators were very difficult to operate and few researchers had the time or the training to cope with this task. Furthermore, few researchers had a need for the Stat Lab's services. With a small clientele, there was plenty of time to spend in depth with each research project. Thus, at its inception, the Stat Lab was involved primarily in service consulting, a combination of advisory consulting and data processing.

Throughout the 1970's, the Stat Lab, which became the Department of Biometry, shifted its focus away from purely service consulting to a greater variety of activities. There were a number of reasons for this change. First, statistical computing packages not requiring computing expertise (e.g., SAS and SPSS) became available. Thus, it became possible for researchers to assume responsibility for much of their data processing. Second, experiment station statisticians did a very effective job convincing the agricultural academic community of the need for formal statistical analysis and, indeed, for carefully planned experimental design. This was true not just in Agronomy, but to varying degrees in all agricultural and home economics disciplines. The requirement of

statistical rigor in agricultural research became virtually universal. These changes led to a greatly increased demand for consulting services and to a greatly increased variety of consulting problems. Proper statistical practice was elevated to a high priority by the Experiment Station and it became a requirement for each research project review team to include a Biometry staff member. Furthermore, Biometry became the computer program debugging center of East Campus. As SAS came into common use, researchers would frequently attempt to design and analyze their own experiments with little input from Biometry. However, many researchers proceeding in this fashion found it necessary to obtain the assistance of Biometry to write or help debug a SAS program. Quite often, this process revealed flawed designs or inappropriate analysis strategies. Both project reviews and debugging experience reinforced the concept that the best time to see a statistician is before collecting any data. This further contributed to the demand for statistical consulting.

During the latter 1970's the nature of research at the Department of Biometry further changed character as collaborative research and tutorial activities became more commonplace. This resulted partly from the recognition that the biometrician's most important contribution comes at the design phase of the research and partly from increasing pressure for Biometry faculty members to document their productivity through publication. Advisory consulting which concentrated on data analysis and the project review process both revealed a need for biometrists to be more involved at all phases of research. To accomplish

this, two strategies were adopted. First, members of the Biometry faculty served as members of graduate student supervisory committees. Second, some Experiment Station scientists chose to include Biometry staff members as cooperators on their projects. Sometimes these relationships were initiated as a result of the research involving a difficult biometrical problem in which the Biometry member was interested, and sometimes they simply arose from a desire to work with a statistical advisor even though the requirements of the project were routine. Toward the end of the 1970's this type of consulting relationship assumed more urgency, particularly for the younger Biometry faculty, as increased emphasis was placed on publication as a criterion for the professional advancement of the Biometry faculty.

The increase in emphasis on publication fundamentally altered the nature of the department. Formerly, there was an explicit understanding that Biometry faculty were not expected to publish. However, since a certain number of publications were required for membership on the graduate faculty and since this was required for membership on graduate supervisory committees, there was always subtle pressure to publish. Until the late 1970's, publications were not an important criterion for promotion, tenure, etc. for Biometry faculty. In 1980, this formally changed.

The increased emphasis on publication created problems for Biometry faculty. Unlike most IANR faculty with research appointments, research for Biometry faculty meant service, primarily in the form of advisory consulting.

Thus, Biometry faculty often found themselves in the bind of being employed to provide service but being evaluated for promotion and tenure on the basis of publication.

Up to the current time Biometry faculty have adapted to this dilemma by emphasizing collaborative research. This in turn has enforced selectivity in choice of consulting clientele. Moreover, since collaborative research can be pursued with no more than a few researchers at a time, Biometry faculty generally limit the number of consulting clients with whom they work. With little student-technician-level consulting assistance, this has meant restricting access to biometrical consulting to a large part of the IANR research community. At the same time, increased demand on departmental services has ensued. Consequently, a number of researchers in need of statistical advice have been frustrated in their attempt to get help.

### Current Research & Consulting Capabilities

Biometry currently has seven faculty level statisticians involved in research and consulting. Because of the division of their appointments between research and teaching, there are 3.95 faculty-level FTE's assigned to consulting. In addition, there are two statistical programmers and six graduate assistants supported by the department. The graduate assistant's are working on MS degrees in Biometry and are mostly involved in the teaching program. Their involvement in consulting is minimal, however, a "help desk" was established in

spring 1993 which did provide some advisory consulting support.

All faculty are involved in collaborative research, advisory consulting, tutorial activities and the development of novel applications in biometry, as evidenced by participation in regional research, publication in a statistical journal within the past five years, or presentation of a paper on methodology to a statistical organization within the past five years.

Each faculty member attempts to make a certain amount of time available for consulting appointments and some time available for open access. During the semester, due to teaching activities, contact hours for consulting must be limited generally to a maximum of 5-10 hours per week. Most writing of papers and other creative activity necessarily occurs in the summer when there are no Biometry classes offered. How these numbers translate into consulting and research capability depends on the particular clientele and projects with which the faculty are involved. This is because Biometry's typical consulting activity varies from such problems as syntax errors in SAS programs or graduate students forgetting the definition of "level of significance" to the design of a series of experiments for a very sophisticated research project. As a rough average, Biometry faculty may be involved as collaborators in half a dozen projects at a given time. Perhaps two of them per year will produce joint authorships. In addition, a faculty member will be able to provide advisory consulting to 10-20 clients per month. This number will be lower during the semester and higher in the summer. It will also be somewhat lower if the faculty member chooses to do

innovative work in biometry. Unfortunately, for most of the faculty, time for such innovative work is usually unavailable due to the workload described above. Thus, it is generally limited in scope and tends to occur rather slowly.

In recent years, a Biometry faculty member has participated in each Experiment Station project review. This activity requires a heavy time commitment, but there is great potential for improving the quality of agriculture and home economics research through this participation. Unfortunately, the biometrician's advice is often ignored by the researcher which diminishes the effectiveness of the biometrician's input. Thus, there is a question as to whether the payoff is great enough to justify the time and energy commitment of Biometry faculty.

With faculty, support staff, teaching loads and trained graduate students at their current levels, any expansion of Biometry statistical consulting services is not reasonable. What is possible with current resources is a continuation of collaborative research at the current levels, limited advisory consulting, and tutorial activity as circumstances permit. It is essential that each faculty member protect some time in order to develop creative applications of biometry in response to consulting problems and to remain conversant in the latest developments in Biometry. Biometry is not currently effective in a sustained and systematic fashion in satisfying this latter requirement.

**B. TEACHING PROGRAM****Personnel****Faculty**

Eskridge, Kent M.	Associate Professor
Gardner, Charles O.	Emeritus Professor
Gotway, Carol A.	Assistant Professor
Johnson, Blaine E.	Associate Professor Agronomy/Biometry
Kachman, Stephen D.	Assistant Professor
Marx, David B.	Professor & Head
Parkhurst, Anne M.	Professor
Schutz, Wilfred M.	Asst Vice President & Director University-wide Computing & Professor Biometry
Stroup, Walter W.	Professor
Young, Linda J.	Associate Professor

**Graduate Students (1992-1993)**

Bazubwabo, Jean Pierre  
\*Gardner, Chuck Jr.  
\*Gibson, Ann  
Hadarbach, Driss  
\*Karle, Valerie  
\*Milliken, April  
Schiefelbein, Richard  
\*Yang, Yuelong

**Graduate Students (1993-1994)**

Bazubwabo, Jean Pierre  
\*Block, Gary L.  
\*Brush, Tracy  
Dudden, Matthew S.  
Gardner, Chuck Jr.  
\*Gibson, Ann  
Grau, Scott A.  
Holden, Lyman  
\*Karle, Valerie  
\*Kjar, Dean  
Khayyam, Shemza  
Kuoi, Chen Te  
Mark Liu Shiyas  
Schiefelbein, Richard  
\*Yang, Yuelong

\* = Graduate Assistants

### **Abstract**

The Department of Biometry offers a Master of Science Degree in Biometry. Teaching activities consist of course offerings at the undergraduate and graduate levels, Biometry short courses, seminars and in-service training. Currently the curriculum ranges from an undergraduate level appreciation of biometry to advanced courses in biometrical theory.

Enrollment has increased substantially over the past several years to the point where limits have had to be placed on the class size of several courses. This phenomenon occurs even when enrollments in other departments in the College of Agriculture and Natural Resources decreases. The number of courses in Biometry has expanded from two in 1974 to 15 in 1993. The frequency with which the most popular courses are taught has increased. Student evaluations of the courses have remained consistently very high and the courses as a group have a reputation for being both rigorous and valuable.

The most serious problem is the lack of a doctorate degree program. All of the components are in place that would allow the Department of Biometry to offer a very respectable Ph.D. degree in biometry. No additional resources are required. It is well documented that, even in these difficult economic times, the number of graduates trained in the practice of biometry is not keeping up with the demand.

The purpose of this report is to state the goals of the teaching program, present a historical perspective, review the current capabilities, and identify high priority improvements for maintaining and enhancing the teaching components of the Department of Biometry.

#### Historical Perspective of Teaching Program

The Department of Biometry had its beginning as a statistical laboratory in 1957. At that time only two applied statistics courses were taught in the College of Agriculture and they were offered only once per year. The first, Agronomy 203, was the precursor of the introductory methods course, Biometry 801, with an enrollment of about 25 students.

The second course, Agronomy 310, was the precursor of the experimental design course, Biometry 802. It had an enrollment of about 10-15 students. Both courses were taught by faculty with academic appointments in Agronomy. Later, a similar course in design was offered in Animal Science which was tailored for designs and examples with animals. Since the Statistical Laboratory did not have academic status, faculty were required to have their academic appointments in subject matter departments.

Enrollments in the two basic courses increased markedly in the early 1970's as agricultural research became more sophisticated and interpretation of data required increased statistical literacy. Furthermore, computer software packages which permit complex analyses have encouraged the use of advanced

techniques in agricultural research. Because of these perceived needs, eight additional graduate courses and one undergraduate course were added between 1974 and 1981 to allow students to access more sophisticated techniques. Two additional faculty positions were added during this time, one in 1976, another in 1979. In 1978, the Statistical Laboratory was restructured to include more data processing and information systems functions and was renamed the Biometrics and Information Systems Center (BISC). One of the additional courses dealt with data processing. It has subsequently been replaced by two SAS minicourses which are offered each semester.

The course offerings and class sizes increased rapidly and the need for assistance from biometrics graduate students greatly increased. The main drawback, at that time, was that BISC did not offer graduate degrees. Thus, students employed on assistantships had divided loyalties and usually could assist for only one semester. These temporary arrangements tended to produce unpredictable quality.

Relief came in 1986, when, as a result of recommendations made by the departmental review team, BISC was split into two units, the Biometrics Center and IANR computing. The Biometrics center was awarded academic status, and two additional faculty were recruited. By that time, all faculty members had their academic appointments in the center, although some faculty maintained courtesy appointments in subject matter departments.

In 1989, the Biometrics Center became the Department of Biometry and in 1991 a masters degree program was initiated. The curriculum has been expanded to include some exciting new directions in biometry such as spatial variation, decision analysis, statistical ecology, applications of fractals and chaos. The faculty are dedicated to helping students apply statistical concepts as well as master the theoretical aspects. The interpersonal aspects of the consulting relationship are addressed in the Consulting Practicum.

The department continues to present biometrics seminars and short courses. Lately, however, the seminars have had to be in house due to lack of funds for outside speakers.

In 1992, the department participated in FIPSE. As part of that program the faculty developed a teaching evaluation plan. The faculty views teaching improvement as the primary motivation for participating in an evaluation process. Monetary rewards are important but tend to be sporadic. Moreover, faculty recognize improvement and evaluation as two distinct processes that require separate documentation.

**Courses Offered****Biometry 201****Title: INTRODUCTION TO BIOMETRY (3 cr)****Description:**

Wide scope of topics in practical application of biostatistics in agriculture and biology covering collection and organization of data, normal and binomial distributions, elementary probability, regression and correlation, and analysis of variance. Offered twice a semester.

**Biometry 801****Title: STATISTICAL METHODS IN RESEARCH  
(4 cr, 3 hr lecture, 2 hr lab)****Description:**

Statistical concepts and statistical methodology useful in the descriptive, experimental, analytical, and interpretative study of biological phenomena. Data summarization, probability and basic distributions, hypothesis testing, t-tests, analysis of variance, regression and analysis of covariance are discussed. Emphasis is placed on application and understanding of statistics and relevance to the biological problem. Offered every semester.

**Biometry 802****Title: EXPERIMENTAL DESIGN  
(4cr, 3 hr lecture, 2 hr lab)****Description:**

Presentation of experimental design as a necessary integrated component of agricultural and related issues. Topics include 1) planning, 2) evaluation of precision and assumptions, 3) suitability and efficiency of various experimental designs, 4) integration of various treatment designs, and 5) statistical analysis and interpretation of the data. Offered every semester.

**Biometry 810**  
**Title: MULTIVARIATE METHODS (3 cr)**

**Description:**

An introduction to multivariate techniques commonly used in agricultural research with emphasis on general appreciation, relevance and interpretation. The course is divided into three modules. Module I is a study of reduction of dimensionality and multivariate dependencies which includes principle components, factor analysis, and canonical correlation. Module II is a study of classification procedures which includes discriminant analysis, cluster analysis, and multidimensional scaling. Module III is a study of multivariate extensions to the analysis of variance and the general linear model. Offered spring of even-numbered years.

**Biometry 896 A**  
**Title: NONPARAMETRIC METHODS (3cr)**

**Description:**

Covers a wide variety of statistical methods for data which will not satisfy "usual" statistical assumptions. These methods include the sign test, Wilcoxon, Kruskal-Wallis, and Friedman's test, as well as more advanced topics such as factorials and split-plots. Methods for the estimation of nonparametric alternatives to the mean (e.g. median) and their confidence intervals are also considered. Nonparametric tests for goodness of fit (e.g. Kolmogorov-Smirnov test) are included. Basic probability concepts are developed to provide necessary theoretical background. Offered fall of odd-numbered years.

**Biometry 896 B**  
**Title: ANALYSIS OF CATEGORICAL DATA AND LOG LINEAR MODELS (3 cr)**

**Description:**

Covers a wide variety of methods to handle categorical data. These include the "classical" log-linear models to evaluate and model independence among classification criteria, the so-called "Grizzle-Starmer-Koch" methods to evaluate homogeneity -- i.e. treatment effects on classification probability -- and methods to evaluate structure in classification, such as symmetry, association, logistic regression, etc. Advanced topics include analysis of repeated categorical measurements, and the relationship of categorical data to "generalized linear models." Offered spring of even-numbered years.

**Biometry 896 D**  
**Title: VARIANCE COMPONENT ESTIMATION (3 cr)**

**Description:**

Design and analysis of random effects and mixed models. Topics include 1) Basic theoretical background for models with random effects, 2) Quadratic estimators including Henderson's ANOVA methods, MINQUE, and MIVQUE, 3) optimal design for nested and cross classification models, 4) Likelihood based estimators including maximum likelihood and restricted maximum likelihood, 5) extensions to the analysis of "generalized linear mixed models," and 6) various computing packages. Offered fall of odd-numbered years.

**Biometry 896 E**  
**Title: DECISION ANALYSIS (3 cr)**

**Description:**

Introduces basic concepts of statistical decision theory and their applications to decision making in agriculture. Students are exposed to fundamental ideas such as the quantification of risk, utilities, probability, and expectation required for objective decision making. Computer-based decision support systems are considered. Applications of the methodology is discussed with regard to selection problems in statistics and agriculture. Offered fall of odd-numbered years.

**Biometry 896 F**  
**Title: ECOLOGICAL STATISTICS (3 cr)**

**Description:**

A survey of statistical methods useful in ecology. Topics include discrete distributions, goodness-of-fit tests, sequential estimation, sequential hypothesis testing, analysis of spatial pattern, capture-recapture techniques, line transect methods, life-stage analysis, population growth models, probit tests, and comparison of survival functions. Offered spring of even-numbered years.

**Biometry 896 G**  
**Title: SPATIAL VARIABILITY (3 cr)**

**Description:**

Basic review of statistical methods for detecting nonindependence of data using standard techniques. Introduction of geostatistical concepts will follow including measures of spatial correlation, development and interpretation of semivariograms, nonparametric measures of spatial correlation, and robust estimation of variograms models. Estimation in the presence of spatial correlation is examined using triangulation methods, distance measures, nearest neighbor analysis, and kriging. Lastly, designs which are useful in the presence of spatial correlation are derived. Offered spring of even-numbered years.

**Biometry 896 H**  
**Title: REPEATED MEASURES, TIME SERIES AND CHAOS (3 cr)**

**Description:**

Covers a variety of methods to analyze repeated measurements. Introduces basic concepts in time series and dynamic systems as well as standard general linear model techniques such as growth curve analysis, profile analysis, using both the multivariate approach and adjusted univariate statistics.

**Biometry 901**  
**Title: MULTIPLE REGRESSION (3 cr)**

**Description:**

Linear regression and related analysis of variance and covariance methods for models with two or more independent variables. Techniques for selecting and fitting models, interpretation parameter estimates, and checking for consistency with underlying assumptions will be emphasized. Particular attention to applications of these techniques to biological data. Topics include partial and multiple correlation, use of dummy variables, covariance models, stepwise procedures, methods for estimating response surfaces, and evaluation of residuals. Offered every fall semester.

--

**Biometry 902**

**Title: ADVANCED EXPERIMENTAL DESIGN (3 cr)**

**Description:**

This course is an extension of Biometry 802. It deals with more advanced topics in experimental design, such as augmented designs, partially and completely confounded factorials, balanced and partially balanced incomplete block designs, and designs that consider several blocking factors. In each case, the construction of the design is illustrated and the randomization procedure is demonstrated. Considerable ground work is laid by describing the structure of a factorial treatment design and how this relates to experimental design. Offered every spring semester.

**Biometry 960**

**Title: MATRIX ALGEBRA FOR BIOLOGISTS (2 cr)**

**Description:**

Concepts and techniques useful in matrix preparation and manipulation. Development of applications useful in expanding determinants, computing matrix inverses, determining ranks and linear (in)dependence, and finding latent roots and vectors. Special emphasis is placed on an application of matrices to completion of regression (continuous independent variables) and linear model analyses (discrete treatments) using one general linear model, while being useful to a variety of biological research topics. Offered every fall semester.

**Biometry 970**

**Title: LINEAR MODELS (3 cr)**

**Description:**

Methods and underlying principles for analyzing primarily unbalanced data based on a linear statistical model. Special emphasis is placed on determining exact hypothesis being tested and developing understanding of the linear models literature and computer algorithms associated with messy data. Offered fall semesters of even-numbered years.

**Biometry 971**

**Title: BIOMETRICAL MODELLING (3 cr)**

**Description:**

This course is a second course in theory and application of statistical models. It broadens the repertoire of models from a fixed effects model with errors that are independent and normally distributed. The models that will be studied are random effects models, models with both fixed and random effects, models with correlated errors, generalized linear models, non-linear models, and, if time permits, multivariate models. Offered spring semester.

**Biometry 990**

**Title: PRINCIPLES OF STATISTICAL CONSULTING (2 cr)**

**Description:**

First course in statistical consulting. Designed primarily for graduate students in Biometry, this course is designed to prepare them for future consulting work and to provide them with a more comprehensive understanding of applications of statistics than they would obtain from theory and methods courses alone. Issues include the role and purpose of consulting, statistical issues -- understanding the clients problem, choosing an appropriate procedure, etc. -- and interpersonal issues -- client expectations, difficult clients, working effectively with people, teamwork, etc. Course uses a mix of lecture, discussion, role-playing, and videotaping and discussion of real or simulated consulting meetings. Offered every fall semester.

**Biometry 991**

**Title: PRACTICUM IN STATISTICAL CONSULTING (4 cr)**

**Description:**

Participation in statistical consulting activities of the Department of Biometry under faculty supervision. May take the form of extensive consultation on one highly involved problem or regular availability for many less involved problems over the course of the semester. Students will be expected to prepare written reports to clients summarizing consultation results and to Biometry supervisor summarizing statistical issues, findings, etc. Offered every spring semester.

Teaching has continued to be a major commitment of faculty time and energy. Through the courses that they teach, and the consulting that they do, Biometry faculty have a profound influence on nearly every graduate research program in IANR, and on the professional training and development of the students associated with it.

Student enrollments, student credit hour production, and student contact hours have increased dramatically over the past 7 years, as shown in Figure 1. While student credit hours have increased by almost 70%, teaching faculty FTE have increased by less than 25% during the past 7 years. (Table 5.).

It is significant to note that these increases occurred during a period in which total student credit hour production for the College of Agricultural Sciences and Natural Resources increased by less than 15%. While total student credit hour production for the College of Agriculture has dropped from a peak of 39,483 in the 1980-1981 school year to 31,089 in 1992-93. (Table 2.) credit hour production for the Department of Biometry has risen from 925 to 1490 during the same period.

In 1991 a Master's degree program in Biometry was added. Currently 8 students are enrolled in the Master's degree program. Through their teaching assistantships the graduate students help fill a critical need in the introductory courses. Currently the department offers 4 half time teaching assistantships.

## Current Teaching Capabilities

Biometry currently teaches a total of 18 courses. The courses and their frequency of offering are as follows:

201	Introduction to Biometry . . . . .	Offered every semester
801	Statistical Methods in Research . . . . .	Offered every semester
802	Experimental Design . . . . .	Offered every semester
810	Multivariate Methods . . . . .	Offered fall of every year
896 A	Non Parametric Models . . . . .	Offered fall of odd numbered years
896 B	Analysis of Categorical Data and Log Linear Models . . . . .	Offered spring of even-numbered years
896 D	Variance Component Estimation . . . . .	Offered fall of odd-numbered years
896 E	Decision Analysis . . . . .	Offered fall of odd-numbered years
896 F	Ecological Statistics . . . . .	Offered spring of odd-numbered years
896 G	Spatial Variability . . . . .	Offered spring of even-numbered years
896 H	Repeated Measures/Time Series/Chaos . . . . .	Fall of even-numbered years
901	Multiple Regression . . . . .	Offered every fall semester
902	Advanced Experimental Design . . . . .	Offered every spring semester
960	Matrix Algebra for Biologists . . . . .	Offered every fall semester
970	Linear Models . . . . .	Offered every fall semester
971	Biometrical Modelling . . . . .	Offered every spring semester
990	Principles of Statistical Consulting . . . . .	Offered every fall semester
991	Practicum in Statistical Consulting . . . . .	Offered every spring semester

Demand for these courses is generally heavy. Student enrollments, student credit hours, and student contact hours are shown in Tables 1,3, and 4 and Figures 2,3, and 4. The 201 class is required for some undergraduate majors (e.g. Agricultural Economics) and strongly suggested for any undergraduate planning to pursue graduate study in a biological discipline. 801 and 802 are required for most College of Agriculture graduate students and are also considered to be valuable classes by the faculty in such areas as the School of Biological Sciences, Department of Geology, the College of Home Economics, etc. Most Ph.D. candidates also take 901. The Linear Models class is becoming

increasingly popular. Linear Models and the other classes are taken primarily by Ph.D. candidates with more specialized needs. However, each of these courses is considered vital to the curriculum of the subject matter discipline for which it is relevant.

To make these classes available, the seven Biometry faculty members each teach one class every semester. In 801 and 802 the faculty are supported by TA's who teach the lab sections. In 201 the two sections offered each semester are taught by TA's. Graders are hired for some of the classes to provide additional support.

In addition to classroom teaching, Biometry faculty present seminars at the departmental and IANR levels. Their purpose is to inform IANR researchers of the latest advances in Biometry and to periodically review basic biometric principles. These are considered quite valuable by IANR researchers and often catalyze collaborative research. Each faculty member presents roughly one seminar per semester. Demand exists for more, but time is not available.

Biometry faculty periodically attend seminars held by other departments. This can be as valuable as a teaching function when questions arise concerning the statistical aspects of the seminar. It allows biometry faculty to discuss biometry as it applies explicitly to a particular subject matter.

**DEPARTMENT OF BIOMETRY**  
**STUDENT CREDIT HOURS**

Academic Years 1979-1980 through 1992-1993

COURSE	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93
BIOM 201	45	54	60	81	72	141	153	117	153	183	192	228	261	252
BIOM 801	468	364	488	540	476	448	404	368	460	420	412	428	432	500
BIOM 802	303	213	300	300	312	219	249	186	198	198	240	252	282	384
BIOM 896	6	87	36	30	15	72	26	40	10	57	35	146	81	189
BIOM 901		101	94	91	118	110	90	111	84	96	63	111	159	81
BIOM 902	24	48	16	48	40	40	20	30		38	30	38	54	
BIOM 960		22		28				12					18	
BIOM 970		36		21		33		18		6		36	16	84
TOTAL	846	925	994	1,139	1,033	1,063	942	882	905	998	972	1,257	1,285	1,490

**COLLEGE OF AGRICULTURE**  
**STUDENT CREDIT HOURS**

Academic Years 1979-1980 through 1992-1993

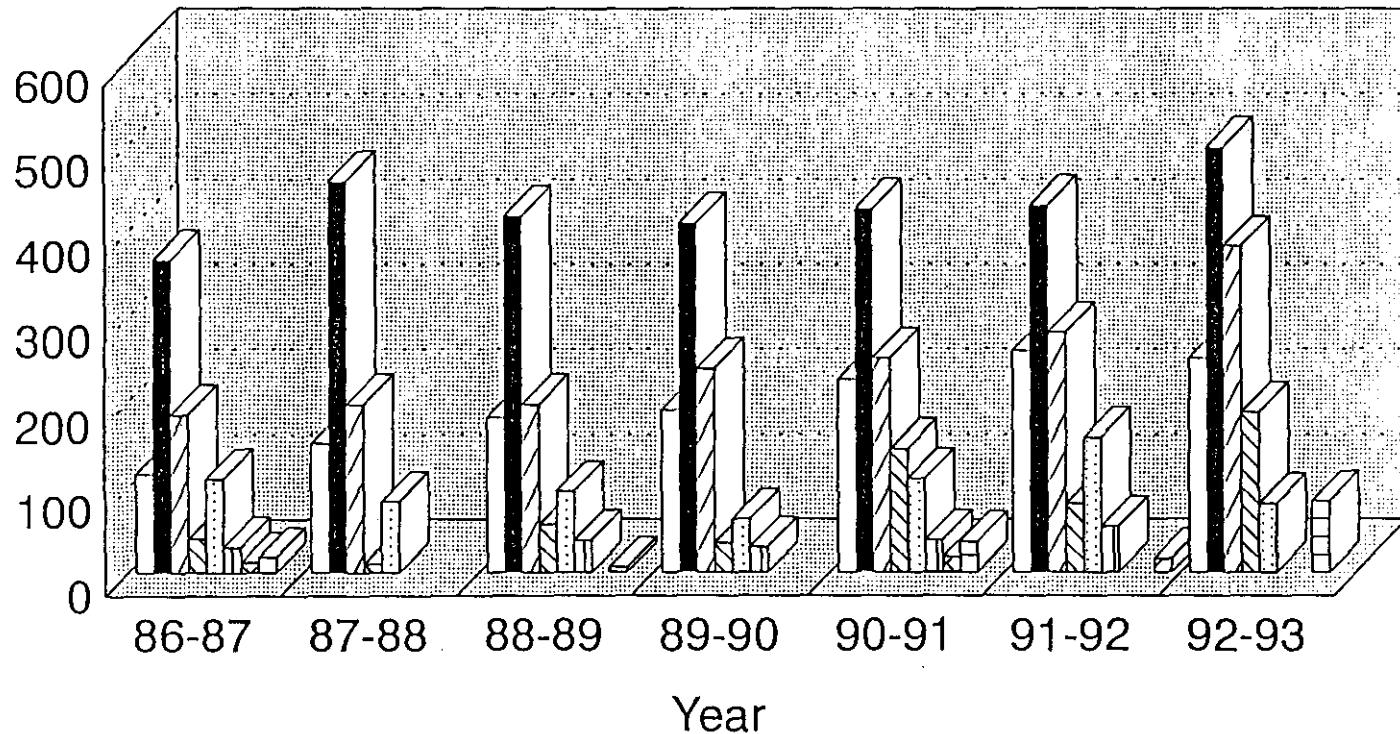
Course	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93
Total	37,619	39,483	39,333	39,208	36,389	32,407	30,043	27,143	26,073	25,432	26,588	28,493	30,046	31,089 (est)

# Biometry

## Credit Hours

Figure 1

Credit Hours



Class Number

- 201
- 801
- 802
- 896
- 901
- 902
- 960
- 970
- 990/991

**DEPARTMENT OF BIOMETRY**  
**STUDENT ENROLLMENT**

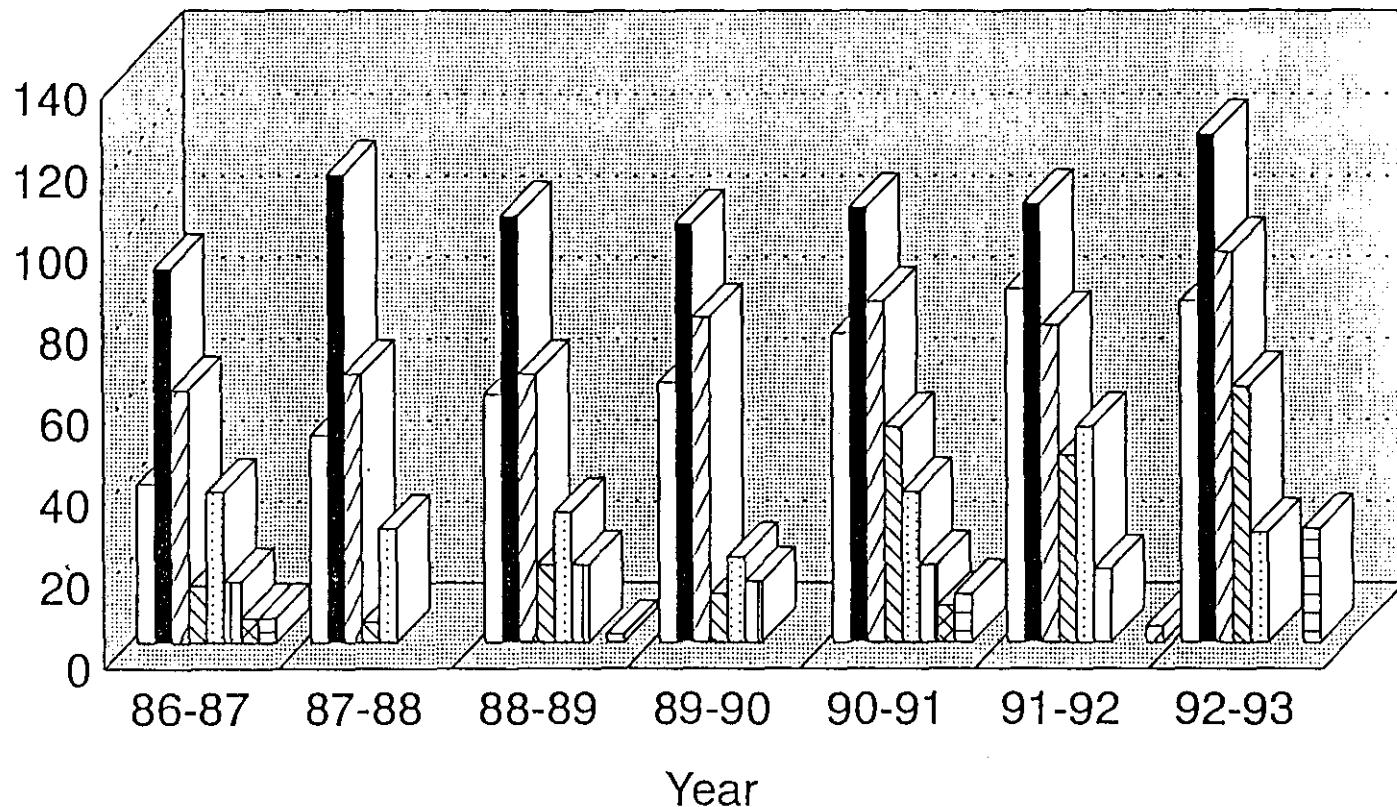
Academic Years 1979-1980 through 1992-1993

Course	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93
BIOM 201	15	18	20	27	24	47	51	39	51	61	64	76	87	84
BIOM 801	117	91	122	135	119	112	101	92	115	105	103	107	108	125
BIOM 802	101	71	100	100	104	73	83	62	66	66	80	84	78	96
BIOM 896	2	29	12	10	5	24	11	14	5	19	12	53	46	63
BIOM 901		37	33	36	47	42	33	37	28	32	21	37	53	27
BIOM 902	12	24	8	24	20	20	10	15		19	15	19	18	
BIOM 960		11		14				6				9		
BIOM 970		12		7		11		6		2		12	4	28
TOTAL	247	293	295	353	319	329	289	271	265	304	295	397	394	423

# Biometry Enrollment Trend

Figure 2

Enrollment



Class Number

- 201
- 801
- 802
- 896
- 901
- 902
- 960
- 970
- 990/991

**DEPARTMENT OF BIOMETRY**  
**STUDENT CONTACT HOURS**

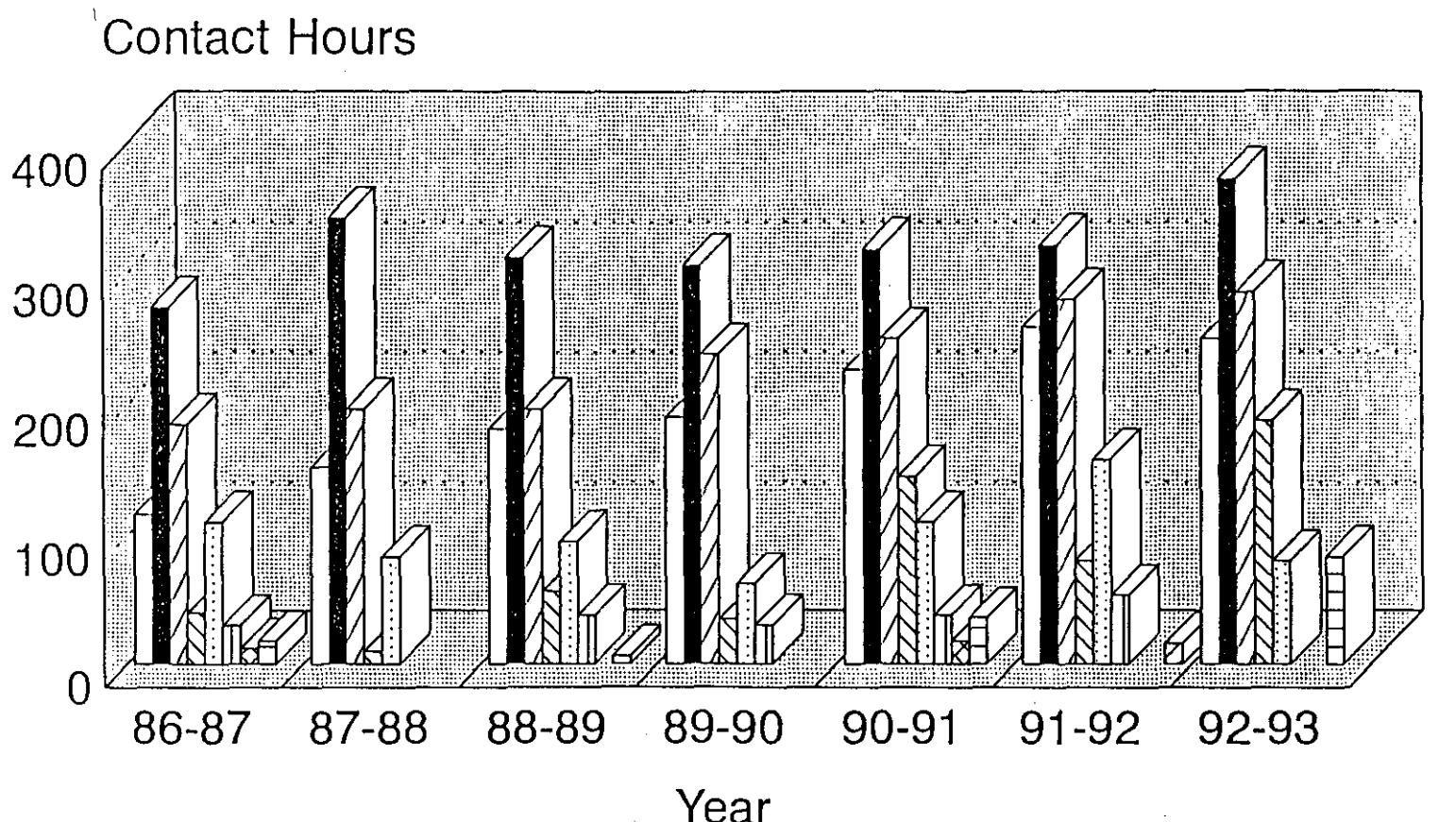
**Academic Years 1979-1980 through 1992-1993**

Course	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93
BIOM 201	45	54	60	81	72	141	153	117	153	183	192	228	261	252
BIOM 801	351	273	366	405	357	336	305	276	345	315	309	321	324	375
BIOM 802	303	213	300	300	312	219	249	186	198	198	240	252	282	288
BIOM 896	6	87	36	30	15	24	26	40	10	57	35	146	81	189
BIOM 901		101	94	91	118	110	90	111	84	96	63	111	159	81
BIOM 902	24	48	16	48	40	40	20	30		38	30	38	54	
BIOM 960		22		28				12					18	
BIOM 970		36		21		33		18		6		36	16	84
TOTAL	729	834	872	1,004	914	903	843	790	790	893	869	1,150	1,177	1,269

Figure 3

# Biometry

## Contact Hours



Class Number

- 201
- 801
- 802
- 896
- 901
- 902
- 960
- 970
- 990/991

**DEPARTMENT OF BIOMETRY**  
**CREDIT HOURS PER FTE FACULTY AND DIRECT COST PER STUDENT CREDIT HOUR**

**Academic Years 1979-1980 through 1992-1993**

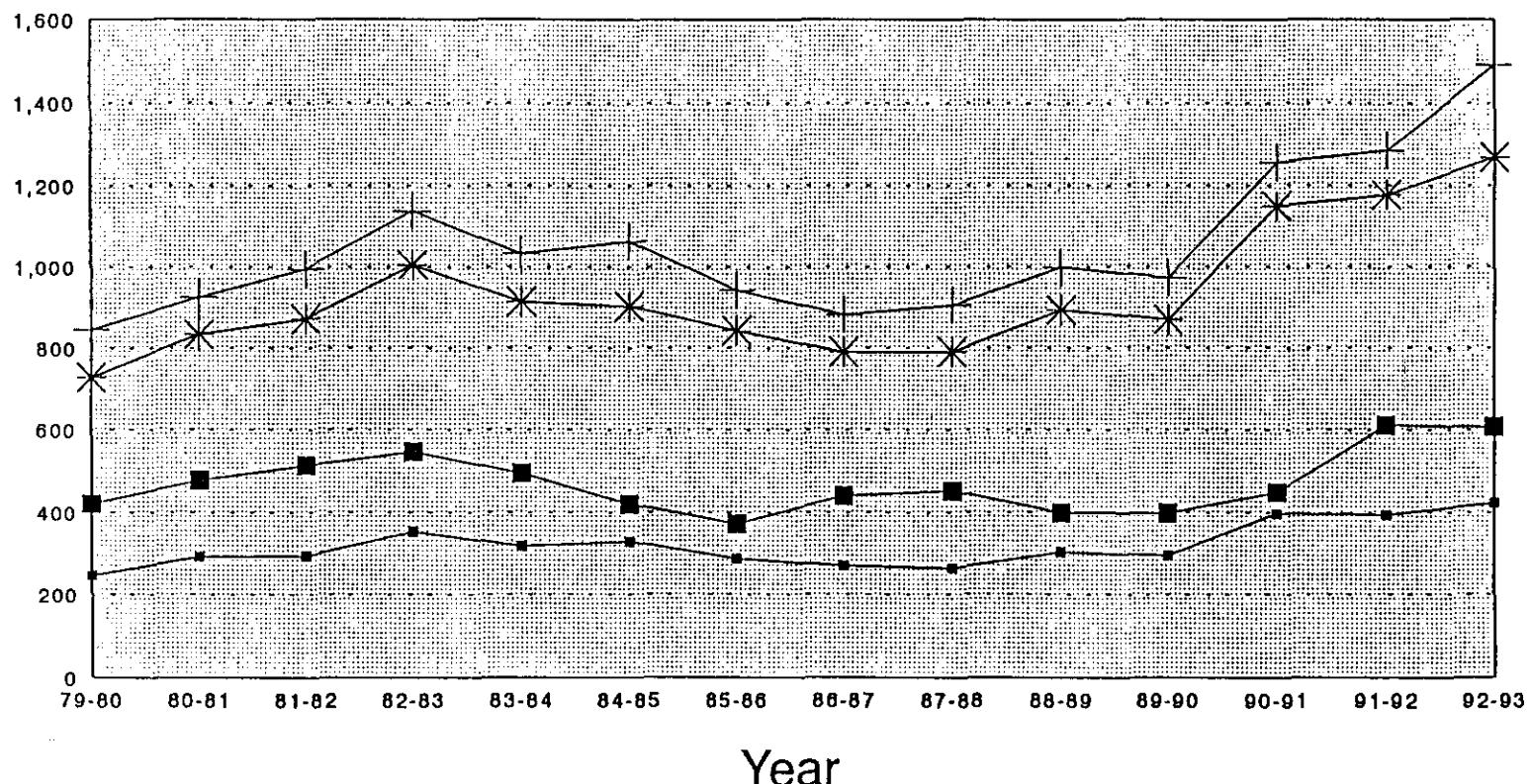
Year	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91	91-92	92-93
FTE	2.01	1.93	1.93	2.08	2.08	2.53	2.53	2.0	2.0	2.5	2.45	2.8	2.1	2.45
SCH	846	925	994	1139	1033	1063	942	882	905	998	975	1257	1285	1490
SCH/FTE	420.9	479.3	515.0	547.6	496.6	420.2	372.3	441.0	452.5	399.2	398.0	449.0	612.0	608.2
Cost/SCH	58.44	58.42	60.94	58.57	66.24	86.76	100.78	89.12	89.84	124.86	132.86	121.97	99.37	102.58

# Biometry

## General Trend

Figure 4

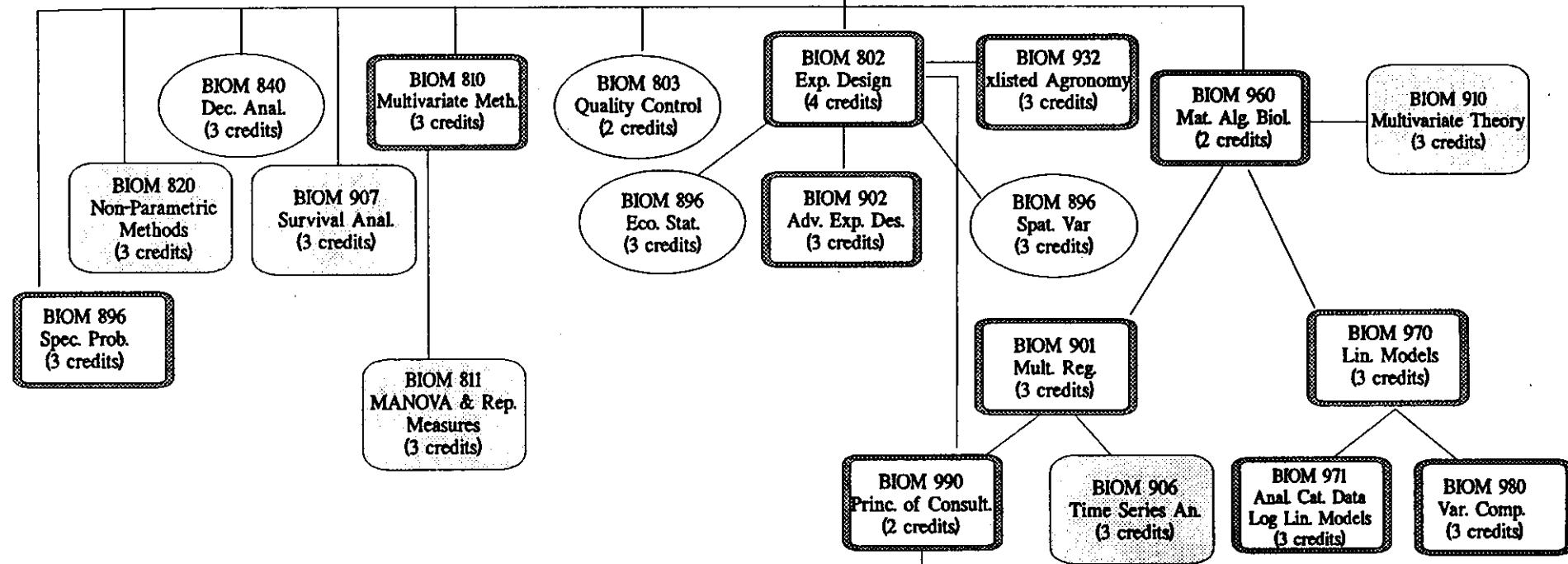
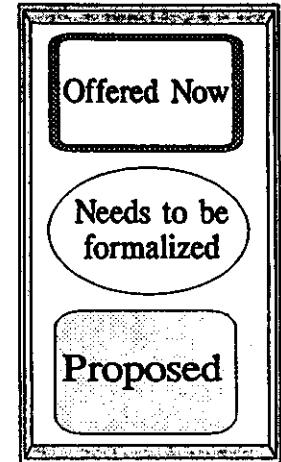
Trend



Enrollment,Credit hours,Contact hours,SCH/FTE

— Enrollment + Credit Hours \* Contact Hours ■ SCH/FTE

# Proposed Curriculum



**Specific Goals and Challenges**

1. Provide a Ph.D. program in Biometry.
2. To provide instruction in graduate and undergraduate biometry courses for IANR students.
3. To provide short courses and seminars for updating IANR staff and faculty.
4. To provide a modern biometry curriculum of sufficient depth and scope to prepare students in the Master's and Ph.D. degree program along with minors at the M.S. and Ph.D. levels to meet the challenges that lie ahead.
5. To provide a professional environment within which innovative teaching developments can occur and professional development can thrive.

## **Faculty Opinion Survey**

**The Department of Biometry is a service oriented unit providing teaching, consulting, and statistical programming support for various users throughout IANR. Because of this service orientation, a survey of IANR faculty was conducted to measure the effectiveness of Department of Biometry activities.**

**The four main objectives of the survey were:**

- 1) how often are our services used by Faculty.**
- 2) what services are seen as inadequate.**
- 3) how do faculty rate the content and adequacy of Department of Biometry courses**
- 4) should the Department of Biometry offer a Ph.D. degree in Biometry.**

### **Population**

**The target population was comprised of all IANR faculty in Lincoln, as well as all faculty assigned to outstate research and extension centers, county extension offices, and the School of Technical Agriculture at Curtis. Surveys were mailed to 623 faculty members.**

### **Data Collection**

A total of 153 (24.6 %) were returned by the end of the two week period given for return of the questionnaires. One and two way frequency tables and means were tabulated using SAS.

**One-Way Frequencies and Means:**

**What is your faculty rank?**

	Frequency	Percent
Instructor	4	2.6
Assistant	30	19.9
Associate	54	35.8
Professor	63	41.7

**What percentage of your appointment is in each of the following categories?**

This information can be looked at in 3 ways:

**Appointment Categories:**

Research Categories	Frequency	Percent
0 - 24%	54	36.2
25 - 49 %	31	20.8
50 - 74 %	42	28.2
75 - 100%	22	14.8

Teaching Categories	Frequency	Percent
0 - 24%	108	72.5
25 - 49 %	18	12.1
50 - 74 %	18	12.1
75 - 100%	5	3.4

<b>Administrative Categories</b>	<b>Frequency</b>	<b>Percent</b>
0 - 24%	140	94.0
25 - 49 %	4	2.7
50 - 74 %	2	1.3
75 - 100%	3	2.0
<b>Extension Categories</b>	<b>Frequency</b>	<b>Percent</b>
0 - 24%	60	40.3
25 - 49 %	9	6.0
50 - 74 %	30	20.1
75 - 100%	50	33.6

**Overall means for appointments.**

<b>RESEARCH</b>	<b>34.82</b>
<b>TEACHING</b>	<b>15.38</b>
<b>ADMINISTRATION</b>	<b>3.49</b>
<b>EXTENSION</b>	<b>45.14</b>

**Means for those reporting more than 0 % appointment in an area.**

<b>RESEARCH</b>	<b>52.40</b>
<b>TEACHING</b>	<b>34.19</b>
<b>ADMINISTRATION</b>	<b>47.27</b>
<b>EXTENSION</b>	<b>70.06</b>

Administrative Categories		With
0 - 24%		
25 - 49 %		
50 - 74 %		
75 - 100%	3	
Extension Categories		Frequency
0 - 24%		60
25 - 49 %		9
50 - 74 %	30	20.1
75 - 100%	50	33.6

Overall means for appointments.

RESEARCH	34.82
TEACHING	15.38
ADMINISTRATION	3.49
EXTENSION	45.14

Means for those reporting more than 0 % appointment in an area.

RESEARCH	52.40
TEACHING	34.19
ADMINISTRATION	47.27
EXTENSION	70.06

**With which department or administrative unit are you primarily affiliated.**

	COUNT	PERCENT
<b>Did Not Respond</b>	10	6.54
<b>Ag.Economics</b>	6	3.92
<b>Ag.Leadership,Ed.,&amp;Comm.</b>	3	1.96
<b>Ag.Meteorology</b>	4	2.61
<b>Agronomy</b>	22	14.38
<b>Animal Science</b>	12	7.84
<b>Biochemistry</b>	3	1.96
<b>Biological Systems Eng.</b>	11	7.19
<b>Center for Water&amp;Env.Programs</b>	2	1.31
<b>Comm. &amp; Comp. Services</b>	2	1.31
<b>Cooperative Ext. Service</b>	7	4.58
<b>Entomology</b>	3	1.96
<b>Food Science &amp; Technology</b>	5	3.27
<b>Forestry,Fisheries,&amp;Wildlife</b>	8	5.23
<b>Horticulture</b>	4	2.61
<b>IANR</b>	3	1.96
<b>Ne. College of Technical Ag.</b>	1	0.65
<b>Northeast Res.&amp;Ext.Center</b>	4	2.61
<b>Nutritional Science &amp; Dietetics</b>	2	1.31
<b>Panhandle Res.&amp;Ext.Center</b>	6	3.92

<b>Plant Pathology</b>	<b>4</b>	<b>2.61</b>
<b>South Central Res.&amp;Ext.Center</b>	<b>3</b>	<b>1.96</b>
<b>Southeast Res.&amp;Ext.Center</b>	<b>8</b>	<b>5.23</b>
<b>Veterinary&amp;Biomedical Science</b>	<b>9</b>	<b>5.88</b>
<b>West Central Res.&amp;Ext.Center</b>	<b>11</b>	<b>7.19</b>

**Are you familiar with the services of the Department of Biometry?**

	<b>Frequency</b>	<b>Percent</b>
<b>Yes</b>	<b>122</b>	<b>81.3</b>
<b>No</b>	<b>28</b>	<b>18.7</b>

**How important is Department of Biometry input into statistical design and analysis in your research?**

	<b>Frequency</b>	<b>Percent</b>
<b>Very important</b>	<b>58</b>	<b>39.2</b>
<b>Of some importance</b>	<b>50</b>	<b>33.8</b>
<b>Of little importance</b>	<b>12</b>	<b>8.1</b>
<b>Does not apply</b>	<b>28</b>	<b>18.9</b>

**Do you advise graduate students?**

	<b>Frequency</b>	<b>Percent</b>
<b>Yes</b>	<b>91</b>	<b>59.9</b>
<b>No</b>	<b>61</b>	<b>40.1</b>

During an average month, how many times do you and/or your graduate students use each of the following services at the Department of Biometry?

**Data Entry:**

Number of Times	Frequency of Response
1	17
2	3
3	1
8	1
10	1

**Data processing and programming support:**

Number of Times	Frequency of Response
1	34
2	12
3	5
4	3
5	2
8	1
10	1

**SAS training courses:**

<b>Number of Times</b>	<b>Frequency of Response</b>
1	28
2	3

**Biometry seminars:**

<b>Number of Times</b>	<b>Frequency of Response</b>
1	15
10	1

**Other:**

<b>Number of Times</b>	<b>Frequency of Response</b>
1	27
2	5
3	4
4	1
5	1
6	1

Please rate the services offered by the Department of Biometry that you use:

	Very Adequate	Adequate	Inadequate	No Opinion
1. Data Entry	20 (16.4%)	16 (13.1%)	3 (2.5%)	83 (68.0%)
2. Data Processing and Programming Support	31 (24.4%)	34 (26.8%)	4 (3.1%)	58 (45.7%)
3. SAS Training Courses	18 (15.1%)	30 (25.2%)	9 (7.6%)	62 (52.1%)
4. Statistical Consulting	59 (45.0%)	31 (23.7%)	9 (6.9%)	32 (24.4%)
5. Biometry Seminars	9 (8.0%)	17 (15.0%)	5 (4.4%)	82 (72.6%)

Please comment on the services provided by the Department of Biometry which you consider inadequate or new services which you think could be offered:

What is your rating of the content of the Biometry courses taught by faculty of the Department of Biometry?

Frequency	Percent
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<b>High</b>	<b>48</b>	<b>32.7</b>
<b>Average</b>	<b>31</b>	<b>21.1</b>
<b>Low</b>	<b>1</b>	<b>0.7</b>
<b>No Opinion</b>	<b>67</b>	<b>45.6</b>

**What is your rating of the adequacy of the Biometry course offerings provided by the Department of Biometry?**

	Frequency	Percent
<b>Very Adequate</b>	<b>31</b>	<b>21.4</b>
<b>Adequate</b>	<b>49</b>	<b>33.8</b>
<b>Inadequate</b>	<b>4</b>	<b>2.8</b>
<b>No opinion</b>	<b>61</b>	<b>42.1</b>

**Should the Department of Biometry offer a Ph.D. degree in Biometry?**

	Frequency	Percent
<b>Yes</b>	<b>27</b>	<b>18.1</b>
<b>No</b>	<b>17</b>	<b>11.4</b>
<b>No Opinion</b>	<b>105</b>	<b>70.5</b>

**How could the Department of Biometry be improved to better accommodate your needs?**

**Kent Eskridge**

**Curriculum Vita**

**Address:** Home: 5027 Dudley Work: Department of Biometry  
Lincoln, NE 68504 103 Miller Hall  
402.464.4638 University of Nebraska  
Lincoln, NE 68583-0712  
402.472.2903

**Education:**

B.S. 1976	University of Missouri Kansas City, Missouri	Mathematics
B.A. 1976	University of Missouri Kansas City, Missouri	History
M.A. 1981	University of Missouri Columbia, Missouri	Statistics
Ph.D. 1987	University of Nebraska Lincoln, Nebraska	Ag. Economics

**Thesis:**

Choosing Optimal Plant Varieties: A Comparison of Risk Models and Common Selection Practices

**Professional Experience:**

Statistician	U.S. Bureau of Labor Statistics	1976-1978
	Kansas City, Mo.	
Graduate Assistant	Iowa State University	1978-1979
Substitute Teacher	Kansas City, Mo. Public Schools	1979-1980
Graduate Assistant	University of Missouri-Columbia	1980-1981
Statistician	Missouri Dept. of Natural Resources	1981-1981
	Jefferson City, Mo.	
Research Associate	Human Resource Data Systems	1981-1983
	Columbia, Mo.	

**Consultant and Manager** University of Nebraska  
**of Data Processing** Lincoln, Ne. 1983-1987

**Assistant Professor** University of Nebraska  
**of Biometry** Lincoln, Ne. 1987-1992

**Associate Professor** University of Nebraska  
**of Biometry** Lincoln, Ne. 1992-present

**Private Consultant** Economic Research  
Associates 1989-1991

State of Nebraska 1987-Present  
Sandoz Pharmaceuticals 1987-Present  
Harris Technologies 1985-Present  
Koers Consulting Company 1985-Present  
Conagra Flour Milling Co. 1990-Present  
Amigos Restaurants 1990  
CIMMYT - Islamabad,  
Pakistan 1986  
ISABU - Bujumbura, Burundi 1993

#### **Professional Societies:**

American Statistical Association  
Biometrics Society  
American Agricultural Economics Association  
Sigma Xi Scientific Society  
Crop Science Society of Agronomy  
Decision Sciences Institute

#### **Refereed Journal Publications:**

E. J. Stevens, S. J. Stevens, A. D. Flowerday, C. O. Gardner, and K. M. Eskridge. 1986. Phenology of dent corn and popcorn (*Zea mays* L.) II. Influence of planting date on crop emergence and early growth stages. Agronomy Journal. 78:880-884.

E. J. Stevens, S. J. Stevens, A. D. Flowerday, C. O. Gardner, and K. M. Eskridge. 1986. Phenology of dent corn and popcorn (*Zea mays* L.) III. Temperature dependent models. Agronomy Journal. 78:885-891.

E. J. Stevens, S. J. Stevens, A. D. Flowerday, C. O. Gardner, and K. M. Eskridge. 1986. Developmental morphology of dent corn (*Zea mays* L.) with respect to growth staging. Agronomy Journal. 78:867-874.

E. J. Stevens, K. M. Eskridge, S. J. Stevens, A. D. Flowerday, and C. O. Gardner. 1986. Phenology of dent corn and popcorn (*Zea mays* L.) I. Analysis of repeated measures from phenology experiments. Agronomy Journal. 78:1081-1088.

E. J. Stevens, S. J. Stevens, R. N. Gates, K. M. Eskridge, and S. S. Waller. 1987. Technical Note: A modified procedure for microhistological cuticular analysis of herbivore diets. Journal of Range Management. 40:187-189.

K. M. Eskridge, and E. J. Stevens. 1987. Growth curve analysis of temperature dependent phenology models. Agronomy Journal. 79:291-297.

P. G. Hatfield, D. C. Clanton, K. M. Eskridge, and D. W. Sanson. 1989. Intake of lactating beef cows differing in milk production. Journal of Animal Science. 67:3018-3027.

A. R. Aggour, D. P. Coyne, A. K. Vidaver, and K. M. Eskridge. 1989. Transmission of common blight pathogen in bean seed. Journal of the American Society of Horticultural Science. 114(6):1002-1008.

K. M. Eskridge. 1990. Selection of stable cultivars using a safety first rule. Crop Science. 30(2):369-374.

A. A. Maki, M. M. Beck, E. W. Gleaves, J. A. DeShazer, and K. M. Eskridge. 1990. CSF ion composition and manipulation in response to heat stress in an avian species, *Gallus domesticus*. Comparative Biochemistry and Physiology A. 96A(1):135-140.

P. G. Hatfield, D. C. Clanton, D. W. Sanson, and K. M. Eskridge. 1990. Methods of administering ytterbium for estimating fecal output. Journal of Range Management. 43(4):316-320.

D. W. Sanson, G. L. Walker, D. C. Clanton, and K. M. Eskridge. 1990. Relationship between phosphorus intake and blood or fecal phosphorus in gestating cows. Journal of Range Management. 43(3):238-241.

C. A. Ishimaru, K. M. Eskridge, and A. K. Vidaver. 1991. Distribution analyses of epiphytic populations of *Xanthomonas campestris* pv. *phaseoli* on dry beans. Phytopathology. 81(3):262-268.

R. T. Clark, J. T. Nichols, and K. M. Eskridge. 1991. Economic optimum fertilizer rates for subirrigated meadow hay production, including values for hay quality. Journal of Production Agriculture. 4(2):233-240.

K. M. Eskridge and B. E. Johnson. 1991. Expected utility maximization and selection of stable plant cultivars. Theoretical and Applied Genetics. 81(6):825-832.

D. H. Steinegger, D.A. Aguero, R.J. Johnson, and K. M. Eskridge. 1991. Monofilament lines fail to protect grapes from bird damage. HortScience 26(7):924

K. M. Eskridge, P. F. Byrne, and J. Crossa. 1991. Selecting stable cultivars by minimizing the probability of disaster. Field Crops Research 27:169-181.

K. M. Eskridge. 1991. Screening cultivars for yield stability to limit the probability of disaster. Maydica. 36:275-282.

D. A. Aguero, R. J. Johnson, K. M. Eskridge. 1991. Monofilament lines repel house sparrows from feeding sites. Wildlife Society Bulletin. 19(4):416-422.

L. Tulsieram, W. A. Compton, R. Morris, M. Thomas-Compton, and K. Eskridge. 1992. Analysis of genetic recombination in maize populations using molecular markers. 1992. Theoretical and Applied Genetics 84:65-72.

G. E. Duhamel, R. J. Bernard, M. R. Mathiesen, and K. M. Eskridge. 1992. Comparison of six commercially available transport media for maintenance of Serpula (Treponema) hydysenteria. Journal of Veterinary Diagnostic Investigation 4:285-292.

K. M. Eskridge and R. F. Mumm. 1992. Choosing cultivars based on the probability of outperforming a check. Theoretical and Applied Genetics 84:494-500.

R. D. Lee, B. E. Johnson, K. M. Eskridge, and J. F. Pedersen. 1992. Selection of superior female parents in sorghum utilizing A3 cytoplasm. Crop Science 32(4):918-921.

K. S. Richter, E. Dorneau, K. M. Eskridge, and C. S. Rao. Microbiological quality of hard, soft, spring and durum wheat flours. Cereal Foods World. In press.

P. A. Pochop, R. J. Johnson and K. M. Eskridge. House sparrow success at nest boxes with monofilament lines. The Wilson Bulletin. In press.

E. Arnaud-Santana, D. P. Coyne, K. M. Eskridge and A. K. Vidaver. Heritabilities and low correlations of leaf, pod and seed reactions to common blight in dry beans (Phaseolus vulgaris L.). Journal of the American Society of Horticultural Science. In press.

#### **Invited Papers:**

K. M. Eskridge. Decision Analysis and Selection of Stable Plant Genotypes. Invited paper to the annual meetings of the University Statisticians of Southern Experiment Stations (USSES) Lincoln, NE. July 1988.

B. E. Johnson, K. M. Eskridge, and Y. Liu. Use of Optimization Models for Multiple Trait Selection. American Seed Trade Meetings. Chicago, IL. December 1989.

K. M. Eskridge. Safety-First Models Useful for Selecting Stable Cultivars. Symposium on Genotype-by-Environment Interaction and Plant Breeding. Louisiana State University. Baton Rouge, LA. February 1990.

P. A. Pochop, R. J. Johnson, D. A. Aguero, K. M. Eskridge. The Status of Lines in Bird Damage Control. Vertebrate Pest Conference. Sacramento, CA. March 1990.

K. M. Eskridge and C. J. Peterson. Selection for quality traits in wheat based on the probability of the traits falling within established limits. Hard Red Winter Wheat Conference. Lincoln, NE. January 1992.

K. M. Eskridge, Charles E. Curtis, and James B. Hassler. 1985. Risk Efficient Production Plans Under Alternative Measures of Income Expectations. Selected paper to the annual meetings of the American Agricultural Economics Association. Ames, IA. August 1985

J. Atwood, G. Helmers, K. M. Eskridge, J. Morrill, M. Langemeier. 1986. Pooling and Cross-sectional Yield Data for Risk Analysis. Selected paper to the annual meetings of the American Agricultural Economics Association. Reno, NV. July 1986.

K. M. Eskridge. 1986. Estimation Risk and Choice of Risk Efficient Production Plans. This paper was selected and to be read to the annual meetings of the American Agricultural Economics Association. Reno, Nevada. July 1986. However, the paper was withdrawn due to an international consultancy in Pakistan.

K. M. Eskridge, W. A. Compton and L. Tulsieram. Using the CATMOD procedure to estimate linkage between pairs of gene loci from offspring of selfed heterozygotes. SAS Users Group International Conference. Honolulu, HA. April 1992.

#### Other Publications:

S. K. Rockwell, A. Dickey, R. Klein, K. Fairbanks, A. Bateman, K. Eskridge. 1986. Conservation Tillage: Nebraska Farmer's Perceptions. 89 pp. Nebraska Co-operative Extension Service. Lincoln, NE

B. E. Johnson, K. M. Eskridge, and Y. Liu. 1990. Use of Optimization Models for Multiple Trait Selection. Proceedings of the 44th Annual Corn and Sorghum Research Conference. p. 106-118. American Seed Trade Association. Chicago, IL

K. M. Eskridge. 1990. Safety-First Models Useful for Selecting Stable Cultivars. Genotype-by-Environment Interaction in Plant Breeding. p. 151-168. Ed. M. S. Kang. Louisiana State Univ., Baton Rouge, LA

D. W. Sanson, G. L. Walker, D. C. Clanton, and K. M. Eskridge. 1990. Relationship Between Phosphorus Intake and Blood or Fecal Phosphorus in Gestating Cows. 1990 Nebraska Beef Cattle Report. p. 42-43. Nebraska Co-operative Extension Service. Lincoln, NE

P. A. Pochop, R. J. Johnson, D. A. Aguero, K. M. Eskridge. 1990. The Status of Lines in Bird Damage Control. Proceedings of the 14th Vertebrate Pest Conference. p. 317-324. Eds. L.R. Davis and R.E. Marsh. Univ. of California., Davis, CA.

D. W. Sanson, K. M. Eskridge, and D. C. Clanton. 1990. Examination of Several Internal Markers for Estimation of Dry Matter Digestion with Steers. Proceedings, Western Section, American Society of Animal Science. Vol. 41 1990.

R. D. Lee, B. E. Johnson, K. M. Eskridge, and J. F. Pedersen. 1990. Utilization of A<sub>3</sub> cytoplasm to select female parents in sorghum, Sorghum bicolor (L.) Moench. Sorghum Newsletter. 31:26

D. S. Nuland and K. M. Eskridge. Probability of outperforming a check. 1992. Proceedings, 35th Bean Improvement Cooperative Meetings. p. 17-20, H. F. Schwartz, ed. Colorado State Univ.

Fort Collins, CO.

K. M. Eskridge, W. A. Compton and L. Tulsieram. Using the CATMOD procedure to estimate linkage between pairs of gene loci from offspring of selfed heterozygotes. 1992. Proceedings of the SAS Users Group International Conference 1992. p. 1042-1047. SAS Institute Inc., Cary, NC.

K. M. Eskridge and C. J. Peterson. Selection for quality traits in wheat based on the probability of the traits falling within established limits. 1992. Proceedings of the 19th Hard Red Winter Wheat Workers Conference. p. 79-82. C. J. Peterson, ed. University of Nebraska, Lincoln, NE.

#### Contributed Papers:

K. M. Eskridge, E. J. Stevens, A. D. Flowerday, and S. J. Stevens. Analysis of Repeated Measures from Field Corn and Popcorn (Zea mays L.) Phenology Experiments. Contributed paper to the annual meetings of the American Society of Agronomy. Las Vegas, NV. November 1984.

R. B. Maxcy, K. M. Eskridge, and R. J. Paul. Evaluating the Microflora of Raw Milk. Contributed paper to the annual meetings of the American Dairy Science Association. Urbana, IL. June 1985.

K. M. Eskridge, R. F. Mumm, M. Aslam, E. J. Stevens. 1986. Selection for Genotypic Stability Using Expected Utility Maximization and Safety First Rules. Contributed paper to the annual meetings of the American Society of Agronomy. New Orleans, LA., December 1986.

A. A. Maki, M. M. Beck and K. M. Eskridge. C-Deoxyglucose Uptake by Laying Hen Brain During Thermoregulation. Poultry Science Association - Annual Meetings. Corvallis, OR. August 1987.

A. A. Maki, M. M. Beck, E. W. Gleaves, J. A. Deshazer, and K. M. Eskridge. Effect of Ion-Blockers at Different Environmental Temperatures on Thermoregulatory Response of Laying Hens. Poultry Science Association - Annual Meetings. Corvallis, OR. August 1987.

K. E. Borg, M. M. Beck, B. D. Schambacher, K. M. Eskridge. Determination of Brain Metabolism in Coturnix Quail Exposed to Different Photo-period. Poultry Science Association - Annual Meetings. Corvallis, OR. August 1987.

M. M. Beck, K. E. Borg, B. D. Schambacher, K. M. Eskridge. C-Deoxyglucose Mapping of Coturnix Quail Brain: Various Photoperiods. Society for Neuroscience - Annual Meetings. Washington, D.C. November 1987.

K. K. Kubic, J. A. Eastin, J. D. Eastin, and K. M. Eskridge. 1988. Solid Matrix Priming of Tomato and Pepper. International Conference on Establishment of Horticultural Crops. Wilmont, PA. April 1988.

K. M. Eskridge and C. A. Ishimaru. 1988. Use of the Weibull Distribution to Model Bacterial Populations on Plant Leaves. Joint Statistics Meetings. New Orleans, LA. August 1988.

K. M. Eskridge. 1988. Safety First and Selection for Genotypic Stability. American Society of Agronomy - Annual Meetings. Anaheim, CA. December 1988.

D. A. Aguero, R. J. Johnson, K. M. Eskridge, J. E. Knight, D. H. Steinegger. 1989. Monofilament Lines Repel House Sparrows. Great Plains Wildlife Damage Control Workshop. Ft. Collins, CO. April 1989

R. P. Novero, M. M. Beck, E. W. Gleaves, and K. M. Eskridge. 1989. Plasma Progesterone During the Ovulatory Cycle in Heat Stressed Hens. Poultry Science Association - Annual Meetings. Madison, WI. July 1989.

D. H. Steinegger, D.A. Aguero, R.J. Johnson, and K. M. Eskridge. Evaluation of monofilament lines to prevent damage to grapes (Vitis Spp.). American Society for Horticultural Science - Annual Meetings. Tulsa, OK. July 1989.

K. M. Eskridge, D. A. Aguero, and R. J. Johnson. Analysis of Wildlife Behavior Experiments When Some Treatments Affect Others. Joint Statistics Meetings. Washington, D.C. August 1989.

K. M. Eskridge and B. E. Johnson. Selecting for Genotypic Stability Using an Expected Utility Model. American Society of Agronomy - Annual Meetings. Las Vegas, NV. October 1989.

D. W. Sanson, K. M. Eskridge, and D. C. Clanton. Examination of Several Internal Markers for Estimation of Dry Matter Digestion with Steers. Western Section, American Society of Animal Science - Annual Meetings. July 1990.

R. P. Novero, M. M. Beck, E. W. Gleaves, K. C. Mitzner, and K. M. Eskridge. Plasma Progesterone and In-vitro Progesterone Secretion by Granulosa Cells from Heat-stressed Hens. Poultry Science Association - Annual Meetings. Blacksburg VA. August 1990.

K. M. Eskridge, R. F. Mumm, and P. F. Byrne. Comparing Cultivars with Checks Using a Safety-First Screening Approach. American Society of Agronomy - Annual Meetings. San Antonio, TX. October 1990.

R. D. Lee, B. E. Johnson, K. M. Eskridge, and J. F. Pedersen. Selecting Female Parents in Sorghum Utilizing A<sub>3</sub> Cytoplasm. American Society of Agronomy - Annual Meetings. San Antonio, TX. October 1990.

R. W. Moore, K. M. Eskridge, P. E. Read. Optimizing callus initiation using stolon nodal segments of buffalograss and a response surface design. American Society for Horticultural Science - Annual Meetings. University Park, PA. July 1991.

K. K. Kessler, R. J. Johnson, and K. M. Eskridge. Lines selectively repel house sparrows from backyard feeders. Great Plains Wildlife Damage Control Conference. Lincoln, NE. April 1991.

P. A. Pochop, R. J. Johnson, and K. M. Eskridge. House sparrow response to monofilament lines at nest boxes. Great Plains Wildlife Damage Control Conference. Lincoln, NE. April 1991.

R. P. Novero, L. S. Hannappel, M. M. Beck, J. A. Deshazer, and K. M. Eskridge. Plasma progesterone-oviposition interval relationships: Normal vs heat stress. Poultry Science Association - Annual Meetings. College Station, TX. August 1991.

G. E. Duhamel, R. J. Bernard, M. R. Mathiesen, and K. M. Eskridge. Comparative analysis of transport media for maintenance of Serpula (Treponema) hyodysenteria. North Central Veterinary Laboratory Diagnosticians Conference - Annual Meetings. Lincoln, NE. June 1991.

A. Weiss, K.M. Eskridge, J.R. Smart, and D.A. Mortensen. Variability of corn yields due to herbicide stress under different climate scenarios. Physiology and determination of crop yield: International Symposium. American Society of Agronomy and the University of Florida Cooperative Extension Service. Gainesville, FL June 1991.

A. Weiss, K.M. Eskridge, J.R. Smart, and D.A. Mortensen. An approach to modeling herbicided damage to corn over large geographic areas. NC202 Meeting: Biological and Ecological Basis for a Weed Management Model to Reduce Herbicide Use in Corn. Lincoln, NE July 1991.

K. M. Eskridge and C. J. Peterson. Selection for quality traits in wheat based on the probability of the traits falling within established limits American Society of Agronomy - Annual Meetings. Denver, CO. October 1991.

D. Walters, C. Shapiro, and K. Eskridge. Residual soil nitrate utilization by corn as influenced by tillage, rotation and cover crop. American Society of Agronomy - Annual Meetings. Denver, CO. October 1991.

A. Weiss, K.M. Eskridge, J.R. Smart, and D.A. Mortensen. Uncertainty of corn yields due to herbicide stress. American Society of Agronomy - Annual Meetings. Denver, CO October 1991.

B. L. Dierberger, L. E. Moser, K. M. Eskridge and K. P. Vogel. Germination of chilled and unchilled switchgrass seed as affected by temperature. American Society of Agronomy - Annual Meetings. Denver, CO October 1991.

D. S. Nuland and K. M. Eskridge. Probability of outperforming a check. Bean Improvement Cooperative - Annual meetings. Lincoln, NE. November 1991.

D. T. Lindgren, J. R. Steadman, and K. M. Eskridge. Yield reduction by rust as affected by fungicide over years and time of reading. Bean Improvement Cooperative - Annual meetings. Lincoln, NE. November 1991.

E. Arnaud-Santana, D. P. Coyne, J. R. Steadman, A. K. Vidaver, K. M. Eskridge, and J. S. Beaver. Heritabilities of seed transmission and leaf and pod reactions to common blight, leaf reaction to web blight, plant architecture and their associations in dry beans (Phaseolus vulgaris). American Society for Horticultural Science - Annual meetings. Honolulu, HA. July 1992.

K. M. Eskridge, O. S. Smith and P. F. Byrne. Comparing test cultivars using reliability functions of test-check differences from on-farm trials. American Society of Agronomy - Annual meetings. Minneapolis, MN. November 1992.

**To be submitted:**

K. M. Eskridge, O. S. Smith, and P. F. Byrne. Comparison of cultivars to checks using reliability functions of test-check differences. In revision Theoretical and Applied Genetics

A. Kueneman, K. Stanek, K. Eskridge and C. Angle. A comparison of the accuracy of four methods used with caregivers of preschool aged children to determine food portion sizes. In revision Journal of the American Dietetic Association

K. K. Kessler, R. J. Johnson and K. M. Eskridge. Bird management at backyard feeders I: choice with lines and food availability. In revision Wildlife Society Bulletin 1992.

K. K. Kessler, R. J. Johnson and K. M. Eskridge. Bird management at backyard feeders II: no-choice trials with lines and hoop device. In revision Wildlife Society Bulletin 1992.

W. Navarro-Alvarez, P. S. Baenziger, K. M. Eskridge, D. R. Shelton and V. D. Gustafson. Effect and fate of sugars in wheat anther culture media I: embryo production. In revision Plant Breeding.

W. Navarro-Alvarez, P. S. Baenziger, K. M. Eskridge, V. D. Gustafson and M. Hugo. Effect and fate of sugars in wheat anther culture media II: Plant regeneration. In revision Plant Breeding.

W. Navarro-Alvarez, P. S. Baenziger, K. M. Eskridge, M. Hugo and V. D. Gustafson. Addition of colchicine to wheat anther culture media to increase doubled haploid plant production. In revision Plant Breeding.

P. E. Reece, J. T. Nichols, J. E. Brummer, R. K. Engel, and K. M. Eskridge. Yield and quality response of Garrison creeping foxtail and native wetland vegetation to fertilizer and harvest date. Submitted to Journal of Range Management 1993

J. E. Brummer, J. T. Nichols, R. K. Engles, and K. M. Eskridge. Evaluation of quadrat size and shape for sampling production of Nebraska sandhills vegetation. Submitted to Journal of Range Management 1992.

M. T. Mmbaga, J. R. Steadman, K. M. Eskridge, D. O'Keefe and M. Meskine. Virulence patterns in bean rust (Uromyces appendiculatus) cultures from diverse geographic areas. Submitted to Journal of Plant Pathology

S. C. Mason, J. M. Lasa and K. M. Eskridge. Number of samples, replications and measurements for in vitro screening technique for sorghum emergence potential in a crusted soil. Submitted to European Journal of Agronomy 1993.

K. M. Eskridge, C.J. Peterson and A. W. Grombacher. Probability of quality traits falling within acceptable limits in hard red winter wheats grown in multiple environments. To be submitted to Crop Science 1993.

K. Stanek, W. I. Manton, C. R. Angle, T. J. Kuehneman, K. M. Eskridge. Lead consumption, anthropometric measurements, and nutrient intake of young children as determined from duplicate diet collections. To be submitted to Journal of Clinical Nutrition.

L. Hodges, D.C. Sanders, K.B. Perry, K. M. Eskridge, et al. Relative environmental adaptation of four bell pepper cultivars across three southeastern states. To be submitted to Hort Science 1993.

D. T. Lindgren, K. M. Eskridge and J. R. Steadman. Estimating yield losses in dry beans infected with rust. To be submitted to Hort Science 1993.

A. Weiss, K.M. Eskridge, J.R. Smart, and D.A. Mortensen. Choosing risk efficient herbicide treatments for corn production based on simulation of the CERES-Maize crop model. To be submitted to Agronomy Journal

D. H. Meyer, B. E. Johnson, and K. M. Eskridge. Genotype by grain-fill interval interaction in grain sorghum hybrids. To be submitted to Maydica

B. Dierberger, L. Moser, K. Eskridge, and K. Vogel. Optimum germination temperature for four switchgrass cultivars. To be submitted to the Agronomy Journal

D. Walters, C. Shapiro, and K. Eskridge. Residual soil nitrate utilization by corn as influenced by tillage, rotation and cover crop. To be submitted to Agronomy Journal

R. T. Clark, P. E. Reece, and K. M. Eskridge. Economic optimum fertilizer rates and harvest date for Subirrigated Meadow Hay Production. To be submitted to Journal of Production Agriculture

#### **Grant Activities:**

Awarded a Research Council travel grant to present a paper entitled "Safety First and Selection for Genotypic Stability" at the 1988 annual meetings of the American Society of Agronomy, Anaheim, CA. (\$500)

Awarded a Research Council travel grant to present an invited paper entitled "Safety-First Models Useful for Selecting Stable Cultivars" to a Symposium on Genotype-Environment Interaction, Louisiana State University, Baton Rouge, LA., February 1990. (\$500)

Awarded FIPSE teaching grant to purchase a video camera and stand for use in a Biometry consulting practicum class. March 1991. (\$500)

Served as cooperator on industry grant from Becton Dickinson Microbiology Systems for: Evaluation of transport media for maintenance of Treponema hyodysenteriae. Principle investigator: Gerald Duhamel. 1991. (\$4000)

Awarded a contract by Sandoz Research Institute for the "Modification, Updating, and testing STATPAD programs." November, 1991. Principle investigators: Kent Eskridge and Gene Boilesen. (\$5400)

Awarded a Research Council travel grant to give a selected presentation entitled "Using the CATMOD procedure to estimate linkage between pairs of gene loci from offspring of selfed heterozygotes" to the SAS User's Group International Meetings, Honolulu, HA., April 1992. (\$790)

Awarded an honorarium for service provided to MVP Laboratories and Dr. Alex Hogg, UNL Department of Veterinary Science regarding testing the efficacy of an actinobacillus pleuropneumoniae vaccine against APP serotypes 1, 3, 5, 9. March 1992 (\$150).

Awarded contract as cooperator on a National Institute of Environmental Health Sciences grant: Childhood blood lead - pre and postnatal sources. Principal investigator: Carol Angle, UNMC. September 1992 (\$11,050).

Awarded contract as cooperator on a National Institute of Environmental Health Sciences grant: Childhood blood lead - pre and postnatal sources. Principal investigator: Carol Angle, UNMC. June 1993 (\$5,050).

Major participant: 1990 NCR LISA Proposal: Systems Evaluation of Farrowing Isolets. Project Coordinator: James DeShazer.

Submitted a research proposal to the Decision Sciences Center, (Dr. Sang Lee, Director) Fall 1989 entitled "Utilization of Decision Theory for the Selection of Optimal Grain Crop Varieties and Application of Expert Systems to Implement this Approach". Principal investigators: Kent M. Eskridge, Blaine E. Johnson, and Robert F. Mumm.

Submitted a research proposal to Pioneer Hi-Bred Seed International Inc. Spring 1989 entitled "An Evaluation of the Effectiveness of an Intuitive Selection Index in Long-Term Selection Projects". Principal investigators: B. E. Johnson and K. M. Eskridge.

Cooperator: Bovine Respiratory Syncytial Virus: Effects of Vaccination of Cows on Immunity in Progeny: Industry grant proposal to Smith Kline-Beecham Animal Health. Principle investigator: Clayton Kelling. March 1991.

Submitted a research proposal to the north central integrated pest management competitive grant committee entitled " An ecosystem approach to understanding corn/weed interactions for crop loss assessment". Spring 1991. Investigators: Albert Weiss, David Mortensen and Kent Eskridge.

**Major participant on a research proposal to the national USDA forestry/rangeland/crop ecosystems competitive grant committee entitled " Implications of global climate change on corn/weed interactions." Spring 1991. Investigators: Albert Weiss, David Mortensen and Kent Eskridge.**

**Cooperator: Development of a pilot decision support system for management of land application of waste in rural Nebraska. ARD interdisciplinary research grant proposal. Spring 1991. Principle investigator: Wayne Woldt.**

**Submitted a proposal to Sandoz Research Institute for financial support to the Department of Biometry to aid Sandoz with research, consulting and education of staff. Spring 1991. Investigator: Kent Eskridge.**

**Submitted a proposal to Pioneer Hi-Bred International entitled "An evaluation of the CERES-Maize growth and yield model to predict genotype x environment interaction." August 15, 1991.**

**Submitted a research proposal to the north central integrated pest management competitive grant committee entitled " A modeling approach to evaluate avoidance mechanisms in plant pests in corn" Fall 1991. Investigators: Albert Weiss, Timothy Arkebauer and Kent Eskridge.**

**Submitted a research proposal to the north central integrated pest management competitive grant committee entitled " A modeling approach to evaluate avoidance mechanisms in corn/velvetleaf ecosystems" January 1992. Principal investigators: Albert Weiss, Timothy Arkebauer and Kent Eskridge.**

**Submitted a research pre-proposal to Pioneer Hi-Bred International entitled "An evaluation of methods used to characterize yield advantage of maize hybrids relative to a check based on limited trial information". March 1993. Principal investigator: Kent M. Eskridge.**

**Charles O. Gardner**

## **Curriculum Vita**

**Address:** Home: 5835 Meadowbrook Lane Work: Department of Biometry  
Lincoln, NE 68510 University of Nebraska  
402.489.1410 103 Miller Hall  
Lincoln, NE 68583-0712  
402.472.2903

#### **Education:**

B.Sc.	1941	University of Nebraska	Technical Science in Agriculture
M.B.A.	1943	Harvard University	Business Administration
M.S.	1948	University of Nebraska	Agronomy - Botany
Ph.D.	1951	North Carolina State University	Statistics

#### **Professional Experience:**

<b>Assistant Extension Agronomist</b>	<b>University of Nebraska</b>	<b>1946-1948</b>
<b>Assistant Statistician</b>	<b>North Carolina State University</b>	<b>1951-1952</b>
<b>Associate Professor of Agronomy</b>	<b>University of Nebraska</b>	<b>1952-1957</b>
<b>Visiting Professor of Genetics</b>	<b>University of Wisconsin</b>	<b>1962-1963</b>
<b>Chairman Statistical Laboratory</b>	<b>University of Nebraska</b>	<b>1957-1968</b>
<b>Professor of Agronomy</b>	<b>University of Nebraska</b>	<b>1957-1970</b>
<b>Regents Professor</b>	<b>University of Nebraska</b>	<b>1970-1989</b>
<b>Interim Head Biometrics</b>	<b>University of Nebraska</b>	<b>1988-1989</b>

Regents	University of Nebraska	1989-Present
Professor Emeritus	Department of Biometry	

#### **Professional Academic Societies:**

**Alpha Zeta**  
**Gamma Sigma Delta**  
**Sigma Xi**  
**Phi Kappa Phi**

#### **Honors and Awards:**

Graduation with High Distinction, University of Nebraska, 1941.  
Certificate of Superior Scholarship, University of Nebraska, 1941.  
Charles Stuart Fellowship, University of Nebraska, 1941.  
\$1000 Scholarship, Harvard University, 1942.  
Fellow, American Society of Agronomy, 1964.  
Designated "Foundation Professor of Agronomy" (Regents Distinguished Professorship),  
University of Nebraska, 1970.  
Gamma Sigma Delta International Award for Distinguished Service to Agriculture, 1977.  
Crop Science Award, Crop Science Society of America, 1978.  
Fellow, American Association for the Advancement of Science, 1980.  
University of Nebraska Award for Outstanding Research and Creative Activity, 1981.  
Crop Science Dekalb-Pfizer Distinguished Career Award, Crop Science Society of America,  
1984.  
Fellow, Crop Science Society of America, 1985.  
Distinguished Service Award, United States Department of Agriculture, 1988.  
Agronomic Service Award, American Society of Agronomy, 1988.  
Maydica, Vol. 34, Issue No. 1, 1989 was dedicated to Dr. Charles O. Gardner for his 40  
years of significant contributions to quantitative genetics and maize breeding.  
Listed in Who's Who in America, Who's Who in Frontier Science and Technology, and  
American Men and Women of Science.

#### **National Offices Held:**

President, Crop Science Society of America, 1975.  
President, American Society of Agronomy, 1982.  
Member, Steering Committee, Section O Agriculture, American Association for the  
Advancement of Science, 1981-1986.  
Chairman, Section O Agriculture, American Association for the Advancement of Science,  
1987.  
Member, Regional Advisory Board, Eastern North American Region, Biometric Society,  
1959-62 and 1965-68.

### **National Committee Service:**

Biometric Society Advisory Board, 1959-62 and 1965-68.  
Board of Directors, Crop Science Society of America, 1974-76 (Chairman, 1975).  
Board of Directors, American Society of Agronomy, 1974-76.  
National Plant Genetics Resources Board, 1975-1981.  
U.S.D.A. Competitive Grants Program Review Panel, 1978-1980.  
National Committee to develop a Title XII International Maize Planting Grant Proposal submitted to AID, 1978-80.  
National Corn Research Coordinating Committee, 1980-82.  
Board of Directors, American Society of Agronomy, 1981-83. (Chairman, 1982).  
American Association for the Advancement of Science Council, 1988.  
Numerous committees of the American Society of Agronomy, Crop Science Society of America, and American Association for the Advancement of Science.  
Pakistan Agricultural Research Grants Committee, National Academy of Sciences--National Research Council Board on Science and Technology for International Development and Pakistan Agricultural Research Council, 1991.

### **Editorial Committees:**

Associate Editor, Crop Science, 1964-66.  
Associate Editor, Agronomy Journal, 1971-73.  
Advisory Board, Egyptian Journal of Genetics and Cytology, 1976-Present  
Advisory Board, Brazilian Journal of Genetics, 1978-Present.  
Advisory Board, Agricultural Handbook - Plant Science Series, CRC Press, Inc., 1977-Present.

### **Memberships in Professional Organizations:**

American Society of Agronomy (Fellow, 1964) (President, 1982).  
Biometric Society (Regional Advisory Board), 1959-62, 1965-68.  
Genetic Society of America  
American Association for the Advancement of Science (Fellow, 1981) (Member at large of Section O Agriculture 1981-86, Chairman 1987, Member of Council 1988).  
Crop Science Society of America (President, 1975) (Fellow 1985).  
Council for Agricultural Science and Technology  
American Genetic Association  
Sigma Xi (President of Nebraska Chapter).  
Gamma Sigma Delta (President of Nebraska Chapter).  
Alpha Zeta (Secretary of Nebraska Chapter).  
Phi Kappa Phi  
American Registry of Certified Professionals in Agronomy, Crops and Soils (ARCPACS).

**Invited Presentations:**

Estimates of genetic parameters in cross-fertilizing plants and their implications in plant breeding. National Academy of Sciences--National Research Council Symposium "Statistical Genetics and Plant Breeding," Raleigh, NC, March 20-29, 1961.

Statistical genetics and plant breeding. A two-lecture series at the NC35 Potato Breeders Technical Committee meeting, Sturgeon Bay, WI, August 21-22, 1961.

Estimation of genetic variances in  $F_n$  populations using Design III mating system of Comstock and Robinson. Corn Quantitative Genetics Conference, Chicago, IL, March 5, 1963.

Estimation of generic parameters using means of varieties, variety crosses, and derived populations of corn. Corn Quantitative Genetics Conference, Chicago, IL, March 5, 1963.

Effect of linkage on estimates of genetic parameters in populations representing early generations following a cross of homozygous lines of corn. Iowa State University, Ames, IA, April 14, 1964.

Investigations involving the varieties Krug and Tabloncillo. Inter-American Conference of Maize Geneticists and Breeders. Rockefeller Foundation, Mexico City, Mexico, June 29-July 3, 1964.

Statistical genetic theory and procedures useful in studying varieties, variety crosses and related populations. IV Reunion Latinoamericana de Fitotecnia, Lima, Peru, November 1-7, 1964.

A general model for genetic effects. University of California, Davis, CA, January 24, 1966.

A genetic model used to evaluate the breeding potential of open-pollinated varieties of corn. International Symposium on Genetics, Piracicaba, Brazil, July 26, 1966.

Results of ten years of individual plant selection for high grain yield in an open-pollinated variety of corn. VII Reunion Lationamericana de Fitotecnia, Maracay, Venezuela, September 19, 1967.

Population changes and response to selection realized in a random-mating population of corn undergoing mass selection. University of Minnesota, St. Paul, MN, April 28, 1967.

Population studies on variability, effects of irradiation and progress from selection in an open-pollinated variety of corn. Seventeenth Annual National Poultry Breeders' Rountable, Kansas City, MO, May 3, 1968.

Use of general genetic model for fixed effects to evaluate breeding potential of populations, strains or lines and to predict performance in advanced generations of hybrid populations. Seventeenth Annual National Poultry Breeders' Roundtable, Kansas City, MO, May 3, 1968.

Mutation studies involving quantitative traits. International Symposium on Present State in Mutation Breeding, Mito, Japan, August 15, 1968.

Mutation studies, recurrent selection programs and use of exotic germ plasm in corn improvement at the University of Nebraska. National Taiwan University, Taipei, Taiwan, September 3, 1968.

Recurrent selection studies and mutation breeding for the improvement of yield in maize at the University of Nebraska. University of the Philippines, Los Banos, Laguna, September 6, 1968.

Effect on means and variances of incorporating exotic germ plasm into adapted varieties and on predictions of progress from selection. Corn Quantitative Genetics Conference, Chicago, IL, March 4, 1969.

A summary of ten generations of mass selection for high grain yield in an adapted open-pollinated variety of corn. NCR2 North Central Corn Breeding Technical Committee Meeting, Chicago, IL, March 4, 1969.

Special problems in mutation breeding in allogamous species. Some results in maize mutation research at the University of Nebraska. Mutation breeding in maize. A one-week lecture series at the International Atomic Energy Agency International Training Course in Mutation Breeding, Casaccia, Italy, May 12 to June 20, 1969.

Genetic variation in irradiated and control populations of corn after ten cycles of mass selection for high grain yield. Internation Symposium on Nature, Induction and Utilization of Mutations in Plants sponsored by IAEA and FAO, Pullman, WA, July 14-18, 1969.

Some results from mass selection and mutation breeding in corn and their implications in sweet corn breeding. Nineteenth Annual Meeting, National Sweet Corn Breeders Association, Chicago, IL, December 9, 1969.

The role of mass selection and mutagenic treatment in modern corn breeding. Twenty-fourth Annual Corn and Sorghum Research Conference, American Seed Trade Association, Chicago, IL, December 9-11, 1969.

Heterosis and inbreeding depression from crosses among cycles of selection in Hays Golden. Corn Quantitative Genetics Conference, Chicago, IL, March 2, 1971.

**Quantitative genetic research in plants - Past accomplishments and research needs.**  
**International Quantitative Genetic Conference, Ames, IA, August 16-21, 1976.**

**Quantitative genetic studies and population improvement in maize. School of Life Sciences,**  
**University of Nebraska, Lincoln, NE, November 11, 1976.**

**Recurrent selection systems used in maize breeding, summary of results obtained, and**  
**possible application to other crops. Hermitage Research Station, Warwick, Queensland,**  
**Australia, January 26, 1977.**

**Predicting gains to be expected from different recurrent selection systems and kinds of**  
**estimates needed for the prediction equations. Hermitage Research Station, Warwick,**  
**Queensland, Australia, January 26, 1977.**

**Some possible applications of recurrent selection systems for the improvement of self-**  
**fertilized crops. Hermitage Research Station, Warwick, Queensland, Australia, January 27,**  
**1977.**

**Expected direct and correlated responses to selection for yield alone compared to**  
**simultaneous selection for several traits using different selection indices in sorghums.**  
**Hermitage Research Station, Warwick, Queensland, Australia, January 27, 1977.**

**Population improvement in maize at the University of Nebraska through recurrent selection**  
**systems. Department of Primary Industries, Mareeba, Queensland, Australia (Southedge**  
**Research Station, Walkamin Research Station, Atherton Tablelands Research Station,**  
**Meringa Experiment Station), February 7, 1977.**

**Quantitative genetic studies in sorghum and their application in predicting progress to be**  
**expected from different recurrent selection systems. Atherton Tablelands Research Station,**  
**Atherton, Queensland, Australia, February 8, 1977.**

**Quantitative genetic studies and population improvement at the University of Nebraska.**  
**University of Western Australia, Perth, Western Australia, February 22, 1977.**

**Recurrent selection systems used effectively for the improvement of maize populations at the**  
**University of Nebraska and elsewhere. Waite Agricultural Research Institute, Adelaide,**  
**South Australia, February 25, 1977.**

**Quantitative genetic studies in maize and their application in planning breeding systems and**  
**in interpreting results of recurrent selection programs at the University of Nebraska.**  
**University of Sidney, New South Wales, Australia, (C.S.I.R.O. scientists attending), March**  
**4, 1977.**

Quantitative genetic studies in maize and their application in planning breeding systems and in interpreting results of recurrent selection programs at the University of Nebraska.  
University of Nebraska. University of Queensland, Brisbane, Queensland, Australia  
(C.S.I.R.O. and Bureau of Sugar Experiment Stations scientists attending), March 16, 1977.

Quantitative genetics and selection studies in maize and sorghum. Cornell University,  
Ithaca, NY, April 19, 1977.

Mass selection in maize and related genetic studies. University of California at Davis, CA,  
February 8, 1978.

Mass selection in maize and related genetic studies. Universidad Autonoma Agraria  
"Antonia Narro," Saltillo, Mexico, April 12, 1978.

Quantitative genetic studies in sorghum at the University of Nebraska. Universidad  
Autonoma Agraria "Antonio Narro," Saltillo, Mexico, April 12, 1978.

Results of W.A. Compton from two cycles of reciprocal full-sib selection at the University of  
Nebraska. Universidad Autonoma Agraria "Antonio Narro," Saltillo, Mexico, April 13,  
1978.

Mass selection methods for maize improvement. University of Novi Sad, Novi Sad,  
Yugoslavia, September 12, 1978.

Contributions of quantitative genetics to plant breeding. Commemorative lecture in  
celebration of the 10th anniversary of the Graduate College, Antonio Narro Agricultural  
University, Saltillo, Mexico, September 3, 1981.

Some applications of electrophoresis to plant breeding. Commemorative lecture in  
celebration of the 10th anniversary of the Graduate College, Antonio Narro Agricultural  
University, Saltillo, Mexico, September 4, 1981.

Genetic information from the Gardner-Eberhart model for generation means. Closing  
plenary session of IX Congreso Nacional de la Sociedad Mexicana de Fitotecnia, Buenavista  
Saltillo, Coahuila, Mexico, August 3-7, 1982.

Mass selection studies in three maize populations at the University of Nebraska and recurrent  
full-sib family selection for leaf freckles and wilt disease tolerance in two maize populations.  
Center for Agricultural Investigations in the North Gulf Region, National Institute for  
Agricultural Investigations, Rio Bravo, Mexico, June 4, 1982.

Population improvement and its integration with hybrid development activities to produce superior maize cultivars for different maize-growing areas of Pakistan. Invitation paper presented at Pakistan Agricultural Research Council - National Agricultural Research Center, Islamabad, Pakistan, September 9, 1986.

Recurrent selection for cold and freeze tolerance in maize (*Zea mays* L.) and its potential application in Pakistan. Invitation paper presented at Pakistan Agricultural Research Council -National Agricultural Research Center, Islamabad, Pakistan, September 9, 1986.

Population improvement and its integration with hybrid development activities to develop superior cultivars for the tropics -- some efficient and integrated schemes. Invitation paper presented at the XII Meeting of Maize Researchers in the Andean Zone, Quito Ecuador, October 4, 1986.

Quantitative genetic theory and integrated breeding systems for maize improvement. Keynote address, Second East Central and Southern Africa Regional Maize Workshop, Harare, Zimbabwe, March 16, 1987.

Genotype x environment interaction and its implications in maize breeding in international and national programs. Invited seminar presented to the staff of the International Center for Maize and Wheat Improvement, El Batán, Mexico, May 29, 1987.

Quantitative genetic research in maize at the University of Nebraska. Invited seminar presented to Department of Genetics staff, National Institute for Agricultural Technology, Secretary of State for Agriculture and Animal Husbandry, Castelar, Argentina, September 11, 1987.

Management of germplasm resources and the development and improvement of maize populations used as sources of new inbred lines and hybrid. Invited seminar presented to public and private plant breeders at Pergamino Experimental Station, Pergamino, Argentina, September 18, 1987.

Integration of population improvement and hybrid programs in maize improvement. Invited major conference paper presented at the 18th Argentine Congress of Genetics, Buenos Aires, Argentina, September 14, 1987.

Selection for cold and freeze tolerance in corn: Evaluations of original and selected populations. Invited paper presented at the American Seed Trade Association's Annual Corn and Sorghum Research Conference, Chicago, IL, December 11, 1987.

Breeding for tolerance to environmental and biological stresses in maize. Invited paper presented at "Euromais '88: Breeding and Production of Maize," Maize Research Institute, Zemun Polje, Zemun, Yugoslavia, October 8, 1988.

Breeding for cold and freeze tolerance and for disease resistance in maize. Invitation seminar presented to the maize breeding staff, Novi Sad University, Novi Sad, Yugoslavia, October 10, 1980.

Breeding for tolerance to environmental and biological stresses in maize. Invitation seminar presented to the maize breeding staff, Maize Research Institute, Osijek University, Osijek, Yugoslavia, October 12, 1980.

Nature of gene effects controlling quantitative traits in maize, knowledge about them, and breeding systems for maize improvement. Invited lecture presented to Leaders of National Maize Improvement Programs in developing countries, International Center for Maize and Wheat Improvement, El Batán, Mexico, October 11, 1989.

Predicting progress from selection and utilizing estimates of genotype x environment interaction and experimental error in identifying the target population of environments for any maize-breeding program. Invited lecture presented to Leaders of National Maize Improvement Programs in developing countries, International Center for Maize and Wheat Improvement, El Batán, Mexico, October 12, 1989.

The diallel cross and related populations as sources of genetic information for planning breeding programs and utilizing germplasm resources. Invited seminar presented to Leaders of National Maize Improvement Programs in developing countries and to the staff of the Maize and Wheat Improvement Programs, International Center for Maize and Wheat Improvement, El Batán, Mexico, October 13, 1989.

Conventional Plant Breeding and Biotechnology: a Complementary Approach to Crop Improvement. Invited seminar presented at Khamphaengsaen Campus, Kasetsart University, Thailand, to combined biotechnology staffs of the Khamphaengsaen Campus and the Central Lab, Bangkok Campus. May 9, 1990.

Prospects for Applying Molecular Genetics and Biotechnology in Conventional Plant Breeding Programs. Invited guest speaker at meeting of Plant Breeding Society, Ministry of Agriculture, Bangkok, Thailand. May 10, 1990.

Plant Breeding and Biotechnology. Invited speaker at joint meeting of the staff of the International Center for Tropical Agriculture (CIAT) and Program Leaders, Maize Programs of all South American Countries. Cali, Colombia, Feb. 15, 1991.

Mating Designs and Field Designs in Plant Breeding. Invited seminar, Department of Biometry, University of Nebraska, Lincoln, Nebraska, April 25, 1991.

Experimental Designs and Statistical Methods Useful in Plant Breeding and Genetics. Summer course in Biometrics, Department of Biometry, University of Nebraska, June, 1991.

Population improvement and its integration with hybrid development activities to produce superior maize cultivars for different maize-growing areas of Pakistan. Invitation paper presented at Pakistan Agricultural Research Council - National Agricultural Research Center, Islamabad, Pakistan, September 9, 1986.

Recurrent selection for cold and freeze tolerance in maize (*Zea mays* L.) and its potential application in Pakistan. Invitation paper presented at Pakistan Agricultural Research Council -National Agricultural Research Center, Islamabad, Pakistan, September 9, 1986.

Population improvement and its integration with hybrid development activities to develop superior cultivars for the tropics -- some efficient and integrated schemes. Invitation paper presented at the XII Meeting of Maize Researchers in the Andean Zone, Quito Ecuador, October 4, 1986.

Quantitative genetic theory and integrated breeding systems for maize improvement. Keynote address, Second East Central and Southern Africa Regional Maize Workshop, Harare, Zimbabwe, March 16, 1987.

Genotype x environment interaction and its implications in maize breeding in international and national programs. Invited seminar presented to the staff of the International Center for Maize and Wheat Improvement, El Batán, Mexico, May 29, 1987.

Quantitative genetic research in maize at the University of Nebraska. Invited seminar presented to Department of Genetics staff, National Institute for Agricultural Technology, Secretary of State for Agriculture and Animal Husbandry, Castelar, Argentina, September 11, 1987.

Management of germplasm resources and the development and improvement of maize populations used as sources of new inbred lines and hybrid. Invited seminar presented to public and private plant breeders at Pergamino Experimental Station, Pergamino, Argentina, September 18, 1987.

Integration of population improvement and hybrid programs in maize improvement. Invited major conference paper presented at the 18th Argentine Congress of Genetics, Buenos Aires, Argentina, September 14, 1987.

Selection for cold and freeze tolerance in corn: Evaluations of original and selected populations. Invited paper presented at the American Seed Trade Association's Annual Corn and Sorghum Research Conference, Chicago, IL, December 11, 1987.

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Breeding for cold and freeze tolerance and for disease resistance in maize. Invitation seminar presented to the maize breeding staff, Novi Sad University, Novi Sad, Yugoslavia, October 10, 1980.

Breeding for tolerance to environmental and biological stresses in maize. Invitation seminar presented to the maize breeding staff, Maize Research Institute, Osijek University, Osijek, Yugoslavia, October 12, 1980.

Nature of gene effects controlling quantitative traits in maize, knowledge about them, and breeding systems for maize improvement. Invited lecture presented to Leaders of National Maize Improvement Programs in developing countries, International Center for Maize and Wheat Improvement, El Batán, Mexico, October 11, 1989.

Predicting progress from selection and utilizing estimates of genotype x environment interaction and experimental error in identifying the target population of environments for any maize-breeding program. Invited lecture presented to Leaders of National Maize Improvement Programs in developing countries, International Center for Maize and Wheat Improvement, El Batán, Mexico, October 12, 1989.

The diallel cross and related populations as sources of genetic information for planning breeding programs and utilizing germplasm resources. Invited seminar presented to Leaders of National Maize Improvement Programs in developing countries and to the staff of the Maize and Wheat Improvement Programs, International Center for Maize and Wheat Improvement, El Batán, Mexico, October 13, 1989.

Conventional Plant Breeding and Biotechnology: a Complementary Approach to Crop Improvement. Invited seminar presented at Khamphaengsaen Campus, Kasetsart University, Thailand, to combined biotechnology staffs of the Khamphaengsaen Campus and the Central Lab, Bangkok Campus. May 9, 1990.

Prospects for Applying Molecular Genetics and Biotechnology in Conventional Plant Breeding Programs. Invited guest speaker at meeting of Plant Breeding Society, Ministry of Agriculture, Bangkok, Thailand. May 10, 1990.

Plant Breeding and Biotechnology. Invited speaker at joint meeting of the staff of the International Center for Tropical Agriculture (CIAT) and Program Leaders, Maize Programs of all South American Countries. Cali, Colombia, Feb. 15, 1991.

Mating Designs and Field Designs in Plant Breeding. Invited seminar, Department of Biometry, University of Nebraska, Lincoln, Nebraska, April 25, 1991.

Experimental Designs and Statistical Methods Useful in Plant Breeding and Genetics. Summer course in Biometrics, Department of Biometry, University of Nebraska, June, 1991.

**Mating Designs and Methods Used to Estimate and Interpret Components of Variance in Population Genetic Studies and Recurrent Selection Experiments. Advanced Maize Breeding Course for Directors of National Maize Breeding Programs, International Center for Maize and Wheat Improvement, El Batán, Mexico, October 2, 1991.**

**Field Designs and Methods Used to Estimate and Interpret Components of Variance in Population Genetic Studies and Recurrent Selection Experiments. Advanced Maize Breeding Course for Directors of National Maize Breeding Programs, International Center for Maize and Wheat Improvement, El Batán, Mexico, October 3, 1991.**

**Genetic Model Used and Recent Results Comparing Intra-population and Inter-population Recurrent Selection Systems Used by W. A. Compton and S. L. Tragesser at the University of Nebraska. Seminar presented to Research Staff, International Center for Maize and Wheat Improvement, and Directors of National Maize Breeding Programs in developing countries, October 4, 1991.**

**Responses to Mass Selection in Maize Over Three Decades. Advanced Plant Breeding Class, University of Nebraska, Lincoln, NE, March 20, 1992.**

**Scientific Publication and Technical Papers:**

Gardner, C. O. 1952. Design and analysis of Bose's triangular singly linked block designs. University of North Carolina Institute of Statistics. Mimeograph Series No. 55.

Gardner, C. O., P. H. Harvey, R. E. Comstock and H. F. Robinson. 1953. Dominance of genes controlling quantitative characters in maize. *Agron. J.* 45:186-191.

Caldecott, R. S., B. H. Beard and C. O. Gardner. 1954. Cytogenetic effects of X-ray and thermal neutron irradiation on seeds of barley. *Genetics* 39:240-259.

Allmaras, R. R. and C. O. Gardner. 1956. Soil sampling for moisture determination in irrigation experiments. *Agron. J.* 48:15-17.

Nilson, E. B., F. A. Johnson and C. O. Gardner. 1957. Parenchyma and epidermal cell length in relation to plant height and culm internode length in eight varieties of winter wheat (*Triticum aestivum* L.). *Bot. Gaz.* 119:38-43.

Connin, R. V., H. J. Gorz and C. O. Gardner. 1958. Greenhouse technique for evaluating sweetclover weevil's preference for seedling sweetclover plants. *Jour. Econ. Ent.* 51:190-193.

Beard, B. H., F. A. Haskins and C. O. Gardner. 1958. Comparisons of effects of X-rays and thermal neutrons on dormant seeds of barley, maize, mustard and safflower. *Genetics* 43:728-736.

Rawlings, J. O., D. G. Hanway and C. O. Gardner. 1958. Variation in quantitative characters of soybeans in the second generation after irradiation of seeds with X-rays and thermal neutrons. *Agron. J.* 50:524-528.

Gardner, C. O. and J. H. Lonnquist. 1959. Linkage and the degree of dominance of genes controlling quantitative characters in maize. *Agron. J.* 51:524-528.

Kehr, W. R. and C. O. Gardner. 1960. Genetic variability in Ranger alfalfa. *Agron. J.* 52:41-44.

Gardner, C. O. 1961. An evaluation of effects of mass selection and seed irradiation with thermal neutrons on yield of corn. *Crop Science* 1:241-245.

Lonnquist, J. H. and C. O. Gardner. 1961. Heterosis in intervarietal crosses in maize and its implications in breeding procedures. *Crop Science* 1:179-183.

Kehr, W. R., H. O. Graumann, C. C. Lowe and C. O. Gardner. 1961. The performance of alfalfa synthetics in the first and advanced generations. *Nebraska Agric. Exp. Sta. Res. Bull.* 200.

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Kahler, A. L., C. O. Gardner and R. W. Allard. 1981. Evidence for non-random mating in two experimental populations of corn. Crop Science Society of America Annual Meeting, Atlanta, GA, November 3.

Thomas-Compton, M. A. and C. O. Gardner. 1982. Electrophoresis studies in corn and sorghum populations. NCR-2 Corn Breeding Conference, Chicago, IL, March 2.

Magnavaca, R. and C. O. Gardner. 1982. Aluminum tolerance studies in corn. NCR-2 Corn Breeding Conference, Chicago, IL, March 3.

Pollak, L. M., C. O. Gardner and A. M. Parkhurst. 1982. Relationship of allozyme genotypes to morphological and agronomic traits in two experimental corn populations. Crop Science Society of America Annual Meeting, Anaheim, CA, November 1.

Pollak, L. M., C. O. Gardner and A. L. Kahler. 1983. Allozyme polymorphisms related to mating systems in two mass-selected corn populations. NCR-2 Corn Breeding Conference, Chicago, IL, February 22.

Gardner, C. O. 1983. Relationship of isozyme patterns to selection criteria in maize populations. NCR-21 Quantitative Genetics Conference, St. Paul, MN, July 12.

Kling, J. G. and C. O. Gardner. 1983. Changes in gene frequency associated with the production of inbred lines from mass- selected corn populations. Crop Science Society of America Annual Meeting, Washington, D. C., August 17.

Bridges, W. C. Jr., and C. O. Gardner. 1984. Genetic models for interpopulation crosses (adapted x exotic). Crop Science Society of America Annual Meeting, Las Vegas, NV, November 28.

Crossa, J. L. and C. O. Gardner. 1984. Introgression of exotic germplasm for improving adapted maize breeding populations. Crop Science Society of America Annual Meeting, Las Vegas, NV, November 28.

Kling, J. G., and C. O. Gardner. 1984. Effects of irradiation, mass selection, and inbreeding on isoenzyme profiles in maize populations. NCR-21 Quantitative Genetics Technical Committee Meeting, Raleigh, NC, June 5-6.

Rocheford, T. R., C. O. Gardner and A. K. Vidaver. 1985. Studies of resistance to Goss' Wilt (Leaf Freckles and Wilt). NCR-2 Corn Breeding Technical Committee Meeting, Des Plaines, IL, Feb. 26-28.

Crossa, J. L., C. O. Gardner and R. F. Mumm. 1985. Heterosis among populations of maize with different levels of exotic germplasm. Genetics Society of America Annual Meeting, Boston, MA, August 11-15.

Rocheford, T. R., C. O. Gardner and A. K. Vidaver. 1985. Chromosomal locations in corn (*Zea Mays L.*) of a gene(s) for resistance to *Corynebacterium michiganense* spp *nebraskense*. Genetics Society of American Annual Meeting, Boston, MA, August 11-15.

Salerno, J. C. and C. O. Gardner. 1985. Genetic variability in an inbred line of maize (*Zea mays L.*). Genetic Society of America Annual Meeting, Boston, MA, August 11-15.

Alvarado, L. R. and C. O. Gardner. 1986. Gene effects controlling grain yield and nitrogen-use efficiency traits in maize. Corn Quantitative Genetics Conference Des Plaines, IL, Feb. 25.

Johnson, B. E., C. O. Gardner and J. P. Dauer. 1986. Estimation and geometric interpretation of a weight vector for use in multivariate selection. Corn Quantitative Genetics Conference. Des Plaines, IL, February 15.

Johnson, B. E., C. O. Gardner and J. P. Dauer. 1986. A model and its application for finding relative weights of traits used in simultaneous multi-trait selection. Crop Science Society of America Annual Meeting, New Orleans, LA, Dec. 2.

Salerno, J. C., C. O. Gardner and E. A. Favret. 1986. Heterotic regions in the maize genome. Crop Science Society of America Annual Meeting, New Orleans, LA, Dec. 4.

Wilhelm, W. W., M. R. Hinze and C. O. Gardner. 1987. Corn hybrid response to tillage under dryland and irrigated conditions. Crop Science Society of America Annual Meeting, Atlanta, GA, Dec. 1.

Eichelberger, K. D. and C. O. Gardner. 1989. Long-term mass selection for yield and prolificacy in maize. North Central Region Corn Breeding (NCR-2) Research Conference, Rosemont, IL, Feb. 22.

Gardner, C. O. 1989. North Central Region Quantitative Genetics (NCR-21) Conference,  
St. Paul, MN, June , 1989.

**Carol A. Gotway**

**Curriculum Vita**

**Address:**

<b>Home:</b>	601 Windsor Dr. Papillion, NE 68128 402.597.1426	<b>Office:</b> Department of Biometry University of Nebraska 103 Miller Hall Lincoln, NE 68583 402.472.2903
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**Education:**

B.S.	1984	Bradley University	Mathematics
B.S.	1984	Bradley University	Geology
M.S.	1986	Iowa State University	Statistics
Ph.D.	1989	Iowa State University	Statistics

**Theses:**

Weighted Estimation of the Distribution Function of a Spatially Stationary Process. M.S. thesis.

Influence From Spatial Processes. Ph.D. thesis.

**Professional Experience:**

Research/ Laboratory Assistant	Department of Geology Bradley University	1982-1984
Graduate Assistant/ Course Instructor	Department of Statistics Iowa State University	1984-1986
Statistical Consultant	Agricultural Experiment Station Iowa State University	1986-1987
Statistical Consultant	RAND Corporation	1987-1988
Researcher	Department of Statistics Iowa State University	1987-1989

<b>Post-Doctoral Research Appointment</b>	<b>Centre de Geostatistique Fontainebleau, France</b>	<b>1989-1990</b>
<b>Statistical Consultant</b>	<b>Sandia National Laboratories</b>	<b>1990-1992</b>
<b>Assistant Professor</b>	<b>Department of Biometry University of Nebraska</b>	<b>1992-Present</b>

**Other Experience:**

**Sandia Award for Excellence, 1991 - Sandia National Laboratories**  
**George W. Snedecor Award, 1988 - Iowa State University**  
**Mu Sigma Rho, 1986 - National Statistical Honorary**  
**Shell Oil Research Fellowship, 1986**  
**PACE (Premium for Academic Excellence) Award, 1984 - Iowa State University**  
**Phi Kappa Phi, 1983 - National Scholastic Honorary**

**Professional Societies:**

**American Statistical Association**  
**American Society for Quality Control**  
**American Society for Quality Control Certified Quality Engineer**  
**International Association for Mathematical Geologists**  
**American Geophysical Union**

**Publications:**

**Refereed Journal Articles:**

Gotway, C.A., 1991. Fitting semivariogram models by weighted least squares. Computers and Geosciences, Vol. 17, No. 1, pp. 171-172.

Gotway, C.A., and Cressie, N.A.C. 1990. A spatial analysis of variances applied to soil-water infiltration. Water Resources Research, Vol. 26, no. 11, pp. 2695-2703.

Cressie, N. Gotway, C.A. and Grondona, M.O. 1990. Spatial prediction from networks. Chemometrics and Intelligent Laboratory Systems, Vol. 7, pp. 251-271.

**Technical Papers:**

Lappin, A.R., Gotway, C.A., Molecke, M.A., Hunter, R.L. and Lorusso, E.N. 1991. Rationale for revised bin-scale gas generation tests with contact-handled transuranic wastes at the Waste Isolation Pilot Plant, Sandia Report No. SAND90-2481, Sandia National Laboratories, Albuquerque, NM, 182p.

Boozer, D.D., Church, H.W., Einfeld, W., Engi, D., Gotway, C.A., Spencer, F.W. and Zak, B.D. 1991. Toxicological effects of Kuwaiti oil fires. Sandia Report No. SAND91-1981,  
Sandia National Laboratories, Albuquerque, NM, 44p.

**Invited Presentations:**

"Distribution Function Estimation Using Correlated Data." Presented to the Nebraska Chapter of the American Statistical Association, December 10, 1992, Omaha, NE.

Applied Geostatistics Workshop with D.B. Marx and G.W. Hergert. For the American Association of Agronomists, October 31-November 2, 1992, Minneapolis, MN.

Institute of Mathematical Statistics Invited Paper: "Minimax Prediction in Spatial Process." Presented at IMS Annual Meetings, April 4-7, 1990, Baltimore, MD.

**Contributed Presentations:**

"Sequential Indicator Simulation of Lithology with Application to Vadose Zone Water Flow and Transport." Presented at the American Geophysical Union Spring Meetings. May 11-15, 1992, Montreal, Canada.

**Additional Research:**

Gotway, C.A. 1992. The use of conditional simulation in nuclear waste site performance assessment. Technometrics, To appear.

Gotway, C.A., and Cressie, N. 1992. Improved multivariate prediction under a general linear model. Journal of Multivariate Analysis, To appear.

Gotway, C.A., Conrad, S.H. and Zimmerman, D.A. 1992. Sequential indicator simulation of lithology with application to vadose zone water flow and transport. Water Resources Research.

Gotway, C.A. and Rutherford, B.M. 1993. Stochastic Simulation for Imaging Spatial Uncertainty: Comparison and Evaluation of available algorithms. Proceedings of the workshop on Geostatistical Simulation, M. Armstrong, G. Verly, and P. Dowd, eds. Kluwer, Dordrecht. To appear.

Gotway, C.A. and Rutherford, B.M. 1993. Exhaustive data sets for use in the evaluation and comparison of geostatistical simulation methods. Technical Report 9301, University of Nebraska-Lincoln, Lincoln, NE.

Western Biometrics Section Invited Paper: "Geostatistical Tools Useful in the Physical Sciences," To be presented at WNAR meetings, June 28-30, 1993, Laramie, WY.

Technometrics Section Invited Paper: "The Use of Conditional Simulation in Nuclear Waste Site Performance Assessment." To be presented at ASA Annual Meeting, August 8-12, 1993, San Francisco, CA.

**Manuscripts Reviewed 1993:**

- 2 manuscripts for Journal of the American Statistical Association
- 2 manuscripts for Water Resources Research
- 1 manuscript for Journal of Computational and Graphical Statistics
- 1 manuscript for Journal of Weed Technology
- 1 manuscript for Journal of Geographical Analysis
- 1 manuscript for Soil Science of America Journal

**Books Reviewed 1993:**

Haining, R. 1990. "Spatial Data Analysis in the Social and Environmental Sciences," Reviewed for Technometrics.

**Project Reviews 1993:**

- Participated in 3 project reviews:
- 2 - Department of Home Economics
- 1 - Department of Agronomy

**Grants Submitted 1993:**

Title: Variable Rate Nitrogen Application for Corn Based on Spatially Variable Grain Yield.  
Principal Investigators: R. Ferguson, G. Hergert, T. Peterson, and C. Gotway. Submitted to Cooperative State Research Service, December 16, 1992.

Title: The Use of Imprecise Information on Spatial Variability to Control Nutrient Leaching.  
Principal Investigators: W. Woldt, I. Bogardi, and C. Gotway. Submitted to Cooperative State Research Service, December 16, 1992.

**Blaine E. Johnson**

**Curriculum Vita**

<b>Address:</b>	<b>Home:</b>	2940 South 26th Lincoln, NE 68502 402.421.3314	<b>Office:</b> 326 Keim Hall University of Nebraska Lincoln, NE 68583 402.472.1562
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**Education:**

B.S.	1971	University of Nebraska Lincoln, Nebraska	Agronomy/Ag Honors
M.S.	1973	Oregon State University Eugene, Oregon	Crop Science major Statistics minor
Ph.D.	1986	University of Nebraska Lincoln, Nebraska	Agronomy

**Theses:**

Heterosis and inbreeding in the progeny of genetically diverse paternal clones of Festuca arcundinacea Schreb. M.S. thesis.

A model for finding the relative weights of traits used in simultaneous multi-trait selection.  
Ph.D. dissertation.

**Professional Experience:**

Lab Technician	University of Nebraska Agronomy Department	1968
Teaching Assistant	University of Nebraska Botany Department	1968-1969
Lab Technician	University of Nebraska Agronomy Department	1969-1971
Research Assistant	Oregon State University Crop Science Department	1971-1972
Research Assistant	Cornell University	1973

<b>Owner/Operator Farm/Ranch</b>	<b>Cash Grain and Cow/Calf Operation, North central Nebraska</b>	<b>1973-1983</b>
<b>Graduate Research/ Teaching Assistant</b>	<b>University of Nebraska Biometrics Center</b>	<b>1983-1986</b>
<b>USDA/ARS Research Geneticist and Adjunct Assistant Professor</b>	<b>University of Nebraska Agronomy Department</b>	<b>1986-1989</b>
<b>Assistant Professor</b>	<b>University of Nebraska Agronomy Department</b>	<b>1989-1992</b>
<b>Associate Professor</b>	<b>University of Nebraska Agronomy Department</b>	<b>1992-present</b>
<b>Courtesy Professor</b>	<b>University of Nebraska Department of Biometry</b>	<b>Present</b>

**Professional Societies:**

American Association for the Advancement of Science  
 American Society of Agronomy  
 American Statistical Association  
 Biometric Society  
 Crop Science Society  
 International Association for Genetics in Agriculture  
 Nebraska Corn Breeders Association  
 Editorial Board for Maydica  
 NCR-21, Regional Committee on Quantitative Genetics  
 Alpha Zeta  
 Gamma Sigma Delta  
 Phi Kappa Phi  
 Sigma Xi

**Other Memberships:**

Graduate Faculty Fellow, University of Nebraska  
 Editorial Board for Maydica  
 Editorial Board for Genetica  
 Faculty Associate, Center for Biotechnology, UNL  
 NCR-21, Regional Committee on Quantitative Genetics

**Invited Papers:**

"Use of optimization models for multiple trait selection." 44th Corn and Sorghum Research Conference. Chicago, IL. December 1990.

"Recent developments in design and analysis of maize yield trials" 46th Corn and Sorghum Research Conference. Chicago, IL. December 1992.

**Grants Received:**

ARD/IANR Interdisciplinary Research Program. Title: Mapping of loci affecting the uptake and utilization of nitrogen in maize. (Principal investigator). \$36,000 over three years, 1990-1993.

USDA Midwest Water Quality Initiative. Title: Determining Crop N status to indicate need for fertigation. (Co-investigator). \$204,000 over five years, 1990-1995.

Nebraska Corn Board. Title: Nebraska Corn Quality Evaluation and Improvement. (Co-principal investigator). \$27,000 over two years, 1991-1993.

Pioneer Hi-Bred International, Inc. Title: The utilization of nitrogen fertilizer by inbred lines of corn in seed producing fields. (Principal investigator). \$40,720 over two years, 1991-1993.

UN Foundation, Crop Production Trust Fund. Title: Determining the relationship between non-senescence of corn hybrids and nitrogen management. (Principal investigator). \$29,750 over two years, 1992-1993.

Pioneer Hi-Bred International, Inc. Title: Pioneer Third Country Scholarship Program. \$24,000 over two years, 1992-1994.

Pioneer Hi-Bred International, Inc. Title: Determining the optimal number of families to be retained in each generation during inbred line development. (Principal investigator). \$29,750 over two years, 1992-1993.

**Publications:**

Gorz, H.J., F.A. Haskins, R. Morris, and B.E. Johnson. 1987. Identification of chromosomes that condition dhurrin content in sorghum seedlings. Crop Science 27:201-203.

Haskins, F.A., H.J. Gorz, and B.E. Johnson. 1987. Seasonal variation in leaf hydrocyanic acid potential of low and high dhurrin sorghums. Crop Science 27:903-906.

Jensen, S.G., B. Doupnik, Jr., D. Wysong, and B. Johnson. 1989. An epidemic of sorghum downy mildew in Nebraska in 1987. Plant Disease. 73:75-77.

Johnson, B.E., J.P. Dauer, and C.O. Gardner. 1988. A model for determining the relative weights of traits in multi-trait selection. Appl. Math Modelling 12:556-564.

Johnson, B.E., C.O. Gardner, and K.C. Wrede. 1988. Application of an optimization model to multi-trait selection programs. Crop Science 28:723-728.

Johnson, B. E. 1989. The probability of selecting genetically superior S2 lines from a maize population. Maydica 34:5-14.

Rocheford, T.R., W.C. Bridges, Jr., B.E. Johnson, and C.O. Gardner. 1989. Evaluation of normal and dwarf subpopulations extracted from an exotic x adapted cross of maize. Maydica 34:33-41.

Andrews, D.J., B.E. Johnson, W.M. Ross. 1990. Registration of a pair of A/B grain sorghum parental lines. Crop Science. 30:1379.

Gorz, H.J., F.A. Haskings, and B.E. Johnson. 1990. Registration of 15 germpalsm lines of grain sorghum and sweet sorghum. Crop Science. 30:761-762.

Moore, K.J., L.E. Moser, K.P. Vogel, S.S. Waller, B.E. Johnson, and J.F. Pedersen. 1991. Describing and quantifying growth stages of perennial forage grasses. Agronomy Journal 83:1073-1077.

Vogel, K.P., K.J. Moore, and B.E. Johnson. 1991. Statistical analysis of esophageal and hand-clipped samples from grazing trials. Journal of Range Management. 44:379-382.

Eskridge, K.M., and B.E. Johnson. 1991. Expected utility maximization and selection of stable plant cultivars. Theoretical and Applied Genetics. 91: 825-832.

Lee, R.D., B.E. Johnson, K.M. Eskridge, and J.F. Pedersen. 1992. Selection of superior female parents in sorghum utilizing A3 cytoplasm. Crop Science 32:918-921.

Zhang, J., J.E. Sprecht, G.L. Graef, and B.E. Johnson. 1992. Pubescence density effects on soybean seed yield and other agronomic traits. Crop Science. 32:641-648.

#### Abstracts:

Johnson, B.E., C.O. Gardner and J.P. Dauer. 1986. A model and its application for finding relative weights of traits used in simultaneous multi-trait selection. Agron. Abstr. American Society of Agronomy, Madison, WI. p. 67.

Gorz, H.J., F.A. Haskins, and B.E. Johnson. 1987. Fertility expression of eight cytoplasmic male-sterile sorghums when crossed to 18 forage and sweet sorghums. Agron. Abstr. American Society of Agronomy, Madison, WI. p. 63.

Johnson, B.E., H.J. Gorz, and F.A. Haskins. 1987. Selection for low hydrocyanic acid potential in seedlings of grain sorghum. Agron. Abstr. American Society of Agronomy, Madison, WI. p. 66.

Johnson, B.E. 1988. The probability of identifying genetically superior lines from a maize population. Agron. Abstr. American Society of Agronomy, Madison, WI. p. 85.

Lansac, A.R., C.Y. Sullivan, and B.E. Johnson. 1988. Accumulation of free proline in sorghum pollen at low temperature. Agron. Abstr. American Society of Agronomy, Madison, WI. p. 113.

Eskridge, K.M., and B.E. Johnson. 1989. Selection for genotypic stability using an expected utility model. Agron. Abstr. American Society of Agronomy, Madison, WI. p. 70.

Johnson, B. 1989. The probability of identifying genetically superior lines from a maize population. Agron. Abstr. American Society of Agronomy, Madison, WI. p. 85.

Zavala-Garcia, F., P. Bramel-Cox, J.D. Eastin, B. Johnson, and M.D. Witt. 1989. Genotype x environmental interaction and selection efficiency for drought stress conditions in two sorghum random mating populations. Agron. Abstr. American Society of Agronomy, Madison, WI. p. 107.

Lee, R.D., B.E. Johnson, K.M. Eskridge, and J.F. Pedersen. 1990. Selecting female parents in sorghum utilizing A3 cytoplasm. Agron. Abstr. American Society of Agronomy, Madison, WI. p. 98.

Klingenberg, J.P., T.P. Riordan, and B.E. Johnson. 1990. Slant-tube root screening technique for selection among 199 buffalograss genotypes. Agron. Abstr. American Society of Agronomy, Madison, WI. p. 181.

Riordan, T.P., J.P. Klingenberg, B.E. Johnson, and A. H. Ahring. 1990. Heritability of drought avoidance mechanisms in turf-type seeded buffalograss. Agron. Abstr. American Society of Agronomy, Madison, WI. p. 181.

Johnson, B.E., A.L. Kahler, W.W. Wilhelm, J.S. Schepers, D.J. Lee. 1991. Relationships between RFLP markers and the response of six maize hybrids to six nitrogen fertility levels. Agron. Abstr. American Society of Agronomy, Madison, WI. p. 100.

Klingenberg, J.P., T.P. Riordan, G.L. Horst, and B.E. Johnson. 1991. Rooting initiation performance among 40 buffalograss genotypes evaluated by slant-tube root observations system. Agron. Abstr. American Society of Agronomy, Madison, WI. p. 178.

Rodriguez-Herra, S.A., B. Johnson, W.W. Stroup. 1991. Effect of plant population density in brachytic maize. Agron. Abstr. American Society of Agronomy, Madison, WI. p. 114.

Klingenberg, J.P., B.E. Johnson, T.P. Riordan, and S. Westerholt. 1992. Additive genetic covariance function applied to seedling emergence in a selected buffalograss population. Agron. Abstr. American Society of Agronomy, Madison, WI. p. 171.

Posch, J.S., B.E. Johnson, and D. Lee. 1992. Evaluation of maize inbreds for cold tolerance. Agron. Abstr. American Society of Agronomy, Madison, WI. p. 111.

Rodriguez-Herra, S., B.E. Johnson, and W.W. Stroup. 1992. Application of mixed model methodology to genotype by environment interaction studies. 1992. Agron. Abstr. American Society of Agronomy, Madison, WI. p. 112.

Wilhelm, W.W., B.E. Johnson, and J.S. Schepers. 1992. Influence of leaf removal during detasseling on hybrid seed production. Agron. Abstr. American Society of Agronomy, Madison, WI. p. 158.

#### Symposium or Proceedings:

Johnson, B.E., R.K. Johnson, and R.W. Mandigo. 1986. Effect of selection and feed intake on carcass lean and fat in swine. p. 413-418. In: 3rd World Congress on Genetics Applied to Livestock Production. XI. Genetics of Reproduction, Lactation, Growth, Adaptation, Disease, and Parasite Resistance.

Clark, R.B., D.P. Coyne, W.M. Ross, and B.E. Johnson. 1988. Genetic aspects of plant resistance to iron deficiency. Proc. Int. Congr. Plant Physiol.

Johnson, B., K. Eskridge, and Y. Liu. 1989. Use of optimization models for multiple trait selection. Proc. 44th Corn and Sorghum Research Conference. American Seed Trade Association. Washington, D.C. (Invited presentation).

Rodriguez-Herra, S., B.E. Johnson, W.W. Stroup. 1992. Importancia de la metodología de modelos mixtos en fitomejoramiento. In XIV Congreso Nacional de Fitogenética. Escuela de Ciencias Agronomicas, Campus V, Universidad Autonoma de Chiapas.

**International Travel:**

24-31 March, 1990. International Maize and Wheat Improvement Center. El Batán, Mexico.

24 March to 12 April 1991. DSIR Maize Breeding Project. Palmerston North, New Zealand.

## Stephen D. Kachman

### Curriculum Vita

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#### **Education:**

<b>B.S.</b> 1981	<b>Michigan State University</b> East Lansing, Michigan	<b>Microbiology</b>
<b>M.S.</b> 1986	<b>University of Illinois</b> Champaign-Urbana, Illinois	<b>Animal Breeding &amp; Genetics</b>
<b>Ph.D.</b> 1988	<b>Montana State University</b> Bozeman, Montana	<b>Statistics</b>

#### **Theses:**

Kachman, S.D. (1986), Prediction of genetic merit for growth curve parameters in outbred ICR mice, University of Illinois, MS Thesis.

Kachman, S.D. (1988), Inference procedures for fixed effects in multivariate mixed models, Montana State University, Ph.D. Thesis.

#### **Professional Experience:**

<b>Statistical Analyst</b>	<b>Michigan State University</b> Dairy Science Department	<b>1980-1981</b>
<b>Teaching Assistant</b>	<b>University of Illinois</b> Plant and Animal Genetics	<b>1982</b>
<b>Graduate Research Assistant</b>	<b>University of Illinois</b> Animal Science Department	<b>1981-1984</b>
<b>Math Lecturer</b>	<b>Montana State University</b> Mathematics Department	<b>1984-1987</b>
<b>Graduate Research Assistant</b>	<b>Montana State University</b> Agriculture Experiment Station	<b>1987-1988</b>

<b>Post-Doctoral Associate</b>	<b>Cornell University Animal Science Department</b>	<b>1988-1990</b>
<b>Assistant Professor</b>	<b>University of Nebraska Department of Biometry</b>	<b>1990-Present</b>

**Scholastic Honor:**

Ralph and Mabell Hunter Fellowship, College of Agriculture, University of Illinois, 1983-1984.

**Professional Societies:**

American Society of Animal Science  
American Statistical Association

**Refereed Journal Publications:**

Hanford, K.J., Berfening, P.J., Kress, D.D. and Kachman, S.D. (1988). Interaction maternal grandsire with region of United States and herd for calving ease, birth weight and 205 day weight. Journal of Animal Science. 66:864-871.

Harris, K.B., Thomas, V.M., Peterson, M.K., Kachman, S.D. and McInerney, M.J. (1989). Influence on minerals on rate of digestion and percentage degradable in vitro neutral detergent fiber. Nutrition Report International. 40:219-226.

Kachman, S.D., Baker, R.L. and Gianola, D. (1988). Phenotypic and genetic variability of estimated growth curve parameters in mice. Theoretical and Applied Genetics. 76:148-156.

**Abstracts:**

Boik, R.J., Kachman, S.D. (1986). An empirical Bayes approach to the analysis of repeated measures having non-spherical dispersion matrix. 13th International Biometric Conference. Seattle, Washington.

Burfening, P.J., Kachman, S., Hanford, K. Rossi, D. (1989a). Selection for reproductive rate in Rambouillet sheep I. Estimated genetic change in reproductive rate. Proceedings Western Section American Society of Animal Science.

Burfening, P.J., Kachman, S., Hanford, K. and Rossi, D. (1986b). Selection for reproductive rate in Rambouillet sheep II. Correlated genetic changes in ewe body weight, fleece weight and fleece grade. Proceedings Western Section American Society of Animal Science.

Gianola, D. and Kachman, S.D. (1983). Prediction of breeding value in situations with nonlinear structure: Categorical responses, growth functions and lactation curves. 34th Annual Meeting, European Association of Animal Production. Madrid, Spain.

Hanford, K.J., Kachman, S.D., Baker, R.L., and Gianola, D. (1989). Genetic parameters for age and weight at vaginal opening in mice. Journal of Animal Science. 67:64.

Hanford, K.J., Kachman, S.D. and Gianola, D. (1984). Response to divergent selection for age or weight at vaginal opening in mice. Journal of Animal Science. 59:162.

Hoaglund, C.M., Thomas, V.M., Peterson, M.K. and Kachman, S. (1988). Effect on non-rumen degradable protein and metabolizable energy level on metabolism and performance of gestating ewes. Proceedings Western Section American Society of Animal Science. 39:357-360.

Thomas, V.M., Ayers, K., Kachman, S., Hanford, K., Kott, R. and Hoaglund, C. (1987). Production of gestating ewes fed Lasalocid while grazing Montana winter range. Proceedings Western Section American Society of Animal Science. 38:203-206.

#### **Other Publications:**

Everett, R.W. (1989). Test day model. Genetics Research 1988-1989. Report to Eastern Artificial Insemination Cooperative, Inc.

Kachman, S.D., Baker, R.L. and Gianola, D. (1983). Genotypic and phenotypic variability of estimated growth curve parameters in mice. Journal of Animal Science. 57:155.

Kachman, S.D. and Everett, R.W. (1989). Test day model with individual herd correction factors. Journal of Animal Science. 67:60.

Kachman, S.D. and Gianola, D. (1983). A predictor of genetic merit for parameters describing growth in a nonlinear fashion. Journal of Animal Science. 57:155.

Kachman, S.D. and Gianola, D. (1984a). A bayesian estimator of variance components in nonlinear growth models. Journal of Animal Science. 59:176.

Kachman, S.D. and Gianola, D. (1984b). Genetic evaluation from models including "regulating" traits. Journal of Animal Science. 59:177.

#### **To Be Submitted:**

Burfening, P.J., Kachman, S.D., Hanford, K.J. and Rossi, D. (1990). Selection for reproductive rate in Rambouillet sheep: Estimated genetic change in reproductive rate. Journal of Animal Science. To be submitted.

Kachman, S.D. and Boik, Robert J. (1990). Inference on fixed effects in multivariate mixed models for unbalanced data. Journal of Multivariate Analysis. To be submitted.

Kachman, S.D. and Everett, R.W. (1990a). Test day production model:II. Estimation of residual autocorrelation matrix. Journal of Dairy Science. To be submitted.

Kachman, S.D. and Everett, R.W. (1990b). Test day production model:I. Between herd variability in adjustment factors. Journal of Dairy Science. To be submitted.

Kachman, S.D. and Gianola, D. (1990). Prediction of genetic merit for parameters of growth curves. Biometrics. To be submitted.

#### **Statistical Experience:**

Developed a method for testing hypotheses in multivariate mixed models with unknown covariance matrices.

Developed an estimator of variance components for growth curve parameters.

Collection and analysis of lactation field records.

Assisted in the design and analysis of several projects involving cattle, poultry, sheep, swine and mice.

Analysis of data collected on a variety of projects including grizzly bear mortality in Yellowstone National Park.

Analysis of data with SAS, BMDP, SPSSX, and Harvey's LSMLMW.

#### **Teaching Experience:**

Taught two sections of introductory math and statistics classes each quarter from the fall of 1984 through the spring of 1987.

Ran a lab section of Plant and Animal Genetics.

Instructed a number of graduate students in the use of a variety of computer packages.

#### **Quantitative Genetics Experience:**

Developed predictors of genetic merit for growth curve parameters and for traits influenced by regulating traits.

Assisted in the design, implementation and analysis of a divergent selection study for age and weight at puberty in mice.

1-7-1

Conducted a study of the phenotypic and genetic variability of growth curve parameters in mice.

**Programming Experience:**

Developed a general purpose ration formulation program for microcomputers at Montana State University.

Developed programs to handle a variety of statistical problems at Michigan State University, University of Illinois, and Montana State University.

Developed educational programs for the PLATO computer system on waste management and dairy herd management at Michigan State University.

**David Benjamin Marx**

**Curriculum Vita**

**Address:**      Home: 7644 Grand Oaks Cr.  
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Work: Department of Biometry  
                         University of Nebraska  
                         103 Miller Hall  
                         Lincoln, NE 68583-0712  
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**Education:**

BA	1968	College of Wooster (Chemistry)
MA	1970	University of Missouri (Statistics)
Ph.D.	1977	University of Kentucky

**Thesis:**

Doctoral Dissertation: A Bayesian Classification of Samples into Multinomial Populations

**Professional Experience:**

Teaching Assistant	University of Missouri	1968-69
Assistant Instructor	University of Missouri	1969-70
Teaching Assistant	University of Kentucky	1970-73
Instructor	University of Kentucky Evening Class Program	1970-74
Research Assistant	Tobacco and Health Research Institute	Jan-May 73
Research Associate	Tobacco and Health Research Institute	June 73-74
Lecturer	University of Kentucky	1974
Assistant Professor	University of Arizona Department of Statistics	1975-1979

<b>Assistant Professor</b>	<b>University of Arkansas</b>	<b>1979-1981</b>
<b>Associate Professor</b>	<b>University of Arkansas</b>	<b>1981-1988</b>
<b>Professor</b>	<b>University of Arkansas</b>	<b>1988-1989</b>
<b>Professor and Head</b>	<b>University of Nebraska Department of Biometry</b>	<b>1989-Present</b>
<b>Consultant</b>	<b>University of Kentucky Medical Center Dept. of Community Med. Dept. of Psychiatry Dept. of OBGYN U.S. Forest Service Wilson E. Nolan, Inc. Predictive Modeling Oregon Game &amp; Fish Dept. ISAR - Rwanda, Africa USAID - Burundi, Africa MAROC/USAID/MIAC/UN-L Project NAARP Niger, Africa ARS - MSEA Water Quality Proj ICARDA - Syria ISABU-USAID Burundi, Africa</b>	<b>1971-1972 1971-1972 1972-1973 1984-Present 1984-Present 1986-Present 1986-Present 1986 1986 1989-Present 1989-Present 1990-Present 1992-Present 1992-Present</b>

#### **Professional Societies:**

American Statistical Association  
 Biometric Society  
 Sigma Xi  
 American Association for the Advancement of Science  
 University Statisticians of Southern Experiment Stations (Chairman 1983, 1989)

#### **Refereed Journal Publications:**

(with H.E. McKean and J. Wirtshafter) A Quantification of Monocular and Binocular Fixation in Stabisimus, Journal of Ophthalmology 12:166-172, 1975.

(with H.E. McKean and J. Wirtshafter) Bias of the cover Test in the Diagnosis of Alternating Tropia. Annals of Ophthalmology. April:431-437, 1976.

(with J. Pegelow, et. al.) The Gomperts Functions as a Model for Cotton Hypocotyl Elongations, Agronomy Journal 69:875-879, 1977.

(with J. Blouchard) A Comparison of Two Methods for Obtaining the Size Distribution Characteristics of Particulate Matter in Large-Volume Parenterals. Journal of Pharmaceutical Sciences 67:340-344, 1978.

(with J. Stone) Interaction of Sodium Chloride and Temperature on Germination to Two Alfalfa Cultivars. Agronomy Journal 1979.

(with G.H. Stott) Colostral Immunoglobulin Transfer in Calves I. Period of Absorption, Journal of Dairy Science, 62:1632-1638, 1979.

(with G.H. Stott) Colostral Immunoglobulin Transfers in Calves II. The Rate of Absorption. Journal of Dairy Science, 62:1766-1773, 1979.

(with G.H. Stott) Analysis of Censored Data for such as Colostral Immunoglobulin Transfer in Calves. Journal of Dairy Science, 62:1819-1824, 1979.

(with G.H. Stott) Colostral Immunoglobulin Transfer in Calves III. Amount of Absorption. Journal of Dairy Science, 62:1902-1097, 1979.

(with G.H. Stott) Colostral Immunoglobulin Transfer in Calves IV. Effect of Suckling. Journal of Dairy Science, 62:1908-1913, 1979.

(with R.R. Humphrey) Distribution of the Boojum Tree (*Idria columnaris*) on the Coast of Sonora, Mexico, as Influenced by Climate. Desert Plants, Vol. 2, No. 3, 183-187. 1980.

(with J.T. Gilmore) Soluble Salt Concentrations in Runoff Waters from Soils Previously Cropped by Rice. Soil Science Society of American Journal, Vol. 45, No. 6, 1198-1201, 1981.

(with A.R. Gonzalez) Effects of Storage on Processing Quality of Beans Harvested at the Semi-dry Stage. Journal of American Society of Horticultural Science. Vol. 7, No. 1, 82-86, 1982.

(with A.R. Gonzalez and R.S. Horn) Effect of Planting and Harvest Dates on Yield and Quality of Overwintering Spinach. HortScience 17(3):393-394, 1982.

(with D.E. Goodman and R.M. Rao) Arkansas Grown Rice Varieties Quality Properties Examined. Arkansas Farm Research, Vol. XXXI, No. 5, 6, 1982.

(with D.C. Bouchard and T.L. Lavy) Fate of Metribuzin, Metolachlor, and Fluomefuron in Soil. Weed Science, Vol. 30, 629-632, 1982.

(with T.H. Dao, T.L. Lavy, and J. Dragun) Effect, and Statistical Evaluation, of Soil Sterilization on Aniline and Diuron Adsorption Isotherms. Soil Science Society of American Journal, Vol. 46, No. 5, 963-969, 1982.

(with J.O. Klemmedson, C.E. Meier, and R.E. Campbell) Effect of Stand Composition and Season on Chemistry of Throughfall and Stemflow of Ponderosa Pine Forests. Forest Science, Vol. 29, No. 4, 871-887, June 1983.

(with A.R. Gonzalez, W.A. Sistrunk, and T.E. Morelock) Efficiency of Three Harvesters and Their Effect on Quality of Raw and Processed Snap Beans. HortScience, Vol. 18, No. 5, 742-745, 1983.

(with A.R. Gonzalez) Effect of Gibberellic Acid on Yield and Quality of Fall-harvested and Overwintered Spinach. Journal of American Society of Horticultural Science, Vol. 108, No. 4, 647-651, 1983.

(with A.R. Gonzalez, W.A. Sistrunk, and T.E. Morelock) Comparative Study of Three Snap Bean Mechanical Harvesters. Arkansas Farm Research, Vol. 32, No. 4, 1983.

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(with A.R. Gonzales and J.C. Gavin) Factors Affecting the Color of Snap Beans Produced in Arkansas. Proceedings of the Arkansas State Horticultural Society, 1984, 22-26.

(with A.R. Gonzalez and J.C. Gavin) Effect of Planting Date Sieve Size and Cultivar on Color of Snap Beans. Arkansas Farm Research, Vol. 33, No. 2, 1984.

(with W.F. Nicholson, J.R. Phillips, J.L. Bernhardt and J.E. Slosser) Sampling for Heliothis spp. in an Area-wide Bollworm Management Community. Southwestern Entomologist, No. 6, Dec. 1984, 17-22.

(with R.C. Peralta and T.M. Skergan) Solar Earth Water Distillation for Wet Sand. Trans. of the ASAE, Vol. 27, No. 6, Nov.-Dec, 1984, 1690-1695.

(with A.Y. Ranjha, R.C. Peralta and T.M. Skergan) Potential Solar Earth-Water Distillate Yields in Africa. Solar Energy, Vo. 36, No. 5, 1986, 451-458.

(with D.E. Longer) Cheating on Multiple Choice Exams is Difficult to Assess Quantitatively. NACTA, Vol. XXX, No. 1, March, 1986, 23-25.

(with G.V. Wilson and H.D. Scott) Spatial Dependence of Soil-Water Potentials Associated with Septic Systems. Soil Science, Vol. 144, No. 3, 159-166, 1987.

(with D.E. Longer and D.W. Albers) The Influence of Unannounced Partial Retesting on Learning and Classroom Attendance. J. Agron. Educ., 16, 3-5, 1987.

(with K.C. Thompson) Practical Aspects of Agricultural Kriging, Agricultural Experiment Station Bulletin, #903, University of Arkansas, 1987.

(with R.E. Frans, R.E. Talburt, and H. Crowley) Experimental Design and Techniques for Measuring and Analyzing Responses to Weed Control Practices. Chapter II, Research Methods in Weed Science, third edition, 1986, 29-46.

(with T. L. Lavy, L.A. Norris, and J.D. Mattice) Exposure of Forestry Ground Workers to 2, 4-D, Picloram and Dichlorprop. Environmental Toxicology and Chemistry, Vol. 6, 1987, pp. 209-224.

(with A.R. Tiedemann, D.A. Higgins, T.M. Quigley, and H.R. Sanderson) Responses to Fecal Coliform in Streamwater to Four Grazing Strategies. Journal of Range Management, 1987.

(with L.S. Wood, H.D. Scott, and T.L. Lavy) Variability in Sorption Coefficients of Metolachlor on a Captina Silt Loam. Journal of Environmental Quality, Vol. 16, 1987, 251-256.

(with J.T. Gilmour, H.D. Scott, and J.A. Ferguson) Effects of Long-Term Management in a Humid Region on Spatial Variability of Soil Chemical Status. Soil Science, 145,(3):188-193.

(with W.E. Sabbe) Soil Sampling: Spatial and Temporal Variability. Chapter 1, Soil Testing: Sampling, Correlation, Calibration, and Interpretation, Soil Science Society of American Special Publication. Number 21, 1987, 1-14.

(with G.V. Wilson and H.D. Scott) Spatial Hydraulic Response of a Subsurface Effluent Line Source. Journal Water Pollution Control Federation, 59(11):944-949.

(with G.V. Wilson and H.D. Scott) Experimental and Unnumerical Analyses of Perched Groundwater Mounds Below Septic Systems. Soil Science of American Journal, 51(4) 843-850.

(with C.P. West, A.P. Mallorin, and W.F. Wedin) Spatial Variability of Soil Chemical Properties in Grazed Pastures. Soil Science Society of America. 1989, 53(3), 784-789.

(with J.R. Clark and D.G. Dombek) Seasonal Variation in Elemental Content of "Bluecrop" Blueberry Leaves. University of Arkansas. Arkansas Agricultural Experiment Station Bulletin 920, 1-12.

(with E.L. Bull) How to Determine Snag Density. Western Journal of Applied Forestry, Vol. 5, No. 2, April 1990, 56-58.

(with D.A. Higgins, A.R. Tiedemann and T.M. Quigley) Streamflow Characteristics of Small Watersheds in the Blue Mountains of Oregon. Water Resources Bulletin, 1989, Vol. 25, No. 6, 1131-1149.

(with M. Young and M. Henderson) Attitudes of Nursing Students Toward Patients with AIDS. Psychological Reports, 1990, 76, 491-497.

(with A.R. Gonzalez and J.M. Aselage) Impact of Immature Fruits on Quanlity of Peach Puree. Journal of Food Quality, 1992, 15, 169-181.

**Invited Papers:**

Exchangeability of Classification Parameters in Multinomial Populations (ASA meetings, 1978)

Design of Transect Studies (Western Biometric Society meetings, 1979)

Agricultural Applications of Kriging (ASA meetings, 1984)

Spatial Variability in Agriculture (USSES meetings, 1985)

Applications of Kriging (Graduate Enrichment Program, University of Kentucky, 1985)

Field Testing of an Abstinence-Oriented Family Life Education Curriculum (American School Health Association, 1989)

Applied Geostatistics Workshop (ASA meetings, 1991)

Designed Experiments in the Presence of Spatial Correlation (networking meeting of Caribbean and Central American Statisticians, Port of Spain, Trinidad, 1992)

Applied Geostatistics Workshop with C.A. Gotway and G.W. Hergert. (ASA meetings, 1992)

**Anne M. Parkhurst**

**Curriculum Vita**

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**Education:**

B.A.	1962	University of Virginia	Mathematics/Chemistry
M.S.	1965	Yale University	Statistics
Ph.D.	1992	University of Nebraska	Industrial Engineering

**Thesis:**

Evaluation of Order Determination Procedures in Arma Models

**Professional Experience:**

Research Mathematician	Mobil Oil	1965-1966
Statistical Coordinator	Cornell University	1966-1969
Senior Systems Analyst	University of Nebraska	1969-1972
Instructor	University of Nebraska Department of Biometry	1972-1976
Assistant Professor	University of Nebraska Department of Biometry	1976-1982
Associate Professor	University of Nebraska Department of Biometry	1982-1988
Professor	University of Nebraska	1988-Present

**Professional Societies:**

Alpha Pi Mu - Industrial Engineering Honor Society  
American Meteorological Society  
American Society of Animal Science  
American Statistical Association  
Biometrics Society  
Chi Beta Phi  
Gamma Sigma Delta  
Graduate Women in Science  
NACTA  
Nebraska Academy of Sciences  
Sigma Xi

**Refereed Journal Articles:**

Shapiro, C.A., W.I. Krantz, and A. M Parkhurst. 1989. "Comparison of Harvest Techniques for Cornfield Demonstrations," American Journal of Alternative Agriculture. 3:168-173.

Rzewnicky, Phil E., Richard Thompson, Gary W. Lesoing, Roger W. Elmore, Charles A. Francis, Anne M. Parkhurst, and Russell S. Moomaw. 1988. "On-Farm Experiment Designs and Implications for Locating Research Sites," American Journal of Alternative Agriculture. 4:59-64. Journal Series No. xxxx.

Johnson, S.K., G.H. Deuscher and A.M. Parkhurst. 1988. "Relationships of Pelvic Structure, Body Measurements, Pelvic Area and Calving Difficulty," Journal of Animal Science. 66:1081-88 Journal Series No. 8238.

Knaub, Patricia Kain, Douglas Abbott, William H. Meredith, Anne Parkhurst. 1988. "Perceptions of Stress Associated With Wife's Off-Farm Employment," Home Economics Research Journal. 17(1):86-94. Journal Series No. xxxx.

Bruneau, A.H., A.M. Parkhurst and R.C. Shearman. 1987. "Use of Discriminant Analysis in Kentucky Bluegrass Billbug Resistance Ratings." Hortscience Journal. 112(6):978-980 Journal Series No. 7742.

Combs, Raedene E., Anne M. Parkhurst and Charles S. Madden. 1987. "Solar Heating Systems: Differentiation Between Stages In the Innovation-Decision Process." Home Economics Research Journal. 15-159-168. Journal Series No. 6952.

Laughlin, Joan M., Anne M. Parkhurst, Barbara M. Reagan, Colia M. Janecek. 1985. "Midwest Regional Burn Injury Study: Characteristics of Clothing-Related Burn Accidents." Textile Research Journal, 55:285-299. Journal Series No. 7171.

Pollak, L.M., C.O. Gardner, and A.M. Parkhurst. 1984. "Relationship Between Enzyme Marker Loci and Morphological Traits in Two Mass Selected Maize Populations," Crop Science, 24:1175-9. Journal Series No. 7343.

Walker, C.E. and A.M. Parkhurst. 1984. "Response Surface Analysis of Bake-Lab Data with a Personal Computer," Cereal Foods World, 29:662-666. Journal Series No. 7418.

Waldren, Richard P., Anne M. Parkhurst, and John K. Ward. 1983. "Difference Between Rural and Urban Students in the College of Agriculture at the University of Nebraska." NACTA Journal, 28:8-12.

This paper received honorable mention at the 30th Annual NACTA Conference, June 1984.

Walker, Florence S., Anne M. Parkhurst. 1982. "Identifying Differences in Time Managers." Home Economics Research Journal. 11:57-66. Journal Series No. 5724.

Stinnett, Nick, Nick Sanders, John DeFrain and Anne Parkhurst. 1982. "A Nationwide Study of Families Who Perceive Themselves as Strong." Family Prospective, 16:15-22.

Bader, Linda, John DeFrain and Anne Parkhurst. 1982. "What Parents Feel When Their Child Divorces," Family Prospective, 16:93-100.

Chess, Barbara, John C. Woodward, Maxine Bauermeister and Anne M. Parkhurst. 1981. "Loneliness Among Low-Income, Single Adolescent Mothers," Home Economics Research Journal. 9:374-381. Journal Series No. 5814.

Knoche, Herman W., Anne M. Parkhurst, and S. William Tam. 1979. "The Effect of Volume and Quenching on Estimation of Counting Efficiencies in Liquid Scintillation Counting," International Journal of Applied Radiation and Isotopes, 30:46-49. Journal Series No. 5369.

Chess, Barbara Jo, Anne M. Parkhurst, and Debra L. Schaffer. 1979. "Self-esteem and Marital Adjustment--Controlling the Tendency to Distort Evaluations," Home Economics Research Journal, 8:27-36. Journal Series No. 5592.

Ward, John K., Donald L. Ferguson, and Anne M. Parkhurst. 1979. "Gastrointestinal Parasites in Beef Cows," Journal of Animal Science, 49:306-309. Journal Series No. 5605.

Laughlin, Joan, Judith Besel Trautwein, and Anne Parkhurst. 1978. "The Nebraska Burn Study: Characteristics of Clothing-Related Burn Victims," Textile Chemist and Colorist (The Journal of the American Association of Textile Chemist and Colorist), 10:17-19. Journal Series No. 5406.

Chesser, Barbara Jo, and Anne M. Parkhurst. 1977. "Family Life Students Praise the Computer." Journal of Home Economics, ppg. 19-21.

— **Book Chapters:**

Parkhurst, Anne M., and Charles A. Francis, "Research Methods for Multiple Cropping." Multiple Cropping Systems, C.A. Francis (ed.), Macmillian, p. 285-316, 1986.

Walker, Florence S., Kenneth R. Trembly, and Anne M. Parkhurst. "Financial Management and Family Life," Family Strengths 5. 1983, University Press.

Sutton, A.K. and A.M. Parkhurst. Business Mathematics for Fashion Merchandising Utilizing Computerized Drills. 1978, Austin Press, 222 ppg.

Parkhurst, Anne M., and A.T. James "Zonal Polynomials of Order 1 Through 12 (190)." Selected Tables in Mathematical Statistics, 2:199-388, 1974.

**Abstracts:**

Shapiro, C.A., W.L. Kranz, and A. M. Parkhurst. "Comparison of Harvest Techniques for Cornfield Demonstrations." Agronomy Abstracts, 81:28 Las Vegas, NV. November 1989.

Parkhurst, A.M., J.L. Ballard and K.P. Rajurkar. "Comparison of Methods for Detecting Periodicity in Circadian Rhythms." Abstracts: American Statistical Association, August 1989.

Hahn, G.L., A.M. Parkhurst, and J.A. Nienaber. "Feed Intake and Tympanic Temperature Responses of Ad-Lib-Fed Cattle to Thermal Challenges. 9th Conference on Biometeorology and Aerobiology, Charleston, SC. March 7-8, 1989.

Parkhurst, A.M. and G.L. Hahn. "Impact of Thermal Environment on Steers Using DDS." Abstracts: American Statistical Association, August 22-25, 1988.

Flessner, Theresa R., J. Stubbendieck, and Anne M. Parkhurst. "Effect of Fertilization and Pinching on Blowout Penstemon, Proceedings of the Nebraska Academy of Sciences, April, 1988.

Hahn, G.L., A.M. Parkhurst and J.A. Nienaber, "Tympanic Temperature Rhythms in Cattle in Selected Environments." 18th Conference Agricultural and Forest Meteorology and 8th Conference on Biometeorology and Aerobiology, 320-323, W. Lafayette, IN. September 15-18, 1987.

Parkhurst, A.M., J.L. Ballard and K.P. Rajurkar. "Time Series Modeling: Data Dependent Systems vs. Conventional Approach." Abstracts: American Statistical Association, August 1987.

Francis, C.A., A. M. Parkhurst and R. Thompson. "Designs for On-Farm Research: Statistical Rigor and Client Credibility." Agronomy Abstracts, 78:111, New Orleans, LA. November 30-December 5, 1986.

Pavlish, L.A., C.A. Francis and A.M. Parkhurst. "Statistical Analysis of Multiple Cropping Patterns." Agronomy Abstracts, 78:120, New Orleans, LA November 30-December 5, 1986.

Parkhurst, A.M. and K.P. Rajurkar. "Analysis of Feed Consumption by Data Dependent Systems." Abstracts: Journal of Animal Science, 63:421, Manhattan, KS July 1986.

Ward, J.K., D.L. Ferguson, J. Berthelsen, A. M. Parkhurst and M.J. Nelson. "Deworming: (1) Beef Cow Performance." Abstracts: Journal of Animal Science, 63:319, Manhattan, KS

Ward, J.K., D.L. Ferguson, J. Berthelsen, and A.M. Parkhurst. "Deworming: (2) Beef Calf Performance." Abstracts: Journal of Animal Science, 63:319, Manhattan, KS July 1986.

Johnson, S.K., A.M. Parkhurst and G.H. Deutscher. "Predicting Calving Difficulty with a Discriminant versus a Regression Model." Abstracts: Journal of Animal Science, 63:401, Manhattan, KS July 1986.

Waldren, Richard, John Rupnow, and Anne Parkhurst, "Preferred Professional Activities and Rewards for Teaching." Idea Sharing Session, NACTA Conference, NACTA Journal, 30:28, September 1986.

DeShazer, James A., Anne M. Parkhurst and Jack L. Schinstock. "Agricultural Engineering vs Technology Students - Type Preference Differences," 20th Annual Meeting of the American Society for Engineering Education-Midwest Section, March 20-25, 1985.

Parkhurst, A.M. and C.A. Francis. "Time-Honored Experimental Designs and Complex Cropping Systems." American Statistical Association, August, 1984.

Parkhurst, A.M. and C.A. Francis. "Perceived Time and Learning in Relation to Grades in a Plant Breeding Course." Agronomy Abstracts, 76:4, Las Vegas, NV, November 25-30 1984.

Waldren, Richard P., Anne M. Parkhurst, and John K. Ward, "Differences Between Rural and Urban Students in the College of Agriculture at the University of Nebraska." Idea Sharing Session, NACTA Conference, NACTA Journal, 28:35, June 1983.

- Laughlin, J., and A. Parkhurst, "Log-Linear Model Analysis of the Structural Relationships Among Factors Contributing to Burn Injury Accidents." Proceedings of the Nebraska Academy of Science Ninety Third Annual Meetings, April, 1983.
- Parkhurst, A.M. and W.W. Stroup. "Multidimensional Scaling: Potential for Application in Ecological Studies" American Statistical Association, August, 1983.
- Stroup, W.W. and A.M. Parkhurst, "Use of the Rank-Transformation in the Analysis of Split-Plot Experiments," American Statistical Association, August, 1983.
- Walker, C.E. and A.M. Parkhurst, "Response Surface Analysis of Bake-Lab Data with A Personal Computer," American Association of Cereal Chemists, October 30-November 3, 1983.
- Parkhurst, Anne M. "On Fitting Discrete Distributions." Proceedings of the Nebraska Academy of Sciences, April, 1976.
- Pollack, L.M., C.O. Gardner, and A.M. Parkhurst, "Relationships of Allozyme Genotypes to Morphological and Agronomoc Traits in Two Experimental Corn Populations," Agronomy Abstracts, Anaheim, California, November 28-December 3, 1982.
- Parkhurst, Anne M. "STATAN" Statistical Analysis to Assist Neophytes." Proceedings of the Nebraska Academy of Science, April 1980.
- Parkhurst, Anne M. and Anna Nevius, "Using the Computer to Understand Power of a Test." Proceedings of the Nebraska Academy of Sciences, April, 1978.
- Nevius, Anna B. and Anne M. Parkhurst, "Comparison of the Budgetary Practices of Nebraska Women with a National Survey," Proceedings of the Nebraska Academy of Sciences, April 1977.
- Ward, J.K., D.L. Ferguson, and A.M. Parkhurst. "Gastrointestinal Parasites in Beef Cattle," American Society of Animal Science, July, 1977.
- Roemhildt, LaVera and Anne Parkhurst. "The Comfort and Appearance of Women's Slacks Made from Commercial Patterns Which Vary in Grainline Position." National ACPTC (Association of College Professors of Textiles and Clothing), October, 1977.
- Nevius, Anna B., Anne M. Parkhurst, and Audrey E. Newton. "Computerized Draperies," Proceedings of the Nebraska Academy of Sciences, April, 1976.

**Other Publications:**

**Research Bulletins:**

Laughlin, Joan M., Anne M. Parkhurst, Barbara M. Reagan, Corla M. Janecek, Cora Sivers, Mary M. Hurlocker. "Burn Injury Study: Characteristics of Clothing-Related Burn Accidents," Journal Series, North Central Regional Agricultural Experiment Station Bulletin #292, October 1983, 28pp.

**Quarterly Publications:**

Waldren, Richrd P., Anne M. Parkhurst, and John K. Ward, "Urban vs. Rural: How Different Are College of Agriculture Students?" 1:18-19. 1984.

Chesser, Barbara, John C. Woodward, Maxine Bauermeister, and Anne M. Parkhurst. "Loneliness Among Low-Income, Single Adolescent Mothers," Fall 1981, pp. 18-19.

Newton, Audrey, Anne Parkhurst, and Anne Nevius. "Computer Makes Drapery Calculations Easier," Fall 1978, pp. 19-20.

**Book Reviews:**

The Agricultural Field Experiment: A Statistical Examination of Theory and Practice. S.C. Pearce, John Wiley & Sons, New York. 1983. 335pp for the Journal of Agronomic Education. 13:78. 1984.

**Departmental Reports:**

Adams, John L. and Anne M. Parkhurst, "Farmer/Rancher Perceptions of Channels and Sources of Change Information," 73, August 1984, Dept. of Agricultural Communications Report No. 9.

Kamble, Shipat T., Roger E. Gold, Anne Parkhurst, "Nebraska Residential Pesticide Use Survey (1979 and 1980)", p. 27, April 1982, Environmental Programs #3.

Parkhurst, A.M. "Multidimensional Scaling on the OSIRIS System," 6 April '79, Biometrics Center Report #18.

Parkhurst, A.M. "Algorithms for Statistical Programmers: Part I Vectors and Random Numbers," 24, May '79, Biometrics Center Report #19.

Parkhurst, A.M. and A. B. Nevius, "Multiple Choice Testing with Multiple Component Scoring," 11, May '77, Biometrics Center Report #16.

Parkhurst, A.M. and A.B. Nevius, "Blank: A Program for Presenting Fill-in-the Blank Questions," 10, June '77, Biometrics Center Report #17.

Parkhurst, A.M. and A.B. Nevius, "CHOICE: A Program for Presenting Multiple Choice Questions." Statistical Laboratory Report #15, 1976.

Parkhurst, A.M. "Computers in the Kitchen." Statistical Laboratory Report #13, 1975.

Parkhurst, A.M. "Designing and Coding Questionnaires," Statistical Laboratory Report #14, 1975.

Parkhurst, A.M. "Two Way Frequency Tables with the Goodman-Kruskal Tau and Chi Squared Statistics." Statistical Laboratory Report #11, 1974.

McKenna, (Kean), Rita, and A.M. Parkhurst. "Computerized Learning Packets for Fashion Merchandising." Statistical Laboratory Report #12, 1974.

Parkhurst, A.M. "An Account of the Precision Obtained from the Multiple Linear Regression Routines Currently Available at the University of Nebraska." Statistical Laboratory Report #6, 1970.

Parkhurst, A.M. "A Program to Construct Orthogonal Polynomials Given Weighting and Spacing." Statistical Laboratory Report #6, 1970.

#### Proceedings:

Parkhurst, A.M. and G.L. Hahn. 1989. "Statistical Issues in Studies of Thermoregulation in Farm Animals," Proceedings of First Conference on Applied Statistics in Agriculture. 1:xx-xx. Journal Series No. xxxx. Accepted.

Hahn, G.L., A.M. Parkhurst, and J.A. Nienaber. "Feed Intake and Tympanic Temperature Responses of Ad-Lib-Fed Cattle to Thermal Challenges. 9th Conference on Biometeorology and Aerobiology, Charleston, SC. March 7-8, 1989.

Zulovich, Joseph M., Anne M. Parkhurst and James A. DeShazer. "Effect of Egg Formation Upon the Dynamic Heat Loss Characteristics of the Laying Hen." Third International Livestock Environment Symposium. Toronto, Ontario, April 25-27, 1988.

Feddes, J.J.R., J.A. DeShazer, and A.M. Parkhurst, "Dynamic Responses of Growing Pigs to High Constant and Cyclic Temperature, April 25-27, 1988.

DeShazer, James A., Anne M. Parkhurst and Jack L. Schinstock. "Agricultural Engineering vs Mechanization Students - Type Preference Differences." Proceedings of American Society for Engineering Education Midwest Section, March 20-22, 1985, pp. 147-157.

Parkhurst, A.M. and C.A. Francis. 1984. "Research Methodology and Analysis for Complex Cropping Systems." The XIIth International Biometrics Conference Proceedings-Invited Papers, Tokyo, Japan: pp. 100-109.

Combs, E. Raedene, Anne M. Parkhurst. 1983. "Solar Heating: Differentiation Between Stages in the Innovative-Decision Process - Initial Results," Proceedings of the 10th International Research Seminar in Marketing, Aix-en-Provence, France. 52-67. Journal Series No. 6952.

Parkhurst, Anne M. 1982. "STATAN, A Query Language to Help Students Practice Statistics," Proceedings of NECC '82, National Education Computing Conference: 302-305.

Parkhurst, Anne M. 1981. "STATAN, A Conversational Interface to Facilitate SAS Usage or It Pays to Get Your SAS in Gear," SAS User's Group Conference Proceedings pp. 461-468.

Parkhurst, Anne M. 1981. "A Statistician's View of the Requirements of Host Database to Support a Central Query Language." Proceedings of the First LBL Workshop on Statistical Database Management, December 2-4, Lawrence Berkeley Laboratory, p. 19-24.

#### **Work in Progress:**

Kollars, S.J., W.A. Gustafason Jr. and A.M. Parkhurst, "Application of All Treatments to a Single Tree/Block for Chemical Fruit Thinning of Apples," Hortscience Journal. No. 7691. Kean, Rita and Anne Parkhurst, "Identifying Groups of Apparel Shoppers Among Elderly Women," Clothing and Textiles Research Journal.

Parkhurst, Anne, and K.P. Rajurkar. "Analysis of Feed Consumption by Data Dependent Systems," Journal of Animal Science.

Parkhurst, A.M. and G.L. Hahn. "DDS Time Series Analysis of Cattle Tympanic Temperature Rhythms."

**Wilfred M. Schutz**

**Curriculum Vita**

**Address:**

<b>Home:</b>	8231 Henry Street Lincoln, NE 68506 402.489.6992	<b>Office:</b> Central Administration 231 Varner Hall 3835 Holdrege University of Nebraska Lincoln, NE 68583 402.472.2861
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**Education:**

B.S.	1957	University of Nebraska	Agronomy
M.S.	1959	University of Nebraska	Genetics
Ph.D.	1962	North Carolina State University	Statistics

**Theses:**

The effect of thermal neutron irradiation of dormant seeds of maize on the relationship among linked genes controlling qualitative and quantitative characters. M.S. Thesis.

The effect of field blocking on gain from selection. Ph.D. Thesis.

**Professional Experience:**

Research Geneticist	Agricultural Research Service U.S. Department of Agriculture North Carolina University Department of Genetics Department of Statistics	1962-1968
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Professor and Head	University of Nebraska Biometrics and Information Systems Center	1968-1987
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Director of IANR Computing and AGNET Administrator	University of Nebraska	1975-1987
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<b>Assistant V-President and Director of University-wide Computing</b>	<b>University of Nebraska Central Administration</b>	<b>1987-present</b>
<b>Professor</b>	<b>University of Nebraska Department of Biometry</b>	<b>Present</b>

**Other Academic Experience and University of Nebraska Service:**

**Graduate Faculty Fellow since 1969**

**Major Professor on 5 Ph.D. programs and 1 M.S. program, served on 22 Ph.D. and 6 M.S. graduate committees.**

**Chairman, UNL Academic Planning Committee**

**Chairman, UNL Conciliation Committee**

**Chairman, UNL Academic Freedom and Tenure Committee**

**Chairman, UNL Computational Services and Facilities Committee**

**Co-Chairman, Chancellor's Task Force on Academic Computing**

**IANR representative on the University-wide Vice Chancellor's Planning Group for Administrative Computing and Chairman of the subcommittee dealing with financial issues and recommendations.**

**Chancellor's representative on the University-wide Academic Computing Services Task Force**

**Chairman, UNL Computer Allocations Committee**

**Campus Coordinator for the North Central Regional Computer Institute**

**University-wide Task Force on the Computerization of Financial Aid Operations**

**Chairman, University-wide Advisory Committee to select and evaluate candidates for the position of Assistant Vice President and Director of University-wide Computing**

**UNL Chancellor's Committee on Networking**

**Graduate College Statistics Advisory Committee**

**Chairman, IANR Computing Advisory Committee**

**Chairman, IANR Task Force on Policies and Procedures for Software Development and Release**

**Chairman, IANR Task Force on Expert Systems**

**Chairman, IANR Department Head's Committee on Graduate Faculty Membership Criteria**

**Chairman, IANR Patents and Copyrights Advisory Committee**

**Chairman, Search and Screening Committee for Dean and Director of the Nebraska Agricultural**

**Experiment Station**

**Chairman, Gamma Sigma Delta Research Awards Selection Committee**

**Extension Curriculum Committee**

**Salary Study Committee**

**Extension Computer Committee**

**Computers in Agriculture Curriculum Steering Committee**

**Ag Communications Computer Graphics Committee**

Extension Task Force on Data Management

UNL Speaker's Bureau

Task Force on Libraries and Computing for the UNL North Central Accreditation Study

Comprehensive Review Team for the College of Home Economics

Comprehensive Review Team for the Animal Science Department

UNL CALMIT Executive Committee

Associate Editor of Crop Science with responsibility for manuscripts with statistical and  
statistical genetics content

**Professional Societies:**

American Statistical Association

Biometrics Society

American Society of Agronomy

Crop Science Society of America

Society of the Sigma Xi

Gamma Sigma Delta

Alpha Zeta

**Refereed Journal Articles:**

Schutz, W.M. and C. Clark Cockerham. 1966. The effect of field block on gain from selection. Biometrics. 22:843-863.

Schutz, W.M. and C.A. Brim. 1967. Inter-genotypic competition in soybeans. I. Evaluation of effects and proposed field plot design. Crop Science.

Brim, C.A., W. M. Schutz, and F.I. Collins. 1967. Nuclear magnetic resonance analysis for oil in soybeans. Glycine max (L.) Merrill, with implications in selection. Crop Science. 7:220-222.

Schutz, W.M. and R.L. Bernard. 1967. Genotype x environment interactions in the regional testing of soybean strains. Crop Science. 7:125-130.

Brim, C.A., W.M. Shutz, and F.I. Collins. 1968. Maternal effect on fatty acid composition and oil content of soybeans. Glycine max (L.) Merrill. Crop Science. 8:517-519.

Schutz, W.M., C.A. Brim, and S.A. Usanis. 1968. Inter-genotypic competition in plant populations. I. Feedback systems with stable equilibria in populations in autogamous homozygous lines. Crop Science. 8:61-66.

Schutz, W.M. and S.A. Usanis. 1969. Inter-genotypic competition in plant populations II. Maintenance of allelic polymorphisms with frequency dependent selection and mixed selfing and random mating. Genetics. 61:875-891.

Schutz, W.M. and C.A. Brim. 1971. Inter-genotypic competition in soybeans. III. An evaluation of stability in multiline mixtures. Crop Science II:684-689.

Jurado, A., W.M. Schutz, and W.A. Compton. 1975. Intergenotypic Studies in Corn (Zea mays L.) II. Among Broad Based Populations. Numero Extraordinario De Investigacion, Vol. I: 40-45.

#### **Abstracts:**

Schutz, W.M. and C. Clark Cockerham. 1962. The use of blocks in making selections. Agronomy Abstracts. p. 72.

Brim, C.A., W.M. Schutz, and F.I. Collins, 1966. Nuclear magnetic resonance analysis for oil in soybeans Glycine max (L.) Merrill, with implications in selection. Agronomy Abstracts, p. 4.

Schutz, W.M. and C.A. Brim. 1966. Inter-genotypic competition in soybean Glycine max (L.) Merrill. Agronomy Abstracts. p. 14.

Schutz, W.M., C.A. Brim and S.A. Usanis. 1967. Intergenotypic competition in evolving populations of autogamous plants. Agronomy Abstracts. p. 85.

Brim, C.A., W.M. Schutz, and F.I. Collins. 1967. Maternal effect on fatty acid composition and oil content of soybeans, Glycine max (L.) Merrill. Agronomy Abstracts. p. 85.

Schutz, W.M. and C.A. Brim. 1969. Effect of plant density on intergenotypic interactions in soybeans. Agronomy Abstracts. p. 44.

#### **Other Publications:**

Schutz, W.M. 1965. An analysis of the contributions of locations to the Regional Uniform Tests. Report of the Twelfth Work Planning Conference of Southern States Collaborators of the U.S. Regional Soybean Laboratory.

Schutz, W.M. 1967. Inter-genotypic competition in soybeans. Report of the Thirteenth Work Planning Conference of the Southern States Collaborators of the U.S. Regional Soybean Laboratory.

Schutz, W.M. 1969. Inter-genotypic competition--Field plot design and procedures. Proceedings of a Symposium on Soybean Breeding, Iowa State University, Ames, IA.

Schutz, W.M. 1970. Computer as potential aid to better crops. Fall issue, College of Agriculture Farm, Ranch and Home Quarterly Publication.

**International Activities:**

Presented two invited papers on the applications of computing in agriculture at the First Middle Eastern Computers and Graphics Conference and Exposition in Riyadh, Saudi Arabia in February 1984.

Presented an invited seminar on computing applications at the Regional Agriculture and Water Research Center of the Ministry of Agriculture and Water in Riyadh, Saudi Arabia in February 1984.

Presented seminars on computing applications to visiting teams from the USSR, mainland China, West Germany, Egypt, England, Denmark, and several other foreign countries.

**Walter W. Stroup**

**Curriculum Vita**

**Address:**      Home: 1606 Janssen Dr.  
                         Lincoln, NE 68506  
                         402.483.1740

Work: Department of Biometry  
103 Miller Hall  
University of Nebraska  
Lincoln, NE 68583-0712  
402.472.2903

**Education:**

B.A.	1973	Antioch College Yellow Springs	Psychology
M.S.	1975	University of Kentucky Lexington, KY	Statistics
Ph.D.	1979	University of Kentucky Lexington, KY	Statistics

**Thesis:**

Maximum likelihood estimation of variance components with the Balanced Incomplete Block Design.

**Professional Experience:**

Teaching Assistant	University of Kentucky	1973-1978
Consulting Assistant	University of Kentucky Animal Science Department	1976-1978
Assistant Professor	University of Nebraska Department of Biometry	1979-1984
Associate Professor	University of Nebraska Department of Biometry	1984-1992
Professor	University of Nebraska Department of Biometry	1992-Present

**Scholastic Honors:**

National Merit Finalist, 1968

Natl. Council of Teachers of English Award in English Composition & Creative Writing, 1968

Rotary Club Scholarship Award in Mathematics, 1968

Twice nominated for outstanding teaching award (1982 and 1986)

**Professional Societies:**

American Statistical Association

Biometric Society

Sigma Xi

University Statisticians of South Experiment Stations

American Society for Horticultural Sciences (assist with statistical issues)

Various university committees and task forces

**Refereed Journal Publications:**

W.W. Stroup, J.W. Evans, R. L. Anderson. 1980. "Maximum Likelihood Estimation of Variance Components in a Completely Random BIB Design." Communication in Statistics. A9 (7): 725-756.

D.E. Reece, B.D. Moser, E.R. Peo, A. N. Lewis, D.R. Zimmerman, J.E. Kinder, and W.W. Stroup. 1982. "Influence of Energy Intake During Lactation on the Interval From Weaning to First Estrus in Sows." Journal of Animal Science. 55:590-598.

D.E. Reece, B.D. Moser, E.R. Peo, A.N. Lewis, D.R. Zimmerman, J.E. Kinder, and W.W. Stroup. 1982. "Influence of Energy Intake During Lactation on Subsequent Gestation Lactation and Post-Weaning Performance of Sows," Journal of Animal Science. 55: 867-872.

W.W. Stroup, and J. Stubbendieck. 1983. "Multivariate Statistical Methods to Evaluate Changes in Botanical Composition." Journal of Range Management. 36:208-212.

S.T. Tan, R.B. Maxcy and W.W. Stroup. 1983. "Colony-Forming Unit Enumeration by a Plate-MPN Method." Journal of Food Protection. 46:836-841.

A. Turgeon, T. Klopenstein, D. Brink, D. Loveday, W.W. Stroup, W.R. Oltjen. 1984. "Production Systems for Compensatory Growth." 1984 Nebraska Beef Cattle Report.

S.J. Knapp, W.W. Stroup, and W.M. Ross. 1985. "Exact Confidence Intervals for Heretability on a Progeny Mean Basis." Crop Science. 25:192-194.

R.J. Johnson, P.H. Cole, and W.W. Stroup. 1985. "Starling Response to Three Auditory Stimuli," Journal of Wildlife Management. 49:620-625.

R. Cleale, T. Klopfenstein, J. Merrill, M. Nelson, and W. Stroup. 1985. "Heat Treated Soybean Products for Growing Beef Cattle." 1985 Nebraska Beef Cattle Report. MP48: 55-57.

W.W. Stroup, S.S. Waller, and R.N. Gates. 1986. "Selection of Appropriate Designs for Pasture Improvement Experiments." Journal of Range Management. 39:200-206.

T.O. Dill, S.S. Waller, K.P. Vogel, R.N. Gates, and W.W. Stroup. 1986. "Renovation of Seede Warm-Season Pastures in Eastern Nebraska with Atrazine." Journal of Range Management. 39: 72-75.

M.A. Worrell, D.C. Clanton, W.W. Stroup, and J.T. Nichols. 1986. "Effect of Harvest Date on Meadow Hay Quality. I. Nutritional Attributes, voluntary intake and rate of passage in growing cattle." Journal of Animal Science. 63:1527-1537.

M.A. Worrell, D.C. Clanton, W.W. Stroup, and J.T. Nichols. 1986. "Effect of Harvest Date on Meadow Hay Quality II. Particle size degradation and particulate passage from the rumen of growing cattle." Journal of Animal Science. 63: 1538-1546.

S.J. Knapp, W.M. Ross, and W.W. Stroup. 1987. "Estimation of Confidence Intervals for Genetic Parameters in Sorghum Populations." Crop Science. 27:265-268.

W.W. Stroup, M.K. Nielsen, and J.A. Gosey. 1987. "Cyclic Variation in Cattle Feed Data: Characterization and Implications for Experimental Design." Journal of Animal Science. 64:1638-1647.

R.N. Gates, T.J. Klopfenstein, S. S. Waller, R.A. Britton, W.W. Stroup, and B.E. Anderson. 1987. "Influence of Thermo-Ammoniation on Quality of Warm Season Hay for Steers." Journal of Animal Science. 64:1921-1834.

W.W. Wilhelm, J.S. Scheppers, L.N. Mielke, J.W. Doran, and W.W. Stroup. 1987. Dryland Maize Development and Yield Resulting from Tillage and Nitrogen Fertilization Practices. Soil and Tillage Research. 10:167-179.

B.A. Holm, R.J. Johnson, D.D. Jensen, and W.W. Stroup. 1988. Responses of Deer Mice to Mehtiocarb and Thiram Treatments. Journal of Wildlife Management. 52:497-502.

W.W. Stroup and E.T. Paparozzi. 1989. Statistical Update: Where do we go from here? Discussion from ASHS Statistics Colloquium. HortScience. 24:58-61.

R.A. McLean, W.L. Sanders, W.W. Stroup. 1991. A unified approach to mixed linear models. American Statistician.

W.W. Stroup and D.K. Multize. 1991. Nearest neighbor adjusted best linear unbiased prediction. American Statistician.

**Abstracts:**

W.W. Stroup, J.W. Evans, R.L. Anderson. 1980. "A Comparison of Two Way Classification Designs for Estimating Variance Components." ENAR Biometrics Meetings.

W.W. Stroup, J. Stubbendieck. 1981. "Multivariate Statistical Methods to Determine Changes in Botanical Composition." Abstracts: Range Management Society.

T.O. Dill, S.S. Waller, K.P Vogel, W.W. Stroup. 1981. "Chemical Restoration of Eastern Nebraska Seeded Warm Season Pastures." 1983 Abstracts: Range Management Society.

C.J. Weiderspan, J.R. Brandle, and W.W. Stroup. 1983. Switchgrass Vegetative and Fertile Tiller Reproduction as Affected by Burning." 1983 Abstracts: Nebraska Academy of Sciences.

P.H. Cole, R.J. Johnson, and W.W. Stroup. 1983. "The Response of Starlings to Three Auditory Stimuli." Ninth Bird Control Seminar.

K.E. Holm, R. J. Johnson, and W.W. Stroup. 1983. "Rodent-Agriculture Interactions in No-Tillage Crop Fields." Sixth Great Plains Wildlife Damage Control Workshop.

L.R. Freeland, R. Ruskamp, J.F. Amend, A.M. Myer, and W.W. Stroup. 1983. "Hemodynamic Effects of Monensin Sodium in Anesthetized Sheep." 1983 Abstracts: Nebraska Academy of Sciences.

A.M. Myer, J.F. Amend, L.R. Freeland, F.M. Mallon, and W.W. Stroup. 1983. "Renal and Myocardial Mechanisms of Monensin Toxicity in Domestic Ponies. 1983 Abstracts: Nebraska Academy of Sciences.

G.E. Aines, R.A. Britton, T. Klopfenstein, and W.W. Stroup. 1983. "In vitro rates of corn cob and wheat straw cell wall digestion as affected by alkali source and level." 1983 Abstracts: 75th Annual Meeting of the American Society of Animal Science.

J.F. Amend, M.M. Beck, and W.W. Stroup. 1983. Physiological Responses to Electroimmobilization in Weaning Beef Calves. Abstracts of the 64th Annual Meeting of the Conference of Research Workers in Animal Disease.

W.W. Stroup, M.K. Nielsen, and J.A. Gosey. 1984. "Cyclic Variation in Cattle Feed Data: Characterization and Implications for experimental design." 1984 Abstracts: 76th Annual Meeting of the American Society of Animal Science.

**W.W. Stroup, S.S. Waller, R.N. Gates.** 1984. "Selection of Appropriate Experimental Design for Pasture Improvement Programs." 1984 Abstracts: International Society for Range Management.

**S. Schuckert, J. Stubbendieck, S.S. Waller, and W.W. Stroup.** 1984. "An Evaluation of Seeding Mixtures and Rates Used to Investigate an Abandoned Center Pivot Irrigation Site." 1984 Abstracts: International Society for Range Management.

**E. Kocher, J. Stubbendieck, S.S. Waller, S.R. Lowry, and W. W. Stroup.** 1984. "Broadcasting Coated Seeds to Revegetate Abandoned Center Pivot Sites." 1984 Abstracts: International Society for Range Management.

**G.A. Riggs, W.W. Stroup, and J.R. Brandle.** 1984. "A Non-destructive Method for Estimation of Needle Surface Area in Pine Seedlings." 1984 Abstracts: Nebraska Academy of Sciences.

**B.A. Holm, R. J. Johnson, D.D. Jensen, and W.W. Stroup.** 1985. "Deer Mouse response to repellents applied to seed corn." 1985 Abstracts: Nebraska Academy of Sciences.

**W.W. Wilhelm, J.S. Schepers, L.N. Mielke, J.W. Doran, J.R. Ellis, and W.W. Stroup.** 1985. "Dryland maize development and yield resulting from tillage and nitrogen fertilization practices." Abstracts - 10th Conference of the International Soil Tillage Research Organization.

**B.C. Hansen, A. J. Lewis, E.R. Peo, and W.W. Stroup.** 1986. "Effect of dietary protein levels on performance and carcass measurements of growing swine." 19th Annual Meeting of the Midwestern Section of the American Society of Animal Science.

**M.A. Worrell, D.C. Clanton, W.W. Stroup, and J.J. Nichols,** 1985. "Effect of Harvest Data on Grass Hay Quality. I." 1985 Abstracts, American Society of Animal Science.

**M.A. Worrell, D.C. Clanton, W.W. Stroup, and J.T. Nichols.** 1985. "Effect of Harvest Date on Grass Hay Quality. II. Particle Size Disappearance from the Rumen of Growing Cattle." 1985 Abstracts, American Society of Animal Science.

**W.W. Stroup.** 1985. "Computers, Time Series, and Animal Behavior." 1985 Abstracts: Joint Statistical Meetings, American Society of Animal Science.

**W.W. Stroup.** 1987. "Comparison of Designs and estimators for Two-way cross-classified mixed models without interaction." 1987 Abstracts: Joint Statistical Meetings, American Statistical Association.

**J.T. Smith, D.A. Zahn, D. Boroto, W.W. Stroup, and S.S. Stinnett.** 1987. "Improving the Effectiveness of Statistical Consultants: A Live Demonstration." 1987 Abstracts: Joint

Statistical Meetings, American Statistical Association.

W.W. Stroup, and E.T. Paparozzi. 1990. "Statistical Procedures to Improve Efficiency and Effectiveness of Complex Plant Nutrition Experiments." Proceedings XXIII International Horticultural Congress.

E.T. Paparozzi, M.A. McVey, D.E. McCallister, M.E. Conley, and W.W. Stroup. 1990. Effect of varying the nitrogen sulfur ration on the physiology of cut roses. Proceedings XXIII International Horticultural Congress.

W.W. Stroup, D. Hadarbach, and D.B. Marx. 1991. "Alternatives to Nearest Neighbor Adjustment using Mixed Models and Geostatistics for Experiments with Spatial Variability." 1991 Proceeding: ENAR Biometric Society Meetings.

W.W. Stroup, P.S. Baenziger, and D.K. Multize. 1991. "A Comparison of Methods to Account for Spatial Variability in Wheat Yield Data." 1991 Proceedings: Agronomy Society of America.

S.A. Rodriguez-Herra, B.E. Johnson, and W.W. Stroup. 1991. "Effect of Plant Population Density on Brachytic Maize." 1991 Proceedings: Agronomy Society of America.

E. Larson, W. Stroup, R. Stock, C. Parrott, R. Britton, and S. Laudert. 1991. "Monensin and Feedlot Intake Variation." 1991 Proceedings: Midwest Section, American Society of Animal Science.

G.F. Louis, A.J. Lewis, P.M. Ermer, W.W. Stroup, W.C. Weldon, and P.S. Miller. 1992. Effect of energy and protein intakes on boar libido and semen characteristics. 1992 Proceedings of the Midwestern Section of the Animal Science Society of America.

**Other Publications:**

W.W. Stroup, J.W. Evans, R.L Anderson, 1978. "Maximum Likelihood Estimation of Variance Components for the Balanced Incomplete Block." University of Kentucky, Department of Statistics, Technical Report #138.

M.P. Ruhrdanz, A.M Parkhurst, W. W. Stroup, and I Mohebalian, 1983. STATAN Reference Guide.

B. Holm, R. J. Johnson, and W.W. Stroup. 1984. "Thiram and Methiocarb for Controlling Deer Mice in Conservation Tillage Fields." Final Report for the National Agricultural Pesticide Impact Assessment Program.

W.W. Stroup. 1987. "A comparison of designs and estimation procedures for the two-way cross-classification mixed model without interaction." In review.

W.W. Stroup, P.E. Hildebrand, C.A. Francis, 1991. "Farmer participation to improve the effectiveness of farming systems research." University of Florida Department of Food and Resource Economics Staff Paper.

W.W. Stroup. 1991. Statistical considerations for on-farm research. Videotape. First presented at Farming Systems Workshop, Michigan State University, October, 1991. Several "reprint" requests already.

**Invited Papers:**

August, 1985. Special session entitled "Recent Advances in Agricultural Statistics" at national meeting of the American Statistical Association. "Computers, Time Series, and Animal Behavior."

February, 1986. Colloquium - "Statistical aspects of cyclic variation in animal feeding behavior," given the departments of Experimental Statistics and Animal Science at Louisiana State University, Baton Rouge, LA.

March, 1988. Colloquium - "Use of Mixed Model Procedures to analysis a class of experiments with Spatial Correlation." Department of Statistics, University of Tennessee-Knoxville.

April, 1988. "A unified approach to Mixed Model Procedures." Keynote talk for Kansas-W. Missouri and mid Missouri combined ASA chapter meetings.

August, 1988. Joint statistical meetings of the American Statistical Association. "A Unified Approach to Mixed Linear Models." New Orleans, LA.

November, 1988. Colloquium - "Use of Mixed Model Procedure in Experiments with Spatial Effects (with some examples from the MIAC/Morocco Aridoculture Center)." Kansas State University, Manhattan, KS.

October, 1989. "Nearest neighbor adjusted best linear unbiased prediction." Featured talk at South Carolina chapter ASA meetings, Clemson, SC.

March, 1992. "Spatial variability methods for agronomic field trials - some experiences." Biometric Society East North American Region annual meetings.

May, 1992. "Mixed model methods for multi-location trials." 15th annual Midwest Biopharmaceutical Workshop.

**Contributed Papers:**

March, 1980. East North American Region Biometrics Society Meetings. "A comparison of designs for estimating variance components in a two-way classification design."

February, 1981. International Range Management Society Meetings. "Multivariate Statistical Methods for Evaluating Changes in Botanical Composition."

February, 1982. SAS User's Group International Meetings. "Use of SAS to analyze experiments conducted over time with multivariate responses and auto-correlated errors."

August, 1983. National Meetings of the American Statistical Association. "Use of rank transformations to analyze split-plot experiments."

February, 1984. International Meetings of the Society for Range Management. "Selection of Appropriate Experimental Designs for Pasture Improvement Research."

August 1987. National Meetings of American Statistical Association: "A comparison of designs and estimators for the two-way cross-classified mixed model without interaction."

August, 1987. National Meetings of American Statistical Association: "Improving the Effectiveness of Statistical Consultants: A Live Demonstration."

November, 1987. National meetings of American Society of Horticultural Sciences: co-coordinated a colloquium to update horticultural researchers on recent advances in statistical design, analysis and computing.

July, 1989. Annual meetings of University Statisticians of Southern Experiment Stations. "Best linear unbiased prediction in field experiments using nearest neighbor methods. Orlando, FL.

April, 1990. Conference on Applied Statistics in Agriculture. "Nearest neighbor adjusted best linear unbiased prediction in agricultural experimentation." Manhattan, KS.

August, 1990. International Horticultural Congress. "Statistical methods to improve the efficiency and effectiveness of complex plant nutrition experiments." Firenze, ITALY.

March, 1991. "Alternative to Nearest Neighbor Adjustments using Mixed Models and Geostatistics for Experiments with Spatial Variability." 1991 ENAR Biometric Society Meetings, Houston, TX.

October, 1991. "A Comparison of Methods to Account for Spatial Variability in Wheat Yield Data." 1991 Agronomy Society of America National Meetings, Denver, CO.

**Proceedings:**

M. McDonnell, T. Klopenstein, W.W. Stroup. 1981. "Soybeans Compared to Corn as an Energy Source of Ruminants." Proceedings: Annual Meeting of the American Society of Animal Science.

W.W. Stroup, 1982. "Use of SAS to Analyze Experiments Conducted Over Time With Multivariate Responses and Autocorrelated Errors." Proceedings of the SAS Users Group International.

A.A. Myer, J.F. Amend, L.R. Freeland, F.M. Mallon, and W.W. Stroup. 1983. "Cardiomyopathy in Domestic Ponies Exposed to Oral Doses of Imophore Monensin Sodium." 1983 Proceedings of Federation of Amer. Soc. for Exp. Biology.

W.W. Stroup and A.M. Parkhurst. 1983. "Use of Rank Transformations to Analyze Split-Plot Experiments." 1983 Proceedings: Joint Statistical Meetings, American Statistical Association.

A.M. Parkhurst and W.W. Stroup. 1983. "Multidimensional Scaling: Potential for Applications on Ecological studies." 1983 Proceedings: Joint Statistical Meetings, American Statistical Association.

W.W. Stroup, R.A. McLean, and W.L. Sanders. 1988. A unified approach to mixed linear models. American Statistical Association 1988 Proceedings of the Statistical Computing Section, pp. 33-40.

**International Activities:**

**Workshops presented:**

September, 1986, Settat, Morocco. Introduction to the statistical methods using SYSTAT computing software. Special emphasis on types of data analysis needed at Aridoculture Center of the MIAC/Morocco Dryland Agriculture Project.

December, 1987. Settat, Morocco. Design and analysis of experiments for dryland research.

December, 1987. Settat, Morocco. Statistical considerations for publishing research results.

October, 1988. Settat, Morocco. Introduction to statistical analysis using PC/SAS.

May, 1989. Settat, Morocco. Advanced topics in statistical analysis using PC/SAS.

August, 1989. Niamey, Niger. Introduction to data management and statistical analysis using PC/SAS. Particular emphasis on the needs of the Niger-American Agricultural Research Project, a joint project of INRAN (Niger agricultural research ministry), Purdue University, and institutions associated with Purdue.

August, 1989. Vienna, Austria. Recent advanced in statistical analysis of field trials with nearest-neighbor effects. With plant breeding group at Agricultural University of Vienna.

June, 1990. Settat, Morocco. Design and analysis of agricultural experiments - with special attention to 1) on-farm trials for farming system research, and 2) experiments with spatial variability (not satisfactorily handled by "conventional methods")

August, 1990. Niamey, Niger. Design and analysis of agricultural experiments - special emphasis on research planning, use of statistical graphics via computer, multi-location experiments, designs for regression (fertilizer, irrigation, etc. experiments).

August, 1992 Bujumbar, Burundi. Design and analysis of agricultural experiments; emphasis on basic biometrical concepts, analysis using SYSTAT, on-farm trials, long-term experiments.

## Linda J. (Willson) Young

## **Curriculum Vita**

**Address:** Home: 2421 South 78th Street Lincoln, NE 68506 402.483.2392      Work: Department of Biometry University of Nebraska 103 Miller Hall Lincoln, NE 68583-0712 402.472.2903

## **Education:**

B.S.	1974	West Texas State University	Mathematics
M.S.	1976	West Texas State University	Mathematics
Ph.D.	1981	Oklahoma State University	Statistics

#### **Professional Experience:**

Teaching Assistant	Oklahoma State University	1977-1980
Graduate Research Assistant	Oklahoma State University Department of Entomology	Summer 1978-79
Graduate Research Assistant	Oklahoma State University Agricultural Experiment Station	1980-1981
Assistant Professor	Oklahoma State University Department of Statistics	1981-1985
University Summer Faculty	Sandia National Laboratories Statistics, Computing & Human Factors Division 7223 Albuquerque, NM	1989
Associate Professor	Oklahoma State University Department of Statistics	1985-1990
Associate Professor	University of Nebraska Department of Biometry	1990-Present

**National Science Foundation Conferences:**

Sequential Analysis, Oklahoma State University, Summer, 1980.  
Second Order Asymptotics in Statistics, University of Oregon, Summer, 1982.  
Mathematical Stochastics of Species Abundance and Community Composition, Oklahoma State University, Spring, 1986.

**Professional Societies:**

American Statistical Association  
Biometrics Society  
Entomological Society of America  
Institute of Mathematical Statistics  
International Society of Ecological Modeling  
The Society of Population Ecology

**Honors:**

Phi Kappa Phi  
Sigma Xi  
Carl Marshall Award for Outstanding Ph.D. Graduate, Oklahoma State University, 1981.

**Formal Courses Taught at Oklahoma State University:**

STAT 4013 - Statistical Methods I  
STAT 4023 - Statistical Methods II  
STAT 4113 - Introduction to Probability Theory  
STAT 4203 - Mathematical Statistics I  
STAT 4213 - Mathematical Statistics II  
STAT 4223 - Statistical Inference  
STAT 5013 - Statistics for Experimenters I  
STAT 5023 - Statistics for Experimenters II  
STAT 5133 - Stochastic Processes  
STAT 5513 - Multivariate Analysis  
STAT 5053 - Time Series Analysis  
STAT 5063 - Multivariate Methods

**Formal Courses Taught at University of Nebraska-Lincoln**

BIOM 802 - Experimental Design  
BIOM 896 - Statistical Ecology  
BIOM 896 - Loglinear Models for Categorical Data  
BIOM 970 - Linear Models

**Grants Received:**

Cotton, Inc., Research Grant, Coop Agreement 82-853, 1982. (Jointly with Jerry H. Young and Laval Verhalen).

Dean's Support Grant, College of Arts and Sciences, Oklahoma State University, 1982-1983.

Dean's Support Grant, College of Arts and Sciences, Oklahoma State University, 1984-1985.

National Science Foundation, Mathematical Sciences: NSF/CMBS Regional Conference in Mathematical Stochastics of Species Abundance & Community Composition, Stillwater, OK, March 17-21, 1986. Grant No. DMS-5803714.

Dean's Incentive Grant for Advanced Faculty, College of Arts and Sciences, Oklahoma State University, 1986-1987.

National Science foundation, Mathematical Sciences: Planning Grant for Inferences Concerning the Means of Negative Binomial Populations, July, 1988-December, 1989.

Dean's Phase II Incentive Grant, College of Arts and Sciences, Oklahoma State University, 1988-1989.

Mid-America State Universities Association: Workshop on Population Dynamics (Jointly with Jerry H. Young), Stillwater, OK, October 27-28, 1988.

Research Council Travel Grant, University of Nebraska, 1992.

Research Council Distinguished Lecturer Grant, University of Nebraska, 1992.

**Proposals Submitted:**

Mortensen, David A., Linda J. Young, Gregg A. Johnson, and Navin K. Sinha. Weed Distributions: A Diagnostic for Evaluating Preventive Weed Management Systems. NC-IPM Proposal for \$109,503.

**Special Travel:**

Visited Mexican research stations located near Rio Bravo, Tampico, Tapachula, and USDA stations in Brownsville and Weslaco, TX, July 10-19, 1983. Support provided by International Programs, Oklahoma State University.

Team-taught a class in experimental design to ISABU researchers in Bujumbura, Burundi, January 25-February 2, 1993. Also consulted with ISABU researchers and visited a coffee factory and the coffee laboratory during work on one of the consulting problems related to quality control. Support provided by USAID.

**Special Meetings:**

Invited Contributor to the Round Table Discussion on Sampling biological populations, environmental monitoring and field testing. Frontiers of Statistical Ecology Program, August 15, 1986. Syracuse, NY.

Invited Participant in the Panel Discussion on new research perspectives of statistical ecology and environmental statistics. Frontiers of Statistical Ecology Program, August 15, 1986, Syracuse, NY.

Invited Participant in Workshop on Pathways to the Future, 1988. Prior to Annual Meeting of the Institute of mathematical Statistics, Fort Collins, CO, August 13-14.

Leader of Round Table Discussion on How Do Chapters Function on a Tight Budget? Chapter officers Workshop and Reception, August 12, 1993, Boston, MA.

**Conferences and Workshops Organized:**

National Science Foundation - Conference Board of Mathematical Sciences Regional Research Conference in Mathematical Stochastics of Species Abundance and Community Composition. Stillwater, OK, March 17-21, 1986.

Mid-America State Universities Association: Workshop on Population Dynamics (Jointly with Jerry H. Young), Stillwater, OK, October 27-28, 1988.

NCR-70 Committee Technical Meeting on Agricultural Statistics, Lincoln, NE, July 8-9, 1992.

**Contributed Papers Presented at Professional Meetings:**

Willson, L.J. and J.H. Young, 1982. The natural distribution of insects in agroecosystems. 1982 National Convention of the Entomological Society of America and the spring meeting of the Mid-Missouri Chapter of the American Statistical Association in 1983.

Willson, L.J. and J.H. Young, 1984. The methods and problems associated with insect sampling in agroecosystems. Southwestern Branch Meeting of Entomological Society of America. February 13-15, Oklahoma City, Oklahoma.

Young, J.H. and L.J. Willson, 1984. Use of handheld calculators in cotton IPM programs. Southwestern Branch Meeting of Entomological Society of America. February 13-15, Oklahoma City, Oklahoma.

Strabala, M.A., L.J. Willson and J.H. Young, 1984. A new approach to analysis of variance for entomological data. Southwestern Branch Meeting of Entomological Society of America. February 13-15, Oklahoma City, OK.

Willson, L. and J.H. Young, 1984. Problems with sampling discrete distributions for insects. North Central Branch meeting of Entomological Society of America. March 26-28, Wichita, KS.

Young, J.H. and L.J. Willson, 1984. Insect distributions. North Central Branch Meeting of Entomological Society of America. March 26-28, Wichita, KS.

Young, J.H. and L.J. Willson, 1984. Modeling restriction on insect populations. Annual Meeting of the Entomological Society of America. December 9-13, San Antonio, TX.

Vargas-Camplis, J., J.H. Young and L.J. Willson, 1984. Predicted emergence of overwintering bollworms under two different environments. Annual Meeting of Entomological Society of America. December 9-13, San Antonio, TX.

Willson, L.J. and J.H. Young, 1985. Statistical models in entomology. Joint meeting of the Kansas-Western Missouri and Oklahoma Chapters of the American Statistical Association, March, Wichita, KS.

Willson, L.J. and J.H. Young, 1986. The distribution of arthropods in agroecosystems: Insights provided by Bose-Einstein statistics. NSF/CBMS Regional Conference on Mathematical Stochastics of Species Abundance and Community Composition. March 17-21, Stillwater, OK.

Ashraf M., R.C. Berberet and L.J. Willson, 1986. Sampling for the blue alfalfa aphid: Spatial patterns and statistical parameters. North American Alfalfa Improvement Conference. July 27-31, Stillwater, OK.

Young, J.H., and L.J. Willson, 1986. Bose-Einstein statistics as a model for stabilization of disrupted arthropod populations. Annual Meeting of the International Society of Ecological Modeling. August 10-16, Syracuse, NY.

Willson, L.J. and J.H. Young, 1986. A model of the dynamics of arthropod movement toward equilibrium. Annual Meeting of the International Society of Ecological Modeling. August 10-16, Syracuse, NY.

Stark, J. Alan, Linda J. Willson and Jerry H. Young, 1986. Relationships of insect interactions with Bose-Einstein and Maxwell-Boltzmann statistics. Annual Meeting of Entomological Society of America. December 7-11, Reno, NV.

Berberet, R.C. and L.J. Willson, 1986. Probabilities for encapsulation of *Bathyplectes curculionis* eggs by *Hypera postica* larvae in field populations. Annual Meeting of Entomological Society of America. December 7-11, Reno, NV.

Young, Jerry H., Linda J. Willson and J. Alan Stark, 1986. Mechanics of model development using insect interaction within agroecosystems. Annual Meeting of Entomological Society of America. December 7-11, Reno, NV.

Willson, Linda J., Jerry H. Young, and J. Alan Stark, 1986. The effect of interaction on insect movement and distribution within agroecosystems. Annual Meeting of Entomological Society of America. December 7-11, Reno, NV.

Ha, Sam Bong, Laval M. Verhalen, Jerry H. Young and Linda J. Willson, 1987. Effects of selected morphological traits in cotton on natural infestations of the cotton fleahopper and bollworm. 1987 Beltwide Cotton Production Research Conferences. January 4-8, Dallas, TX.

Young, Jerry H., Linda J. Willson and J. Alan Stark, 1987. The effects of disruption on cotton insect spatial patterns. 1987 Beltwide Cotton Production Research Conferences. January 4-8, Dallas, TX.

Willson, Linda J., Jerry H. Young, and J. Alan Stark, 1987. A model of the dynamics of arthropod movement toward equilibrium. 1987 Beltwide Cotton Production Research Conferences. January 4-8, Dallas, TX.

Stark, J. Alan, Jerry H. Young and Linda J. Willson, 1987. Modeling cotton insect movement. 1987 Beltwide Cotton Production Research Conferences. January 4-8, Dallas, TX.

Young, Jerry H., Linda J. Willson, and Getta Gudavall, 1987. An expert system for cotton insects in southwestern Oklahoma. Southwestern Branch Meeting of Entomological Society of America. February 9-11, Austin, TX.

Willson, Linda J., Jerry H. Young and J. Alan Stark, 1987. A model of arthropod movement based on Bose-Einstein Statistics. Spring Meeting of the Biometrics Society. March 22-25, Dallas, TX.

Young, J.H., Linda J. Willson, and J. Alan Stark, 1987. A computer model of arthropod movement. Spring Meeting of the Biometrics Society. March 22-25, Dallas, TX.

Rezay-Garacani, Taghi, Linda J. Willson, and J.H. Young, 1987. A Monte-Carlo study of multiple comparison procedures applied to discrete data. Spring Meeting of the Biometrics Society. March 22-25, Dallas, TX.

Chae, S.S., Linda J. Willson, and J.H. Young, 1987. Sequential hypothesis testing for the mean of a negative binomial distribution, Spring Meeting of the Biometrics Society. March 22-25, Dallas, TX.

Nagardeolekar, Madhuri S., Linda J. Willson and J.H. Young, 1987. A sequential test for population means from two negative binomial distributions with a common k. Spring Meeting of the Biometrics Society. March 22-25, Dallas, TX.

Payton, Mark E., Linda J. Willson, and J.H. Young, 1987. Bounds for the difference between mean and median of the beta and negative binomial distribution. Spring Meeting of the Biometrics Society. March 22-25, Dallas, TX.

Willson, Linda J. and J.H. Young, 1987. Modeling the movement of arthropods within agroecosystems using interacting Markov chains. Annual Meeting of the American Statistical Association. August 17-20, San Francisco, CA.

Young, Linda J. and Jerry H. Young, 1988. The effects of insecticides on the spatial distribution of cotton insects. Beltwide Cotton Production Research Conferences. January 3-8, New Orleans, LA.

Young, Linda J. and J.H. Young, 1988. Insect movement and density estimation within agroecosystems, Symposium-Workshop on Estimation and Analysis of Insect Populations. January 25-29, Laramie, WY.

Nagardeolekar, Madhuri S., Linda J. Young, and J.H. Young, 1988. A fixed sample size procedure for selecting the best negative binomial population. Joint Statistical Meetings, August 22-25, New Orleans, LA.

Payton, Mark E., Linda J. Young, and J.H. Young, 1988. An urn model for sexual attraction of insects in agroecosystems. Joint Statistical Meetings, August 22-25, New Orleans, LA.

Young, Linda J. and Jerry H. Young, 1988. Inference concerning the mean of a negative binomial population. Joint Statistical Meetings. August 22-25, New Orleans, LA.

Young, Linda J. and Jerry H. Young, 1989. The 2-SPRT as an alternative to Wald's SPRT when testing hypotheses concerning insect populations. Conference on Applied Statistics in Agriculture. May 1-2, Manhattan, KS.

Young, Linda J., Jerry H. Young and Mark E. Payton, 1989. A model of insect sexual preference based on an extension of Polya's Urn model. Joint Statistical Meetings. August 6-10, Washington, D.C.

Seebeck, Katherine, Linda J. Young, and Jerry H. Young, 1989. A computing program to develop and evaluate an SPRT for three discrete distributions. Joint Statistical Meetings. August 6-10, Washington, D.C.

Nagardeolekar, Madhuri S., Linda J. Young, and Jerry H. Young, 1989. An approximate Kiefer-Weiss solution for the negative binomial distribution. Joint Statistical Meetings. August 6-10, Washington, D.C.

Payton, Mark E., Linda J. Young and Jerry H. Young, 1989. An analysis of sequential sampling from discrete distributions with more than two alternative hypotheses. Joint Statistical Meetings. August 6-10, Washington, D.C.

Young, Linda J. and Jerry H. Young, 1990. A spatial view of the negative binomial parameter k when describing insect populations. Kansas State University Conference on Applied Statistics in Agriculture. April 29-May 1, Manhattan, KS.

Young, Linda J. and Robert G. Easterling, 1990. Estimation of extreme percentiles based on sensitivity tests. Joint Statistical Meetings. August 6-9, Anaheim, CA.

Young, Linda J., Gerald R. Bodman, Eugene C. Boilesen, and Walter W. Stroup, 1990. A statistical analysis of the performance of milking system vacuum regulators. Kansas State University Conference on Applied Statistics in Agriculture. April 28 - April 30, Manhattan, KS.

Payton, Mark E., Linda J. Young, and J.P. Chandler. 1991. An examination of sequential tests between three hypotheses. Joint Statistical Meetings. August 18-22, Atlanta, GA.

Payton, Mark E. and Linda J. Young. 1992. A sequential procedure to test three values of a binomial proportion. Joint Statistical Meetings. August 9-13, Boston, MA.

Young, Linda J. and Jerry H. Young. 1992. An interacting particle system as a model of insect movement. Joint Statistical Meetings. August 9-13, Boston, MA.

#### **Invited Papers:**

Willson, Linda J. and J.H. Young, 1984. Insect distribution: A critical element in the choice of sampling methods for insects. Annual Meeting of Entomological Society of America. December 9-13, San Antonio, TX.

Willson, L.J. and J.H. Young, 1985. Bose-Einstein statistics applied to the study of insect distribution. Annual Meeting of University Statisticians at South Experiment Stations. August 1, Stillwater, OK.

Willson, L.J., J.H. Young and Be-Ny Wu, 1985. A comparison of five goodness-of-fit tests. Annual Meeting of University Statisticians at Southern Experiment Stations. August 1, Stillwater, OK.

Young, J.H. and L.J. Willson, 1985. The use of Bose-Einstein statistics in population dynamics models of arthropods. Annual Meeting of the International Society of Ecological Modeling. August 11-15, Gainesville, FL.

Willson, L.J. and J.H. Young, 1985. Some examples of weighted distributions in entomological studies. Advanced Research Conference on Weighted Distributions and Related Methods. November 9-13, University Park, PA.

Willson, L.J. and J.H. Young, 1986. Distributions of insects in agroecosystems. Annual SRCOS/ASA Summer Research Conference. June 16-20, Mobile, AL.

Young, L.J. and J.H. Young, 1988. The application of urn models to the study of insect distribution. Statistics Symposium at the University of Missouri-Columbia. November 15, Columbia, Missouri.

Young, Linda J. and Jerry H. Young, 1989. The case for and against statistical hypothesis testing. North Central Branch Meeting of Entomological Society of America. March 12-15, Indianapolis, IN.

Young, Linda J. and Jerry H. Young, 1990. Is there any such thing as randomness? Symposium on Chaos in Biological and Agricultural Systems: The Statistical Issues. June 3-6, Lincoln, NE.

Young, Linda J. and Jerry H. Young, 1991. New approaches in insect dispersal models compared to classical approaches. Joint Statistical Meetings. August 18-22, Atlanta, GA.

#### Refereed Publications:

Willson, Linda J. and Leroy Folks, 1983. Sequential estimation of the mean of the negative binomial distribution. Sequential Analysis 2:55-70.

Willson, L.J. and J.H. Young, 1983. Sequential estimation of insect population densities with a fixed coefficient of variation. Environmental Entomology 12:669-672.

Willson, L.J., J.L. Folks, and J.H. Young, 1984. Multistage estimation compared with fixed sample size estimation of the negative binomial distribution. Biometrics 40:109-117.

Young, J.H. and L.J. Willson, 1984. A model to predict damage reduction to flower buds or fruit by *Heliothis spp.* in the absence or presence of two Coleoptera predators. The Southwestern Entomologist 9:33-38.

King, J.E., R.G. Price, J.H. Young, L.J. Willson and K.N. Pinkston, 1985. Influence of temperature on development and survival of the elm leaf beetle *Pyrrhalta luteola* (Muller). Environmental Entomology 14:272-274.

Willson, Linda J., J. Leroy Folks and Jerry H. Young, 1986. Complete sufficiency and maximum likelihood estimation for the two-parameter negative binomial distribution. Metrika 33:349-362.

Mshiu, E.P., J.H. Young, L.J. Willson and K.S. Mussett, 1987. Resistance of cotton varieties to *Heliothis zea* (Lepidoptera: Noctuidae). Southwestern Entomology 12:183-189.

Young, J.H. and Linda J. Willson, 1987. The use of Bose-Einstein statistics in population dynamics models of arthropods. Ecological Modeling 37:456-467.

Willson, Linda J., J.H. Young, and J. Leroy Folks, 1987. A biological application of Bose-Einstein statistics. Communications in Statistics 16:445-459.

Berberet, R.C., L.J. Willson and M. Odejar, 1987. Probabilities for encapsulation of eggs of *Bathyplectes curculionis* (Hymenoptera: Ichneumonidae) by larvae of *Hyper postica* (Coleoptera: Curculionidae) and resulting reduction in effective parasitism. Annals of the Entomological Society 80:483-485.

Young, Linda J. and J.H. Young, 1989. A model of arthropod movement in agroecosystems. Lecture Notes in Statistics: Estimation and Analysis of Insect Populations 55:378-386.

Payton, Mark E., Linda J. Young, and Jerry H. Young, 1989. Bounds for the difference between median and mean of beta and negative binomial distributions. Metrika 36:347-354.

Goh, K.S., R.C. Berberet, L.J. Young and K.E. Conway, 1989. Mortality of *Hyper postica* (Coleoptera: Curculionidae) in Oklahoma caused by *Erynia phytonomi*(Arthur) (Zygomycetes: Entomophthorales). Environmental Entomology 18:964-969.

Goh, K.S., R.C. Berberet, L. J. Young and K.E. Conway, 1989. Mortality of the parasite *Bathyplectes curculionis* (Hymenoptera: Ichneumonidae) during epizootics of *Erynia phytonomi* (Zygomycetes: Entomophthorales) in the alfalfa weevil. Environmental Entomology 18:1131-1135.

Young, Linda J. and Jerry H. Young, 1990. The 2-SPRT as an alternative to Wald's SPRT when testing hypotheses concerning insect populations. Proceedings of the 1989 Kansas State University Conference on Applied Statistics in Agriculture: 116-124.

Young, Linda J. and Jerry H. Young, 1990. A spatial view of the negative binomial parameter k when describing insect populations. Applied Statistics in Agriculture 2:13-20.

Ashraf, M., R.C. Berberet, and L.J. Young, 1990. Time-specific life tables for blue alfalfa aphid, *Acyrthosiphon kondoi* Shinji, (Homoptera: Aphididae) in Oklahoma. Environmental Entomology. In Press.

Mulekar, Madhuri S., Linda J. Young, 1991. Approximations for a fixed sample size selection procedure for negative binomial populations. Communications in Statistics 20:1767-1776.

Young, Linda J. and Jerry H. Young, 1991. Alternative view of statistical hypothesis testing. Environmental Entomology 20:1241-1245.

Mulekar, Madhuri S., Linda J. Young and Jerry H. Young, 1992. Using an approximate Kiefer-Weiss solution for testing insect population densities. Metrika 39:219-226.

Mulekar, Madhuri S. and Linda J. Young, 1993. A fixed sample size selection procedure for negative binomial populations. Metrika 40:25-35.

Mulekar, Madhuri S., Linda J. Young and Jerry H. Young, 1993. Introduction of 2-SPRT for testing insect population densities. Environmental Entomology 22:346-351.

Cahoon, Joel, William Kranz, Normon Klocke, and Linda Young. 1993. Furrow irrigators response to in-season precipitation and geographic characteristics. Agricultural Water Management 23:41-49.

Payton, Mark E., Linda J. Young, and J.P Chandler, 1993. Using SAS to solve a system of non-linear equations. Journal of Statistical Computation and Simulation. In Press.

Young, Linda J. and Robert G. Easterling, 1992. Estimation of extreme percentiles based on sensitivity tests. Technometrics. In Press.

Young, Linda J. and Jerry H. Young. 1993. Statistics with agricultural pests and environmental impacts. Invited Chapter in Handbook of Statistics Volume 12: Environmental Statistics. In Press.

Spomer, Stephen M., Timothy T. Orwig, Leon G. Higley, Gerald L. Selby, and Linda J. young. 1993. Clinal variation of *Hesperia leonardus* Harris (Hesperiidae) subspecies in the Loess Hills. Environmental Entomology. In Press.

#### Papers Under Review:

Mulekar, Madhuri S. and Linda J. Young, 1992. A fixed sample size selection procedure for negative binomial populations with two distance measures. Submitted to Journal of Japan Statistical Society.

Young, Linda J. and Jerry H. Young, 1992. Is there any such thing as randomness? Submitted to Proceedings of Symposium on Chaos in Biological and Agricultural Systems: The Statistical Issues.

Payton, Mark E. and Linda J. Young, 1992. A sequential procedure for deciding among three hypothesis. Submitted to Statistics and Decisions.

Young, Linda J. 1993. Computation of some exact properties of Wald's SPRT when sampling from a class of discrete distributions. Submitted to Biometrical Journal.

Siegfried, Blair D. and Linda J. Young, 1993. Activity of detoxification enzymes in non-target aquatic terrestrial insects. Submitted to Environmental Entomology.

Young, Linda J., Mark E. Payton, and Jerry H. Young. A model of insect sexual preference based on an extension of Polya's urn model. Submitted to Journal of Applied Probability.

**Papers Under Preparation:**

Rezay-Garacani, Taghi, Linda J. Young and J.H. Young. A Monte-Carlo study of multiple comparison procedures applied to discrete data. To be submitted to Communications in Statistics.

Young, Linda J. and Robert G. Easterling. Estimation of extreme percentiles based on sensitivity tests. To be submitted to Technometrics.

Nagardeolekar, Madhuri S. and Linda J. Young. Approximations for a fixed sample size selection procedure for negative binomial populations. To be submitted to Communications in Statistics.

Payton, Mark E., Linda J. Young, and J.H. Young. An exact analysis of sequential sampling from a binomial distribution with three alternative hypotheses. To be submitted to Journal of the Royal Statistical Society, Series B.

Young, J.H. and L.J. Young. Spatial relationships of predator and prey of cotton insects. To be submitted to Entomophaga.

Young, Linda J. and Jerry H. Young. Further considerations in the use of Wald's SPRT. To be submitted to Economic Entomology.

Young, Linda J. and Jerry H. Young. The 2-SPRT: Comparisons with Wald's SPRT. To be submitted to Environmental Entomology.

Young, Linda J., Madhuri S. Mulekar, and Mark E. Payton. Corrections factors needed for the 2-SPRT. To be submitted to Annals of Statistics.

Young, Linda J. and Linda A. Pavlish. Jackknifing and bootstrapping for the negative binomial parameter k. To be submitted to Biometrics.

### **Other Publications:**

Young, J.H., L.J. Willson and M.A. Strabala, 1983. Temperature and its effect on cotton and cotton insects. Research report, Agricultural Experiment Station, Oklahoma State University, Stillwater, OK.

Young, J.H. and L.J. Willson, 1983. Cultural control of *Heliothis spp.* Cropping Systems-Oklahoma. 1983 Southern Cooperative Series Bulletin (subject to peer review).

Young, J.H. and L.J. Willson, 1983. Beneficial insects as control agents of *Heliothis spp.* in Oklahoma. 1983 Souther Cooperative Series Bulletin (subjected to peer review).

Young J.H., Linda Willson and Ken Pinkston, 1983. Sequential sampling for predators in cotton. Current report, Agricultural Experiment Station, Oklahoma State University, Stillwater, OK.

Young, Jerry H., Linda J. Willson, and R.G. Price, 1986. Cotton fleahopper preference of cotton cultivars as oviposition sites. Proceedings of 1986 Beltwide Cotton Production Research Conference: 488-489.

Ha, Sam Bong, Laval M. Verhalen, Jerry H. Young and Linda J. Willson, 1987. Effects of selected morphological traits in cotton in natural infestations on the cotton fleahopper and bollworm. Proceedings of the 1987 Beltwide Cotton Research Conference: 104-105.

Young, Jerry H., Linda J. Willson and J. Alan Stark, 1987. The effects of disruption on cotton insects spatial patterns. Proceedings of the 1987 Beltwide Cotton Research Conference: 281-282.

Stark, J. Alan, Jerry H. Young and Linda J. Willson, 1987. Modeling cotton insect movement. Proceedings of the 1987 Beltwide Cotton Research Conference: 282-284.

Willson, Linda J., Jerry H. Young and J. Alan Stark, 1987. A model of the dynamics of arthropod movement toward equilibrium. Proceedings of the 1987 Beltwide Cotton Research Conference: 284-286.

Young, Linda J. and Jerry H. Young, 1988. The effects of insecticides on the spatial distribution of cotton insects. Proceedings of the 1988 Beltwide Cotton Research Conference.

Seebeck, Katherine, Linda J. Young and Jerry H. Young, 1990. A computing program to develop and evaluate an SPRT for three discrete distributions. Proceedings of Statistical Computing Section of American Statistical Association:116-121.

### **Chapters in Books:**

Young, Linda J. and Jerry H. Young, 1989. A model of arthropod movement in agroecosystems. In Lecture Notes in Statistics: Estimation and Analysis of Insect Populations. L. McDonald, B. Manly, J. Lockwood and J. Logan, Eds. pp. 378-386.

Young, Linda J. and Jerry H. Young. Statistics with agricultural pests and environmental impacts. Invited Chapter in Handbook of Statistics Volume 12: Environmental Statistics. In Press.

### **Books in Preparation:**

Young, Jerry H. and Linda J. Young, Arthropod Population Dynamics. A draft copy of the text has been used at Oklahoma State University during the 1986-1990 Spring semesters. It is currently being revised and will be submitted for publication.

Young, Linda J. and Jerry H. Young, Statistical Ecology. Contracted with Chapman-Hall for a 1995 anticipated publication date.

Biometry Department Faculty. Biological Data Sets with Emphasis on Experimental Design. Contracted with Chapman-Hall for a 1994 anticipated publication date.

### **Service Function:**

#### **Oklahoma State University**

##### **Departmental:**

Undergraduate Advisor, 1981-1985  
Awards Committee, 1981-1987  
Chairman of Awards Committee, Fall 1982; 1983-1986  
Personnel Committee, 1985-1990  
Sponsor of Statistics Club, 1985-1986  
Seminar Coordinator, 1985-1990  
Graduate Committee, 1985-1986; 1988-1990  
Computer Committee, 1988-1990  
Presently supervise one doctoral student

##### **University and Within State:**

Phi Kappa Phi Scholarship Committee, Oklahoma State University, 1982-1983  
University Committee for Academic Use of the Computer Center, Oklahoma State University, 1986-1989. Chair of committee, 1987-1988.  
Phi Kappa Phi Information Officer, Oklahoma State University, 1983-1986.  
College of Arts and Science Honors Committee, Oklahoma State University, 1984-1987.

Chair of Curriculum and Research Committee of Women's Council, Oklahoma State University, 1987-1988.

Vice-President of Women's Council, Oklahoma State University, 1988-1989.

**University of Nebraska:**

**Department of Biometry:**

Seminar Chairman, 1990-1992

Curriculum Committee, 1990-Present

Graduate Committee, 1990-Present

**University:**

Member of Faculty Advisory Council for the College of Agriculture and Natural Resources, University of Nebraska-Lincoln. 1991-1993.

Currently serve on 8 Master's Committees and 6 Ph.D. Committees.

**American Statistical Association:**

Vice-President for Academic Affairs, Oklahoma Chapter of American Statistical Association, 1982.

Secretary/Treasurer, Oklahoma Chapter of American Statistical Association, 1983-1987.

Professional Ethics Committee of the American Statistical Association, 1986-1988.

President-Elect, Oklahoma Chapter of American Statistical Association, 1987-1988.

President, Oklahoma Chapter of American Statistical Association, 1988-1989.

Representative to Council of Chapters, Nebraska Chapter of American Statistical Association, 1991-Present.

Member of the ASA-NCTM Joint Committee on the Curriculum in Statistics and Probability, 1992-94.

Member of American Statistical Association Review Committee for the Environmental Protection Agency's Environmental Monitoring and Assessment Project (EMAP), 1989-1995. Chair of committee for 1989-1990.

Member of American Statistical Association's Technical Advisory Committee for the Environmental Protection Agency's Statistical Consulting Center. (*Because this is a new ASA committee and I am only recently appointed, I do not know the length of service at this time.*)

Member of the Publications Committee of the Statistics and the Environment Section of ASA, 1991-present.

Treasurer of the Statistics and the Environment Section of ASA. 1993.

Organizer and Chair of a Special Session. 1993 Joint Statistical Meetings, San Francisco, CA.

Coordinator of Judging and Judge of the 1993 ASA Project Competition. (*Nebraska chapter has responsibility for the judging in 1993-1994.*)

Work with third graders at Pyrtle Elementary School in Lincoln, NE, as they prepare posters for the 1993 ASA Poster Competition.

**Member and Chair on an ad hoc Committee for Proposing a Journal with Emphasis on Statistical Applications in the Biological Sciences.** The Board of Directors approved the proposal in August, 1992.

**International Biometric Society and Eastern North American Region (ENAR):**

**Member of the Scientific Program Committee for the 1994 International Biometrics Conference.**

**Representative for the ENAR to the Elizabeth Scott Award Committee, 1992.  
Biometrics Section ASA Representative to ENAR for the 1994 Spring Meetings Program Committee.**

**Current Index to Statistics:**

**Contributing Editor to Current Index to Statistics, 1987-present.  
Editorial Collaborator to Current Index to Statistics, 1986.**

**Technical Committee:**

**Nebraska representative to NCR-170, Research Advances in Agricultural Statistics.  
Chair for 1991-92.**

**Reviewer/Referee:**

**Journal articles have been reviewed for the following journals:**

*Biometrics*

*Communications in Statistics, Simulation and Computation*

*The American Statistician*

*Journal of Economic Entomology*

*Canadian Entomologist*

*Ecology*

*Journal of Statistical Computation and Simulation*

*Environmental Entomology*

*Technometrics*

*Statistics and Probability Letters*

**Reviewed National Science Foundation proposals for the Probability and Statistics Program and the Ecosystems Program.**

**Reviewed several books on inference, statistical methods and experimental design.**

**Masters Students Advised:**

Michelle A. Strabala, 1984. Monte Carlo Simulations of the Analysis of Variance for Discrete Data. Oklahoma State University.

Be-Ny Wu, 1985. A Monte Carlo Study of Five Goodness-of-Fit Tests. Oklahoma State University.

Taghi Rezay-Garacani, 1985. A Monte Carlo Study of Multiple Comparison Procedures Applied to Discrete Data. Oklahoma State University.

Maria Ana Ebron Obejar, 1986. Predicting Rates of Parasitism and Encapsulation of *Bathyplectes spp.* in the Alfalfa Weevil. Oklahoma State University.

Michael D. Sinclair, 1986. A New Look at Insect Aggregation in Agroecosystems. Oklahoma State University.

J. Alan Stark, 1987. An Application of Maxwell-Boltzmann and Bose-Einstein Statistics to the Modeling of Insect Distributions. Oklahoma State University.

Mark E. Payton, 1988. Two Problems Concerning Negative Binomial Distribution: Bounds for Mean-Median Difference and Urn Model for Insect Attraction. Oklahoma State University.

Katherine Seebek, 1989. A Computer Program to Develop and Evaluate a Wald's Sequential Probability Ratio Test for the Parameters of Three Discrete Distributions. Oklahoma State University.

Lim Siew Joo, 1989. A Computer Program to Develop and Evaluate a 2-SPRT for the Negative Binomial, Binomial, and Poisson Distributions.

**Ph.D. Students Advised:**

Madhuri S. Nagardeolekar, 1988. Fixed Sample Selection Procedures and Approximate Kiefer-Weiss Solution for Negative Binomial Populations.

Mark E. Payton, 1991. An Examination of Sequential Procedures for the Testing of Three hypotheses. Oklahoma State University.

Table 1  
 Academic Program Review  
 Department of Biometry  
 Average Faculty Salaries and Average Years in Rank  
 By Rank, 1987-88 and 1991-92

RANK	1987-88								
	Biometry			Overall UNL (Includes Library)			Overall UNL (Excludes Library)		
	No. of Faculty	Av. Yrs. in Rank	Ave. Salary	No. of Faculty	Av. Yrs. In Rank	Ave. Salary	No. of Faculty	Av. Yrs. In Rank	Ave. Salary
Professor	2	6.0	34,445	517	10.6	41,310	514	N/A	41,356
Associate	2	6.5	29,828	307	7.0	31,379	291	N/A	31,927
Assistant	1	1.0	22,146	272	3.9	26,975	253	N/A	27,718

RANK	1991-1992								
	Biometry			Overall UNL (Includes Library)			Overall UNL (Excludes Library)		
	No. of Faculty	Av. Yrs. in Rank	Ave. Salary	No. of Faculty	Av. Yrs. In Rank	Ave. Salary	No. of Faculty	Av. Yrs. In Rank	Ave. Salary
Professor	2	2.5	57,298	442	11.1	60,819	438	11.1	61,000
Associate	2	6.5	46,376	332	6.8	44,393	316	6.9	45,073
Assistant	2	1.5	36,050	356	3.3	38,033	336	3.3	38,987

Source: UNL Faculty Salary Study Committee file for above years. Twelve-month salaries have been converted to academic year using .75 as a conversion factor.

The 1987-88 and 1991-92 Faculty Salary Study files exclude Deans and other administrative salaries and include chairpersons. Comparisons between 1987-88 and 1991-92 must be drawn with caution. The following changes were initiated in 1988-89 as a result of the University's conversion to the new MSA accounting system. In addition, some inconsistencies with UNL's AAU comparator group were rectified. Moving to an October 1 reporting date provides a more complete data base than has been used in the past.

#### 1987-88

Includes faculty having .50 or greater FTE, ranked as instructor and above. These are converted to 1.00 FTE.  
 Named Professorship stipends are excluded  
 Salaries are based on July 1 budget

#### 1988-89 to Present

Included faculty having 1.00/greater FTE, ranked as instructor and above.  
 Named Professorship stipends are included.  
 Salaries based on faculty who are active as of October.

**Table 2**  
**Academic Program Review**  
**Department of Biometry**  
**Comparison of Average Faculty Salaries by Rank**  
**With Current Comparator Group**  
**Academic Year 1991-92**

Institution	Professor		Associate		Assistant		Instructor	
	Total Number	Average Salary						
Current Comparator Group	--	--	--	--	--	--	--	--
Univ. of Nebr. Lincoln	2	57,298	2	46,376	2	36,050	--	--
Difference		--		--		--		--
Percent Change Required to Meet the Comparator Group Average.		--		--		--		--

The Faculty Salary Study file includes those have a 1.00 FTE, ranked as instructor and above. Deans and other academic administrative salaries are excluded, departmental chairpersons are included. Regents Professorship stipends are included. All personnel and salaries are taken from the October 1 personnel data tape. Note: The ten comparator institutions are: University of Minnesota, Purdue University, University of Missouri, Ohio State University, University of Illinois, Iowa State University, University of Iowa, Colorado State University, University of Colorado, and University of Kansas.

Source: AAU Data Exchange, 1991-92, and UNL October 1, 1991 Personnel Data Tape.

**Table 3A**  
**Academic Program Review**  
**Department of Biometry**  
**Budgeted FTE Teaching Staff**  
**1988-89 To 1992-93**

Personnel Category	1988-89	1989-90	1990-91	1991-92	1992-93	% Change from 88-89 to 92-93	% Change from 91-92 to 92-93
Faculty	2.20	2.45	2.55	2.10	2.45	11.36	16.67
Other A-Line	0.30	0.30	0.30	0.30	0.30	0.00	0.00
Managerial/ Professional	--	--	--	--	--	--	--
Clerical/Tech/Service	1.00	1.00	1.00	1.00	0.00	0.00	0.00
Graduate Assistant	0.70	0.70	0.70	1.20	2.70	0.00	0.00
Other hourly	0.24	0.24	0.24	0.24	0.00	0.00	0.00
<b>TOTAL FTE STAFF</b>	<b>4.44</b>	<b>4.69</b>	<b>4.79</b>	<b>5.34</b>	<b>6.69</b>	<b>5.63</b>	<b>8.06</b>

Source:UNL General Operating Budget for above years as of July 1. It includes unfilled lines and thus not all FTE budgeted are available for instruction. This table includes only account LGE/61-237-01.

**Table 3B**  
**Academic Program Review**  
**Department of Biometry**  
**Budgeted FTE Research Staff**  
**1988-89 To 1992-93**

Personnel Category	1988-89	1989-90	1990-91	1991-92	1992-93	% Change from 88-89 to 92-93	% Change from 91-92 to 92-93
Faculty	2.20	2.10	2.85	3.30	3.95	79.55	19.70
Other A-Line	0.30	0.30	0.30	0.30	0.30	0.00	0.00
Managerial/ Professional	1.60	1.60	1.76	1.76	1.76	10.00	0.00
Clerical/Tech/Service	1.52	1.52	1.45	1.45	1.45	(4.61)	0.00
Graduate Assistant	0.03	0.03	0.03	2.80	2.80	2,900.00	2,900.00
Other hourly	--	--	--	--	--	--	--
<b>TOTAL FTE STAFF</b>	<b>5.65</b>	<b>5.55</b>	<b>6.39</b>	<b>9.61</b>	<b>10.26</b>	<b>47.96</b>	<b>22.22</b>

Source:UNL General Operating Budget for above years as of July 1. It includes unfilled lines and thus not all FTE budgeted are available for instruction. This table includes only account LGE/62-237-01.

**Table 3D**  
**Academic Program Review**  
**Department of Biometry - TOTAL**  
**Budgeted FTE Staff**  
**1988-89 To 1992-93**

Personnel Category	1988-89	1989-90	1990-91	1991-92	1992-93	% Change from 88-89 to 92-93	% Change from 91-92 to 92-93
Faculty	4.40	4.55	5.40	5.40	6.40	45.45	18.52
Other A-Line	0.60	0.60	0.60	0.60	0.60	0.00	0.00
Managerial/ Professional	1.85	1.85	2.00	2.00	2.00	8.11	0.00
Clerical/Tech/Service	4.55	4.55	4.25	4.25	3.25	(28.57)	(23.53)
Graduate Assistant	0.73	0.73	0.73	0.73	1.60	119.18	119.18
Other hourly	0.24	0.24	0.24	0.24	0.24	0.00	0.00
<b>TOTAL FTE STAFF</b>	<b>12.37</b>	<b>12.52</b>	<b>13.22</b>	<b>13.22</b>	<b>14.09</b>	<b>13.90</b>	<b>6.58</b>

Source:UNL General Operating Budget for above years as of July 1. It includes unfilled lines and thus not all FTE budgeted are available for instruction. This table includes account LGE/61-237-01, LGE/62-237-01, and LGE/62-237-70.

**Table 4A**  
**Academic Program Review**  
**Department of Biometry**

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**Budgeted Dollars, A-Line FTE, Budget Per SCH, and SCH/Budgeted A-Line FTE  
 1988-89 - 1992-93**

<b>YEAR</b>	<b>Total Budgeted Dollars</b>	<b>Budgeted A-Line Dollars</b>	<b>Budgeted A-Line FTE</b>	<b>SCH/ Academic Year</b>	<b>SCH/ Budgeted A-Line FTE</b>	<b>A-Line Budgeted Dollars/SCH</b>
1988-89	186,884	123,879	2.50	981	392.40	126.28
1989-90	222,686	153,903	2.75	965	350.91	159.48
1990-91	250,587	173,462	2.85	1,235	433.33	140.46
1991-92	232,129	155,376	2.40	1,291	537.92	120.35
1992-93	263,280	181,640	2.75	1,490	541.82	121.91
<b>% Change from 1988-89 to 1992-93</b>	<b>40.88</b>	<b>46.63</b>	<b>10.00</b>	<b>51.89</b>	<b>38.08</b>	<b>(3.46)</b>
<b>% Change from 1991-92 to 1992-93</b>	<b>13.42</b>	<b>16.90</b>	<b>14.58</b>	<b>15.41</b>	<b>0.73</b>	<b>1.29</b>

Source: UNL General Operating Budget for above years as of July 1. Total dollars include staff salaries and wages, benefits, operating expenses and equipment. Budgeted A-line dollars exclude staff benefits. Total budgeted dollars and budgeted A-Line dollars and FTE may include dollars for unfilled positions. This table includes only account LGE/61-237-01.

Table 4B  
Academic Program Review  
Department of Biometry

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**Budgeted Dollars, A-Line FTE, Budget Per SCH, and SCH/Budgeted A-Line FTE  
1988-89 - 1992-93**

Year	Total Budgeted Dollars	Budgeted A-Line Dollars	Budgeted A-Line FTE	SCH/Academic Year	SCH/Budgeted A-Line FTE	A-Line Budgeted Dollars/SCH
1988-89	240,480	123,880	2.50	--	--	--
1989-90	266,412	138,079	2.40	--	--	--
1990-91	329,260	185,743	3.15	--	--	--
1991-92	410,912	245,869	3.60	--	--	--
1992-93	450,845	261,495	4.25	--	--	--
% Change from 1988-89 to 1992-93	87.48	111.09	70.00	--	--	--
% Change from 1991-92 to 1992-93	9.72	6.36	18.06	--	--	--

Source: UNL General Operating Budget for above years as of July 1. Total dollars include staff salaries and wages, benefits, operating expenses and equipment. Budgeted A-line dollars exclude staff benefits. Total budgeted dollars and budgeted A-line dollars and FTE may include dollars for unfilled positions. This table includes only account LGE/62-237-01.

**Table 4C**  
**Academic Program Review**  
**Department of Biometry - Statistical Services**  
**Budgeted Dollars, A-Line FTE, Budget Per SCH, and SCH/Budgeted A-Line FTE**  
**1988-89 - 1992-93**

197

Year	Total Budgeted Dollars	Budgeted A-Line Dollars	Budgeted A-Line FTE	SCH/ Academic Year	SCH/ Budgeted A-Line FTE	A-Line Budgeted Dollars/SCH
1988-89	43,585	--	--	--	--	--
1989-90	45,170	--	--	--	--	--
1990-91	49,543	--	--	--	--	--
1991-92	50,926	--	--	--	--	--
1992-93	29,372	--	--	--	--	--
% Change from 1988-89 to 1992-93	(32.61)	--	--	--	--	--
% Change from 1991-92 to 1992-93	(42.32)	--	--	--	--	--

Source: UNL General Operating Budget for above years as of July 1. Total dollars include staff salaries and wages, benefits, operating expenses and equipment. Budgeted A-line dollars exclude staff benefits. Total budgeted dollars and budgeted A-line dollars and FTE may include dollars for unfilled positions. This table includes only account LGE/62-237-70.

**Table 4D**  
**Academic Program Review**  
**Department of Biometry - Total**  
**Budgeted Dollars, A-Line FTE, Budget Per SCH, and SCH/Budgeted A-Line FTE**  
**1988-89 - 1992-93**

Year	Total Budgeted Dollars	Budgeted A-Line Dollars	Budgeted A-Line FTE	SCH/ Academic Year	SCH/ Budgeted A-Line FTE	A-Line Budgeted Dollars/SCH
1988-89	470,949	247,759	5.00	981	196.20	252.56
1989-90	534,268	291,982	5.15	965	187.38	302.57
1990-91	629,390	359,205	6.00	1,235	205.83	290.85
1991-92	693,967	401,245	6.00	1,291	215.17	310.80
1992-93	743,497	443,135	7.00	1,490	212.86	297.41
% Change from 1988-89 to 1992-93	57.87	78.86	40.00	51.89	8.49	17.76
% Change from 1991-92 to 1992-93	7.14	10.44	16.67	15.41	(1.07)	(4.31)

Source: UNL General Operating Budget for above years as of July 1. Total dollars include staff salaries and wages, benefits, operating expenses and equipment. Budgeted A-line dollars exclude staff benefits. Total budgeted dollars and budgeted A-line dollars and FTE may include dollars for unfilled positions. This table includes account LGE/61-237-01, LGE/62-237-01, and LGE/62-237-70.

Table 3C  
 Academic Program Review  
 Department of Biometry-Statistical Services  
 Budgeted FTE Staff (Revolving)  
 1988-89 To 1992-93

Personnel Category	1988-89	1989-90	1990-91	1991-92	1992-93	% Change from 88-89 to 92-93	% Change from 91-92 to 92-93
Faculty	--	--	--	--	--	--	--
Other A-Line	--	--	--	--	--	--	--
Managerial/ Professional	0.25	0.25	0.24	0.24	0.24	(4.00)	0.00
Clerical/Tech/Service	2.03	2.03	1.80	0.80	0.80	(60.59)	(55.56)
Graduate Assistant	--	--	--	--	--	--	--
Other hourly	--	--	--	--	--	--	--
<b>TOTAL FTE STAFF</b>	<b>2.28</b>	<b>2.28</b>	<b>2.04</b>	<b>2.04</b>	<b>1.04</b>	<b>(54.39)</b>	<b>(49.02)</b>

Source:UNL General Operating Budget for above years as of July 1. It includes unfilled lines and thus not all FTE budgeted are available for instruction. This table includes only account LGE/62-237-70.

**Table 5**  
**Academic Program Review**  
**Department of Biometry**  
**Number of Course Sections, Registrations**  
**Average Class Size, and Student Credit Hours**  
**Fall Semesters 1988-89 and 1992-93**

199

Course Number	Fall 1988-89				Fall 1992-93			
	No. of Sections	Registrations	Average Class Size	Student Credit Hours	No. of Sections	Registrations	Average Class Size	Student Credit Hours
201	--	--	--	--	1	13	13	39
801	1	64	64	256	1	69	69	276
802	--	--	--	--	1	35	35	140
896A	1	19	19	57	1	15	15	45
896B	--	--	--	--	1	5	5	15
896C	--	--	--	--	1	1	1	3
901	--	--	--	--	1	27	27	81
901A	1	32	32	32	--	--	--	--
901B	1	31	31	31	--	--	--	--
901D	1	16	16	16	--	--	--	--
970	--	--	--	--	1	10	10	30
<b>Total</b>	<b>5</b>	<b>162</b>	<b>32</b>	<b>392</b>	<b>8</b>	<b>175</b>	<b>22</b>	<b>629</b>

Table 6  
Academic Program Review  
Department of Biometry

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Number of Class Registrations, Student Credit Hours, and Student Contact Hours by Level  
Fall Semesters 1988-89 to 1992-93

Year	Total			Lower Level			Upper Level			Graduate & Professional		
	# of Regis.	Credit Hours	Contact Hours	# of Regis.	Credit Hours	Contact Hours	# of Regis.	Credit Hours	Contact Hours	# of Regis.	Credit Hours	Conta Hour
1988-89	162	392	456	—	—	—	—	—	—	162	392	456
1989-90	145	390	451	—	—	—	—	—	—	145	390	451
1990-91	221	530	584	—	—	—	—	—	—	221	530	584
1991-92	291	579	946	—	—	—	—	—	—	291	579	946
1992-93	175	629	733	13	39	39	—	—	—	162	590	694
% Change from 1988-89 to 1992-93	8.0	60.5	60.7	—	—	—	—	—	—	0.0	50.5	52.2
% Change from 1992-93	(39.9)	8.6	(22.5)	—	—	—	—	—	—	(44.3)	1.9	(26.6)

Source: Analysis of Course Offerings, Class Size, Teaching Load, and Credit Hour Costs, Fall Semester 1988-89 through 1992-93 (Tables 7,103,203), Office of Institutional Research and Planning.

**Table 7**  
**Academic Program Review**  
**Department of Biometry**  
**Student Credit Hours Per FTE Instructional Faculty By Level**  
**Fall Semesters 1988-89 to 1992-93**

**201**

Year	Total			Lower Level			Upper Level			Graduate & Profession		
	FTE Instr. Faculty	SCH	SCH/ FTE	FTE Instr. Faculty	SCH	SCH/ FTE	FTE Instr. Faculty	SCH	SCH/ FTE	FTE Instr. Faculty	SCH	SC FT
1988-89	1.49	392	263.1	—	—	—	—	—	—	1.49	392	26
1989-90	2.71	390	143.9	—	—	—	—	—	—	2.71	390	14
1990-91	2.64	530	200.8	—	—	—	—	—	—	2.64	530	20
1991-92	3.04	579	190.5	—	—	—	—	—	—	3.04	579	19
1992-93	3.32	629	189.5	0.65	39	60.0	—	—	—	2.67	590	22
% Change from 1988-89 to 1992-93	122.8	60.5	(28.0)	—	—	—	—	—	—	79.2	50.5	(16)
% Change from 1991-92 to 1992-93	9.2	8.6	(0.5)	—	—	—	—	—	—	(12.2)	1.9	16

Source: Analysis of Course Offerings, Class Size, Teaching Load, and Credit Hour Costs, Fall Semesters, 1988-89 through 1992-93 (Tables 105, 103, and 107), Office of Institutional Research and Planning.

Table 7A  
 Academic Program Review  
 Department of Biometry  
 Student Credit Hours Per FTE Instructional Faculty By Level  
 (Graduate Assistants Excluded)  
 Fall Semesters 1988-89 to 1992-93

202

Year	Total			Lower Level			Upper Level			Graduate & Profession		
	FTE Instr. Faculty	SCH	SCH/ FTE	FTE Instr. Faculty	SCH	SCH/ FTE	FTE Instr. Faculty	SCH	SCH/ FTE	FTE Instr. Faculty	SCH	SC FT
1988-89	1.16	392	337.9	--	--	--	--	--	--	1.16	392	33
1989-90	2.13	390	183.1	--	--	--	--	--	--	2.13	390	18
1990-91	2.39	530	221.8	--	--	--	--	--	--	2.39	530	22
1991-92	2.30	555	241.3	--	--	--	--	--	--	2.30	555	24
1992-93	2.23	590	264.6	0.35	--	--	--	--	--	1.88	590	31
% Change from 1988-89 to 1992-93	92.2	50.5	(21.7)	--	--	--	--	--	--	62.1	50.5	(7)
% Change from 1991-92 to 1992-93	(3.0)	6.3	9.6	--	--	--	--	--	--	(18.3)	6.3	30

Source: Analysis of Course Offerings, Class Size, Teaching Load, and Credit Hour Costs,  
 Fall Semesters, 1988-89 through 1992-93 (Tables 105A, 103A, and 107A), Office of  
 Institutional Research and Planning.

**Table 8**  
**Academic Program Review**  
**Department of Biometry**  
**Direct Instructional Salary Cost Per Student Credit Hour**  
**Fall Semesters 1988-89 - 1992-93**

<b>Year</b>	<b>Cost Per SCH</b>	<b>Fall Semester Credit Hours</b>
1988-89	57.49	392
1989-90	106.81	390
1990-91	98.73	530
1991-92	99.84	579
1992-93	97.83	629
<b>% Change From 1988-89 to 1992-93</b>	<b>70.17</b>	<b>60.46</b>
<b>% Change From 1991-92 to 1992-93</b>	<b>(2.01)</b>	<b>8.64</b>

Note: The cost represents an allocation of direct salary costs to instruction. Half of the academic year salary has been allocated to the first semester. Salaries have been prorated on the basis of the semester load of each individual instructional staff member, including graduate teaching assistants. The total instructional salary cost was then divided by the number of student credit hours to obtain the "Cost Per SCH."

Source: Analysis of Course Offerings, Class Size, Teaching Load, and Credit Hour Costs, Fall Semesters 1988-89 through 1992-93, Office of Institutional Research and Planning (Tables 110, 103)

**Table 9**  
**Academic Program Review**  
**Department of Biometry**  
**Student Registrations in the Department by College**  
**Fall Semesters 1988-89 to 1992-93**

College	1988-89	1989-90	1990-91	1991-92	1992-93
Agric. Sci. & Nat. Res.	1	1	--	--	14
Architecture	--	--	--	--	--
Arts & Sciences	2	--	2	--	--
Business Admin.	--	--	--	--	--
Engineering	--	--	--	--	--
Graduate	157	144	216	289	160
Home Economics	--	--	--	--	--
Law	--	--	--	--	--
Teachers	--	--	--	--	--
Others & Undeclared	2	--	3	2	1
<b>TOTAL</b>	<b>162</b>	<b>145</b>	<b>221</b>	<b>291</b>	<b>175</b>

Source: Statistics registration tape as of the sixth day of enrollment for above years.

Table 10  
 Academic Program Review  
 Department of Biometry (Code 102)  
 Number of Departmental Majors  
 1988-89 To 1992-93

Year	Undergraduate						Graduate Total
	Freshman	Sophomore	Junior	Senior	Unclassified	Total	
1988-89	--	--	--	--	--	0	--
1989-90	--	--	--	--	--	0	--
1990-91	--	--	--	--	--	0	--
1991-92	--	--	--	--	--	0	1
1992-93	--	--	--	--	--	0	5
% Change from 1988-89 to 1992-93	--	--	--	--	--	--	--
% Change from 1991-92 to 1992-93	--	--	--	--	--	--	400.00

NOTE: Majors included are: 102, Biometry. This was a new major in Fall 1991-92.

Source: Enrollment by Major, Undergraduate and Graduate, Office of Institutional Research and Planning.

**Table 10**  
**Academic Program Review**  
**Majors in Biometry (Code 102)**  
**1988-89 to 1992-93**

Student Level	Black		American Indian		Asian		Hispanic		White		Total		Total
	M	F	M	F	M	F	M		M	F	M	F	
1988-89 Freshman Sophomore Junior Senior Unclassified Total UG Graduate													
1989-90 Freshman Sophomore Junior Senior Unclassified Total UG Graduate													
1990-91 Freshman Sophomore Junior Senior Unclassified Total UG Graduate													
1991-92 Freshman Sophomore Junior Senior Unclassified Total UG Graduate													
1992-93 Freshman Sophomore Junior Senior Unclassified Total UG Graduate	1 (I)	--	--	--	--	--	--	--	1 (I)	0			
												% Change in Total from 1988-89 to 1992-93	% Change in Total from 1991-92 to 1992-93
													400.00

(I) indicates number of students in the category who are non-resident aliens for 1989-90 through 1992-93. Information not available by race or non-resident alien/alien status prior to 1989.

Note: Majors included are 102, Biometry

Source: Profiles for above fall semesters, Office of Institutional Research and Planning.

Table 12 is a listing of faculty in the department of Biometry. The following information gives an explanation of some column headings:

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**AFT**E administrative FTE

**FFTE** faculty FTE

**G**

F Grad Faculty Status

**F**

P Full or Part Time

**R**

T Regular or Temporary

**Deg** Refers to PDF Education Codes:

- 01 Less than high school graduation
- 02 High school graduate or equivalent
- 03 Trade Certificate
- 04 1-2 years beyond high school
- 05 Associate degree or equivalent
- 06 Professional certificate
- 07 3-4 years beyond high school
- 08 Bachelors degree
- 09 Masters degree
- 10 J.D., L.L.B.
- 11 6 years specialization
- 12 Doctoral candidate
- 13 All but dissertation
- 14 Doctoral degree
- 00 Other

**FTE**

DCS First line is FTE, second line shows FTE in Division of Continuing Studies

**Bud-Sal** Salary

**Adj-Sal** Ignore this column

**Prof** shows whether or not they have a professorship

**Appt** 9 or 12 month appointment (0=12 mo., 1 or 2 = 9 mo.)

**Blank** 12 Months Job Paid Over 12 Months

- 01 Academic Year Paid Over 9 Months
- 02 Academic Year Paid Over 12 Months
- 03 Ten Months Paid Over 10 Months
- 04 Ten Months Paid Over 12 Months
- 05 Summer Session
- 06 Fall Semester
- 07 Spring Semester

**Explanation of Table 12 (Continued)**

**08 Other**

**09 Spring Semester Paid Over 8 months**

**Term** Appointment amount indicator (Annual amount to be paid)

**AA**--Total is annual salary for an academic year or all-year appointment

**AP**--Total Payment for period of the appointment. Used for appointment other than academic-year and all year appointments.

Table 12

NAME	TENURE HM	SSN STATUS	MODIFIER ADMIN	TITLE AFTEFFTE	G - F	F - P	E T H N	R - T	P O A	S E X	D E G	TITLE-DT HIRE-DT	BIRTH TENURE	FTE DCS	BUD_SAL SALARY	ADI-SAL SAL_FTE	PROF	APPT TERM	AMNT
MARX, DAVID B.		220-46-0192 ACTIVE	DEPT HD	PROFESSOR 0.60 0.40	F	F	W	R	I	M	14	03/16/89 03/16/89	02/27/46 T 89	1.00	92,800 92,800	69,600 1.00	0	0	0
STROUP, WALTER W.		407-74-7654 ACTIVE		PROFESSOR 1.00	F	F	W	R	2	M	14	07/01/92 07/01/92	01/23/50 T 86	1.00	71,970 71,970	53,978 1.00	0	0	0
ESKRIDGE, KENT M.		499-56-8347 ACTIVE		ASSOC PROF 1.00	F	F	W	R	2	M	14	07/01/92 03/01/83	06/15/51 E 94	1.00	55,140 55,140	41,355 1.00	0		0
PARKHURST, ANNE M.		048-30-1527 ACTIVE		PROFESSOR 1.00	F	F	W	R	2	F	09	07/01/88 02/01/69	05/05/40 T 79	1.00	66,170 66,170	49,627 1.00	0	0	0
YOUNG, LINDA J.		456-96-1969 ACTIVE		ASSOC PROF 1.00	F	F	W	R	2	F	14	07/01/90 07/01/90	12/24/52 T 90	1.00	61,330 61,330	45,997 1.00	0	0	0
GOTWAY, CAROL A.		325-42-3800 ACTIVE		ASST PROF 1.00	F	W	R	2	F	14		07/01/92 07/01/92	08/14/61 E 98	1.00	47,225 47,225	36,375 1.00	0	0	0
KACHMAN, STEPHEN D.		367-74-0760 ACTIVE		ASST PROF 1.00	M	F	W	R	2	M	14	07/01/90 07/01/90	10/02/58 E 96	1.00	47,225 47,225	36,419 1.00	0		0

**Table 13**  
**Academic Program Review**  
**Department of Biometry**  
**Majors by Full and Part Time, Gender, and Age**  
**Fall Semester 1992-93**

Major and Gender	Age of Students																						Total Full & Part		
	Full-Time												Part-Time												
	<18	18-19	20-21	22-24	25-29	30-34	35-39	40-49	50-64	65 &>	Unkn	Total FT	<18	18-19	20-21	22-24	25-29	30-34	35-39	40-49	50-64	65 &>	Unkn	Total PT	
Graduate																									
Biometry						1	1						2				0								
Men						1	1						2				1								
Women						1	2	1					4				1								
Total																							0	2	
																							1	3	
																							1	5	

Source: Fall Semester 1992-1993 Profiles, Office of Institutional Research and Planning

Table 14  
Academic Program Review  
Department of Biometry  
Student Credit Hours by Course Level  
and the Instructional Staff Teaching the Courses  
Fall Semesters 1990-91, 1991-92, and 1992-93

Fall Semester	Course Level									
	100	200	300	400	500	600	700	800	900	Total
1990-91				42				423	104	569
1991-92								399	156	555
1992-93		39						479	114	632

Note: Credit is assigned according to the home department of the instructional staff who teach the courses.

Source: Profiles for above years, Table A50.