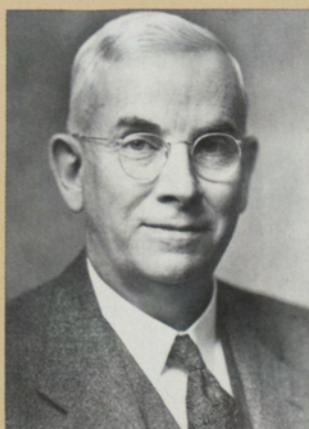
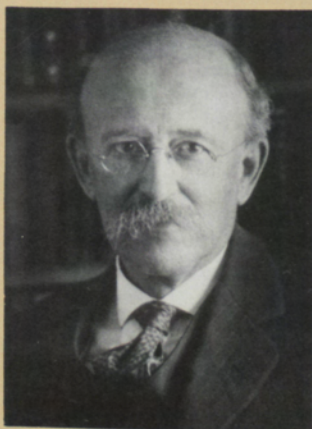


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NIMAL HUSBANDRY  
AT CORNELL  
UNIVERSITY

A History and  
Record of  
Development  
from 1868 to 1963

**Kenneth L. Turk**



*Animal Husbandry at Cornell University:  
A History and Record of Development from 1868 to 1963*

Kenneth L. Turk

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Ithaca, NY  
February, 2005



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# ANIMAL HUSBANDRY AT CORNELL UNIVERSITY

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A History and Record  
of Development  
from 1868 to 1963

**Kenneth L. Turk**

College of Agriculture and Life Sciences  
at Cornell University, Ithaca, New York

## CONTENTS

<i>Preface</i>	<i>Page</i>
<i>Phase I</i>	
<b>EARLY YEARS OF ANIMAL HUSBANDRY AT CORNELL FROM THE BEGINNING TO 1903</b>	<b>1</b>
The Land Grant Act: Founding of Cornell University	1
Agriculture Lagged in the Early Years	3
Roberts Gave Early Leadership to Animal Husbandry	5
First Cornell Agricultural Experiment Station Organized	8
Hatch Act Provided Funds for Research	10
New York State Agricultural Experiment Station at Geneva	11
New Cornell Agricultural Experiment Station Began Functioning	12
Student Instruction	13
Winter Courses Established	13
Extension Work Started	14
Farmers' Institutes Initiated	15
Early Milk Records	15
Research Expands during the 1890s	16
Roberts Retires	19
<i>Phase II</i>	
<b>ANIMAL HUSBANDRY UNDER ADMINISTRATION OF HENRY H. WING, 1903-1928</b>	<b>21</b>
Department of Animal Husbandry Organized	21
New York State College of Agriculture Established	21
Status of Animal Husbandry Department	23
Growth in Staff and Programs	24
Research Expands	27
Growth in Extension	29
Director Bailey Retires	31
Open-Formula Feeds	33



Work in Animal Nutrition Initiated in 1915	33
World War I Affects College Activities	34
Semicentennial of the University	36
Farmer Interest in the College Increases	36
Relationships with the Geneva Experiment Station	37
Progress during the Twenties to 1928	39
Professor Wing Retires	47
F. B. Morrison Succeeds Professor Wing as Head of the Department	49
Death of I. P. Roberts	50

### *Phase III*

<b>GROWTH AND DEVELOPMENT OF ANIMAL HUSBANDRY UNDER ADMINISTRATION OF FRANK B. MORRISON, 1928-1945</b>	<b>51</b>
Animal Husbandry Advisory Committee Formed	51
Department Reorganized	52
Major Programs, 1928-1944	58
Animal Nutrition Division	59
Department of Biochemistry Established	67
Quality of Protein for Ruminants	67
Dairy Cattle Division	68
Death of E. S. Savage	74
Work in Dairying Continued at Geneva until 1943	75
Animal Breeding and Artificial Insemination	77
Beef Cattle and Meats Divisions	78
Sheep and Swine Divisions	82
Horse Division	86
Rapid Growth of Extension	88
Extension Programs in Dairy Production	89
Extension with Livestock Other than Dairy Cattle	100
Livestock Extension for Rural Youth	102
Important Role of College Administration	104

Morrison Retires from Position as Department Head	105
Turk Succeeds Morrison	106

#### *Phase IV*

### **GROWTH AND DEVELOPMENT OF ANIMAL HUSBANDRY UNDER ADMINISTRATION OF KENNETH L. TURK, 1945-1963**

Plans for the Future	107
Increases in Salaries	109
Sources of Operational Funds	109
State University Established	110
New Library for the College	111
Livestock Advisory Council Organized	111
Study for Projected Five-Year Program	113
New Home for Animal Husbandry	114
Relationships with University and College Administration	116
Some Policy Changes on Staff Employment	118
Student Enrollment Increases in Postwar Period	119
Proposal for Change in Name of Department	124
Administrative Assistance in the Department	124
Morrison Grants and Fellowships	125
American Dairy Science Association Annual Meeting at Cornell	126
American Society of Animal Science Originated at Cornell	126
Morrison Retires from Active Service	127
Active Programs in All Areas in Animal Husbandry	129
Animal Nutrition Division	129
Livestock Feeding Division	134
Animal Breeding and Physiology	135
Dairy Cattle Division	143
Beef Cattle and Meats Divisions	150
Sheep and Swine Divisions	154



Horse Division	158
Animal Husbandry Extension Functions Effectively	159
Extension Programs with Dairy Cattle	161
Livestock Extension Gains Momentum	175
Junior Dairy and Livestock Extension	183
Status of Faculty in Animal Husbandry	185
Cornell Increases Its International Dimension	185
A Final Word	188
Appendix 1. Courses Offered in Animal Husbandry	189
A. Selected years 1910–11 to 1924–25	189
B. Selected years 1929–30 to 1944–45	191
C. Selected years 1949–50 to 1963–64	194
Appendix 2. Graduate Students Majoring in One of the Fields in Animal Husbandry, 1890–1963.	197
Appendix 3. Grants, Contracts, Agreements, and Gifts	243
References	267
Index of Names	269
Index of Subjects	280

## Preface

It was 1952 when my colleagues first asked me to review the early history of animal husbandry at Cornell for our department seminar. Since that time I have been invited to present this material again about every 4 or 5 years, primarily, I suppose, for the benefit of new graduate students and new staff members. After retirement from the university in 1974, several of my friends suggested that the outline I had used in the seminars should be expanded into a more-complete history. What follows, therefore, is the result of my efforts to put together a chronological record of the accomplishments of men and women in animal husbandry in teaching, research, and extension from the earliest days of the university up through 1963. It is meant to deal only with the early history.

My personal experience at Cornell dates from September 1930 when I entered as a graduate student and assistant with Professor Frank B. Morrison, the second head of the department. I got to know Professor Henry H. Wing, who was the first professor and head of the Department of Animal Husbandry and one of the masterminds of dairying in the United States. I became acquainted with Liberty Hyde Bailey, the second dean and director, who had organized the College of Agriculture into departments and was a great leader in the college during a period of remarkable development. I knew only a few of the earliest staff members of the department. I studied and worked with those who were on the faculty during the latter years of Professor Wing's administration and who continued under Professor Morrison's leadership. I came to know intimately all the professors and other staff noted in the text during the time I worked with them as a graduate student and later as a faculty member.

For much of this history, I have spent countless hours delving through the earliest annual reports of the university and those of the College of Agriculture and the Cornell University Agricultural Experiment Station up through 1963, also the faculty retirement and memorial statements, research and extension bulletins, other publications in scientific journals, and articles in farm and livestock magazines. Personnel and other files maintained in the department have been very useful. And, of course, I have drawn upon my own personal experiences.

Annual reports and other publications of the New York State Agricultural Experiment Station at Geneva have provided pertinent information on animal husbandry research conducted there until 1943 when it was closed out and the dairy manufacturing research was consolidated on the Ithaca campus.

The book, *Education and Agriculture: A History of the New York State College of Agriculture*, by Gould P. Colman, was a helpful reference along with other historical books and documents.

When starting to put this history together, especially my personal recollections, I spoke of myself in the third person, but this became increasingly awkward. So I settled on using the first person in most of the text.

It is hoped that anyone who reads this early history will grasp the significance of the evolutionary growth and development of our functions in educating and training men and women for leadership, the contributions to animal agriculture through research, and the transfer of knowledge and technology to livestock producers, industries, and consumers. Progress and development of animal husbandry at Cornell from the beginning through 1963 provided a



firm foundation for even greater accomplishments in the future in the animal sciences.

I am grateful to several of my colleagues in the Department of Animal Science for reading this manuscript and for their criticisms and suggestions. They are Professors H. W. Carter, J. D. Burke, J. M. Elliot, R. H. Foote, D. E. Hogue, J. K. Loosli, S. E. Smith, G. W. Trimmerger, G. H. Wellington, and L. D. Van Vleck. In addition, Dr. Charles E. Palm, Professor Emeritus of Entomology and former Dean of the College of Agriculture and Life Sciences, and Dr. Gould P. Colman, University Archivist, made significant and helpful suggestions.

Without both the financial and moral support of Professor J. Murray Elliot, chairman of the department, this history might never have gotten out of dusty file folders. Priscilla Lawrence typed and retyped the manuscript with the patience of an angel for which I am grateful, and my thanks to Lynn Polan for her fine assistance in its final preparation.

My wife, Bernice F. Turk, has provided encouragement, support, and assistance on this project and in many other ways throughout my career and has my special thanks and appreciation.

November 1986

Kenneth L. Turk

## *Phase I*

### **EARLY YEARS OF ANIMAL HUSBANDRY AT CORNELL FROM THE BEGINNING TO 1903**

Animal husbandry at Cornell is as old as the university itself. It had its beginning when Ezra Cornell gave the new university his farm of 207 acres of land, lying between West Avenue and Judd Falls Road, as a part of his original endowment in 1866, plus \$500,000. It was on this farm of less than 100 acres of arable land that the college's herds of livestock were maintained. No additional agricultural land was obtained until 1903. During this span of years, the university farm embraced the area extending from the rear of the president's house (Andrew D. White House) eastward to Judd Falls Road.

The farmstead was located just west of the present location of the Baker Chemistry Laboratory. Included in the farmstead was an old-fashioned bank barn with a wing used as a dairy stable. This original farm was used for improved livestock breeding operations for many years.

The farm had been acquired by Mr. Cornell in 1857, and by 1860 he had developed a substantial herd of purebred Shorthorn and North Devon cattle. He bought animals of the most popular strains and made some importations directly from England. His cattle were exhibited at local fairs and at the New York State Fair, winning many prizes, and breeding stock was sold to other farmers.

Available records indicate that Mr. Cornell's interest in Shorthorns continued during his whole life and was undoubtedly one of the reasons for the famous injunction, "Don't forget the horse doctor," made to President White on the latter's departure for Europe to recruit professors and equipment for the new university. As is well known, this trip resulted in Dr. James Law coming to Cornell. This member of the original faculty became a foremost authority on veterinary science in the United States and the first dean of the New York State Veterinary College (Wing 1933).

On a trip to Europe in 1862, Mr. Cornell attended the International Exposition in London and several other agricultural shows and purchased Southdown sheep for his farm. Close observations were made of farm practices in England and France.

With his demonstrated interests in breeding improved livestock, it is surprising that Mr. Cornell seems to have given little or no attention to the livestock on the college farm in the early days of the university. A herd of cattle was maintained on the farm from the start, but it is not likely that any of the animals were purebred Shorthorns. There was no definite record of the university herds until Isaac P. Roberts came as professor of agriculture in 1874.

### **The Land Grant Act: Founding of Cornell University**

Cornell was designated as New York State's land-grant university by legislative act on April 27, 1865. It seems appropriate here to review briefly some of the background for this significant development.

The ideas and philosophy behind the land-grant universities developed from conditions and experiences of the first half of the 19th century in this country. It was a relatively undeveloped country, and most of the people had little formal education. Many prejudices and superstitions existed, and people had little knowledge of science and its applications to agriculture.

Agriculture, the oldest among the arts, was making little progress. Most farmers felt they could teach the art and practice of farming to their sons without outside help. Collegiate education that might be available was largely of the traditional classical character exemplified by Cambridge and Oxford universities in England. The function of colleges generally was to educate the socially elite and those for the professions of medicine, law, and theology. Any education that was available had little or no relation to the skills needed in agriculture and the industries that were developing.

However, during this time, in the United Kingdom, Germany, and France, scientific investigation in agriculture was developing and beginning to provide useful information. Von Liebig in Germany had published some of his chemical analyses of soils and plants, and Lawes and Gilbert had started their investigations at the Rothamsted Experiment Station in England, but the application of science to agriculture had scarcely begun in the United States.

There were some leaders in the United States, among them Ezra Cornell, who realized the need for better understanding of such things as soil management in relation to crop production and animal disease control in relation to milk and meat production. There was also a growing realization of the great industrial potential of the country and the need for educated and settled workers to develop it. There were factories to be built and operated, machines and equipment to be manufactured, fertilizers and chemicals to be produced, and railroads and other means of transportation to be developed.

Major credit for the development of the land-grant philosophy of education and its enactment into legislation has generally been given to Senator Justin Morrill of Vermont, who introduced the bill into Congress and fought for its passage for 5½ years before it became law in 1862. But, somewhat earlier, Jonathan B. Turner, after pondering for many years on how to put higher education within the reach of all the people who wanted it, had presented a blueprint in 1850 called "A Plan for a State University for the Industrial Classes." The seed was planted in a speech given before the Illinois Teachers Institute in Griggsville, Illinois.

The Morrill Act provided for "an endowment, support, and maintenance of at least one college in each state where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts—in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life." Included in the act was a provision to allocate 30,000 acres of public land to each state for each representative it had in Congress. New York State, with 30 representatives, received 900,000 acres, the most granted to any state.

Ezra Cornell had long held ideas about education for the farming and the industrial classes similar to those of Turner and Morrill. After his arrival in Ithaca in 1828 and after many setbacks in various business ventures along the way, Mr. Cornell ultimately became wealthy through his association and work with the Western Union Telegraph Company. He was elected to the State Legislature and worked toward the founding of a state agricultural college. While serving in the legislature, Ezra Cornell became a good friend of Andrew D. White, a young scholar elected to the senate from Syracuse in

1864. White had written earlier that "from my first years in college it has been the steady aim of my life to aid in founding and building a worthy American university."

In some of his discussions with White, Ezra Cornell said one day, "I have about half a million dollars more than my family will need. What is the best thing I can do with it for the State?" Through their joint efforts, Mr. White introduced a bill in the State Legislature on February 7, 1865, to establish Cornell University. The bill was passed and signed by the governor on April 27th, the same year, designating the new university as New York State's land grant institution. It had been a long, hard-fought struggle to get the bill approved. There was much opposition, especially from several colleges that hoped to get a part of the land-grant funds. In fact, the Peoples College in Havana, now Montour Falls, New York, had been designated first as the recipient of the Morrill Act funds, but when certain financial requirements could not be fulfilled by this institution, Ezra Cornell's plan for the creation of a college at Ithaca finally was successful. In founding Cornell University, Ezra Cornell envisioned an institution that would extend the opportunity for education to everyone, a place where "any person could find instruction in any subject."

Thus, Cornell University was born, and soon thereafter the board of trustees, with Ezra Cornell as chairman, set about its tasks of developing an educational program in terms of courses, professors, and physical facilities. Mr. White was chairman of a Committee on Plan of Organization, and Ezra Cornell looked after the construction of the first building.

The courses of instruction that were planned called ultimately for 46 professors; but for a beginning it was thought that 22 would be sufficient.

Almost immediately after his report had been accepted by the trustees, the board unanimously appointed Andrew D. White as the first president of the university. So he now had the job of implementing the educational and development program his committee had prepared.

During this period, Mr. Cornell devoted much effort to the management of the public lands provided under the Morrill Act. Almost all the states sold their land, which resulted in a glut in the market with some of the lands selling as low as 41 cents an acre. But Ezra Cornell wisely developed a plan for buying the land and holding it without interest for the university until land prices went up. When the lands ultimately were sold, they had increased in value from \$600,000 to approximately \$5,000,000. This was the beginning of the Cornell University Endowment Fund.

## Agriculture Lagged in the Early Years

Ezra Cornell and President White spent the first several years in unsuccessful attempts to find a satisfactory candidate to serve as professor of agriculture. In his autobiography, President White outlined the dilemma, saying that of all the technical departments being established in the university, agriculture caused him the most anxiety. "It (agriculture) had been given the most prominent place in the congressional act of 1862 and in our charter from the state in 1865. But how should agriculture be taught; what proportion should we observe between theory and practice, and what should the practice be?" Many conflicting answers to his questions came from eminent agricultural leaders. Some said the college farm should be conducted purely as a

business operation. Others said it should be a model farm regardless of financial returns. Still others held that it should be wholly experimental. And there was no history of experience at that time to guide President White.

White was able to recruit professors in some of the basic sciences related to agriculture—chemistry, botany, zoology, geology, and veterinary medicine, but it was more difficult in agriculture. He gives three men credit for saving the new Department of Agriculture during those early dark days. They were the Honorable John Stanton Gould, a successful farmer and former president of the State Agricultural Society, who was employed as a lecturer in agriculture because of his ability to combine his knowledge of farming with enthusiasm for teaching; George C. Caldwell, who came from the Pennsylvania State College to become professor of agricultural chemistry; and James Law of the British Royal Veterinary College, who became professor of veterinary medicine. With their help, agriculture as an academic endeavor at Cornell surmounted its first crisis (Myers 1962). At about this time, Albert N. Prentiss was induced to join the staff as professor of botany.

### **Isaac P. Roberts Appointed Professor of Agriculture**

In spite of untiring efforts, it took 5 years from the date when Cornell opened its doors to students in October 1868 to find a man who could function satisfactorily as professor of agriculture. This was a time when agricultural science was largely unknown. It was not until 1874 that Isaac P. Roberts was brought back to his native state from Iowa State College to become professor of agriculture that organized instruction in agriculture really got under way. Before that, a man by the name of Henry McCandless from Ireland had been appointed the first professor of agriculture, but he has been described as "a misfit who left unmourned after one year."

Professor Roberts came from a farm and the traditions of farming near East Varick, Seneca County, New York. He never attended college, but in 1875 he was awarded the degree of master of agriculture by Iowa State College, the first master's degree in agriculture given by any college in the United States.

In his autobiography, Professor Roberts (1916) describes some of the conditions he found after he and his family arrived at Cornell: "Because agriculture was then regarded by most of the classically educated members of the Cornell faculty as quite unworthy of a place in education beside the traditional subjects of the curriculum, we suffered a sort of social neglect and felt ourselves in an alien atmosphere. The contempt for such practical subjects and their teachers was shared to some extent for a number of years by many of the professors of technical departments who were not highly cultivated outside their own fields.

"The university farm was under a lease which did not expire until the following April and there was little teaching to be done, there being only three senior students in agriculture.... This left me plenty of time to look over the situation and to realize how different our conditions were to be from those in Iowa." Roberts could turn to building the university farm and establishing contacts with the farmers in the state. He knew from his experiences in Iowa that a rural constituency was an absolute necessity for a successful college of agriculture.

Roberts described the situation: "From an ample farmhouse to three living rooms in Cascadilla Place; from an 800-acre farm, where in one year I had raised 5000 bushels of corn, to one of less than 100 acres of arable land;

from a herd of 100 cattle, representing four breeds to one of twelve miserable cows; from setting fifty to seventy-five students at work every morning to directing five hired men; from large classes of enthusiastic pupils and ample classrooms to a museum for a lecture room and a pocket edition of a class—such were the comparisons that I instinctively made in those first months."

On April 1, 1874, Professor Roberts took an inventory of all the property belonging to the farm, a copy of which was filed with the university treasurer. This was the first ever taken by any department of the university. "It revealed many things unseen before. It appeared that the dairy might be made to more than pay expenses and the work stock also, for they found employment in other departments when not needed on the farm; and this, in spite of the fact that all of the animals were in wretched condition." In his inventory, Professor Roberts listed these assets:

"There were 10 milch cows that had among them only twenty-two milkable teats, and the veterinarian did not have to be called in to know that the herd was infected with tuberculosis.

"One of the work oxen was sound and strong, but it took most of his strength to hold up his mate.

"There was a stallion of noted Arabian lineage which had been donated to the university and was said to be worth \$15,000, but I have always thought the decimal point ought to have been placed two figures to the left. Although he was the sire of a few colts, he was withdrawn from service perhaps because his colts did not have legs enough on which to place the curbs, ring-bones, spavins, and deformities, which he was capable of transmitting. When we took that Arab of the Desert out of his stall and rode him, he fell dead.

"The farm buildings consisted of a small, dilapidated farmhouse and several low, rambling barns, useful in a way and not altogether bad, which stood close to the college buildings not far from the gorge."

Such were the conditions for the beginnings of agriculture and animal husbandry at Cornell under the leadership of Isaac P. Roberts. As he started his program of development, Professor Roberts kept two objectives in mind for which the university farm was to be maintained: (1) It was to be a model farm. (2) It was to serve as a practical laboratory for investigation and instruction. To meet these objectives, the farm must be large enough to provide the broadest view of agricultural practice.

Roberts proved to be an effective leader, a keen observer, and an outstanding teacher who believed in combining theory and practice. He quickly gained the respect of farmers by his sound judgment and his knowledge of good farming practices. His classes were highly regarded by students because he combined classroom instruction with regular laboratory trips around the college farm to point out the practical application of principles discussed in lectures.

## Roberts Gave Early Leadership to Animal Husbandry

Because livestock provided an important part of the income derived from New York farms, then, as it does today (1986), it was reasonable and natural for I. P. Roberts to give personal attention to instruction and experimentation in this branch of work of the Department of Agriculture. One of his first efforts was to improve the dairy herd and the university farm so that they would meet the objectives he had established.

As described in Professor Roberts's words: "Without consulting the University authorities, I gradually got rid of the miserable milch cows and other poor cattle which were on the farm when I took charge, and by the time the Universal Barn [which later became known as the Roberts Barn] was built, I was beginning to build up a creditable herd. A wealthy tea merchant of New York City, who was a breeder of fancy Jersey cattle, and a friend of one of the Trustees, donated to the farm two cows, and a bull was purchased from him at a nominal price. At this time, Jerseys were believed to be the best of all dairy breeds."

In the meantime, Professor Roberts had become interested in Holsteins as a result of the development of the first herd of this breed in the United States by W. W. Chenery of Boston. After obtaining permission from the university authorities, Professor Roberts purchased from Mr. Chenery "two full-bloods and one half-blood—all that my money would allow." This step brought about a serious objection from the governor of the state, Alonzo Cornell, son of the founder, who thought the bringing of black and white cattle to the college farm had greatly depreciated the value of his father's holdings, especially his Shorthorn cattle.

Soon afterwards, however, Roberts was faced with a much more serious problem. Some of his cherished pure-blood animals contracted tuberculosis and had to be sacrificed. With the aid of Dr. Law, a battle against the disease was carried out. These were just some of the problems that were encountered in attaining "the objective of a highly productive dairy, not only to educate the students but to educate the dairymen of the state so that they would improve their dairies, for milk production was one of the foremost of its industries."

In his autobiography, Roberts describes the development and improvement of the grade herd he inherited: "Year after year, I quietly picked up a Jersey here and a Holstein there, bred grades and a few pure-bloods, sold every season the poorest of the herd—replacing them by purchases of better ones or by those of our own raising; until the dairy herd of twenty-five cows averaged eight thousand pounds of milk per cow per year. Some of the best cows exceeded twelve thousand pounds per year. At that time, the State Dairymen's Association estimated that the average yield per cow per year throughout the state was between three thousand and three thousand five hundred pounds. So at last the stars in the milky way shone clear above the Cornell hills."

About a year after Roberts came to Cornell, the president asked him if he would like to have a new barn. But Roberts was not ready for one yet, for he did not want to duplicate the mistakes of his predecessor and, further, he was not yet sure what branches of farm activities should be most emphasized. So it was not until 1879 that the "model barn" was built. Erected at a cost of \$6,000, the barn was considered a marvel of its time. President Adams is reported as saying one time, "the lines of that barn are the most harmonious of any building on the grounds." It was constructed on the side of a hill on the site of the first Comstock Hall and represented the embodiment of Roberts's dreams. Described by Roberts, "The lower story was devoted to dairy animals, and from their feet to the top of the metal cow surmounting the lightning rod, which projected about four feet above the cupola, was just one hundred feet. The basement also contained a covered yard, an engine and boiler, an ice house, a root cellar, and a milk delivery room. The horses, wagons, granaries, and office occupied most of the second floor; the sheep, grain, hay, straw, and stationary thresher, the third floor. Provision was made for everything a barn should contain, except poultry—which it should not contain. In the basement



and under the horse stalls, a space, about 44 by 60 feet, was set apart to store manures, and this provided a place where the cows might stretch their legs as health demanded. The large crops of grain furnished straw enough to keep this exercising yard fairly tidy." A piggery was added later to the barn.

### Instruction of Students

The primary purpose of the university during the 1870s was the instruction of resident students. But enrollment in agriculture was very low at first, and during the year 1873-74, only 7 students were in agriculture out of a total of 509 in the university. Roberts recommended the abolition of tuition for agricultural students, which was approved by the trustees. Free tuition, along with improved relationships of the university with farm groups, helped greatly in attracting students, and the number enrolled in agriculture increased rather dramatically during the next few years (see table 1).

**Table 1. Student enrollments**

<i>Year</i>	<i>No. in agriculture</i>	<i>No. in university</i>
1874-75	18	532
1875-76	17	542
1876-77	29	561
1877-78	42	529

*Source:* Colman 1963.

But there was a fall in student numbers for a few years after 1878, which created more pressing financial difficulties. In 1880-81 the number was down to 26 in agriculture and a total of 399 in the university.

The work of Roberts was greatly aided by the appointment to the staff of W. R. Lazenby (horticulture) and Henry Comstock (entomology) in 1874. They were added primarily to conduct resident instruction, but they soon recognized that effective teaching in horticulture and entomology required a firsthand knowledge of the problems faced in producing plants and in controlling insects. Comstock contributed greatly to Cornell's reputation by helping farmers control insect damage to their crops. And with this, his own reputation as a noted entomologist grew. Lazenby worked successfully in the establishment of working relationships between the university and farmer groups and, thus, might be considered Cornell's first specialist in extension.

Available records indicate that the course on applied agriculture taught by Roberts included cattle and other livestock, handling of milk, and the production of butter and cheese. The "dairy building" at that time was an old house that stood on the area now occupied by Bailey Hall; it was in use from 1880 to 1893.

## First Cornell Agricultural Experiment Station Organized

Like other land-grant colleges, Cornell started as a teaching institution because there was practically no scientific research in agriculture. But stimulated by the inquiring minds of students and the need for scientific instructional materials, Professor Roberts and the other professors as they were added began to carry out experiments and to record the results of their work.

Roberts conducted early experiments on farm manures and on making silage from green crops that were important contributions to improved farm practices. In his description of some work with animals in his new barn, Roberts wrote: "The sheep quarters on the third floor, where winter lambs were reared, was practically frost proof. The lambs which yeaned in December and January were highly fed and, when from six to seven weeks old, were hog-dressed and expressed to New York City where they found a market at prices ranging from five to ten dollars per head. We learned among many other things, for this was an experimental as well as a commercial undertaking, that if ewes were not shorn before going into winter quarters, the high feeding and mild temperature made it very uncomfortable for them, although such conditions were ideal for making the lambs grow rapidly."

With the leadership and encouragement of Professor Roberts, the Cornell University Agricultural Experiment Station was organized in February 1879, the second of its kind in the United States. The first station had been established at Middletown, Connecticut, 4 years earlier in 1875. The Board of Control comprised the members of the faculty of agriculture and one delegate from each of seven agricultural organizations and farmers' clubs. At the board's first annual meeting on June 20, 1879, officers were elected: I. P. Roberts, president; G. C. Caldwell, director; A. N. Prentiss, treasurer; and W. R. Lazenby, secretary. All work of the station was volunteer and limited by the amount of time not required for professional duties of the university. The experiment station had no funds, except for \$250 given by Miss Jennie McGraw for the printing of the first annual report of 133 pages in 1880. This report included work in dairying, entomology, agricultural chemistry, horticulture, and field crops, covering all work in progress since 1874.

Reports dealing with animal husbandry and dairying included the following:

"The Influence of the Ration on the Composition of Milk," by G. C. Caldwell, in cooperation with I. P. Roberts.

"Observations on the Lung Plague of Cattle (pleuropneumonia contagiosa bovina)," by James Law.

"Field Experiments with Various Crops (wheat, oats, corn, grasses [clover and timothy], clover, mangels-wurzels)," by I. P. Roberts.

"Experiments with Various Fertilizers on Indian Corn," by G. C. Caldwell.

"The Effect of Exposure of Cream to Oxygen on the Quality of the Butter," by L. B. Arnold.

"The Effect of Sour Whey on Curd," by L. B. Arnold.

"Experiments upon the Curing of Cheese," by S. M. Babcock.

It is interesting to note here that S. M. Babcock was a graduate student and instructor in chemistry, 1875-77. Along with Whitman H. Jordan,

Babcock was responsible for the chemical analyses and related work for the early experiments of the Cornell University Agricultural Experiment Station.

Included in this first volume also was a brief report of some of Roberts's work on silage. "Ensilage of cabbage leaves, made in a pit, was of excellent condition and was readily, greedily eaten by cattle... even though it had changed to a dark brown product with a strong, sour odor."

Another note indicated that 1 bushel of carrots and 1 bushel of oats were equal to 2 bushels of oats in feeding workhorses and that horses thrive upon a change in diet.

Encouraged by the beginnings of agricultural experiments, the board of trustees appropriated \$1,000 for the station for 1881-82 and \$1,145 for the year 1882-83.

The second report appeared in 1883 and gave the results of several experiments in cattle feeding and crops conducted by Professor Roberts. These included ensilage for young cattle and beef cows, malt sprouts compared with grain, and ensilage compared with dry feed for milch cows. These tests demonstrated that silage of good quality can be substituted for dry feed without danger of any notable change in animal performance. Studies also were made on the relative proportion of nutrients in the tops and butts of corn stalks. Field experiments were made with wheat and oats with respect to modes of seeding, varieties, and responses to different fertilizers. Analyses were made on several fodders.

From his experiments, Professor Caldwell reported, "We have not sufficient data from actual feeding experiments upon which to base a reliable calculation of the maintenance ration, or of a ration for the production of a certain effect. The effect of these rations tested is by no means always proportional to their richness." Further, he pointed out that amides "make up no small part of the so-called crude protein of some of our feeding stuffs, and enter still more largely into the calculated digestible protein of this crude protein." With reference to earlier records of a large number of feeding experiments that were being reported from England and Germany, Caldwell also stated, "It is not, therefore, a matter for surprise that expected results are not always obtained with feeding rations composed largely of characteristic American feeding stuffs and calculated on the basis of digestible nutrients; nor that different combinations of such feeding stuffs showing like richness in digestible nutrients, when calculated by the German tables of digestibility, may produce unlike results."

In the light of the progress in soybean production in the United States in the present century, it is of significance to observe that a brief report was made on the analysis of soja bean and pod, which was provided by a student from Japan. It was felt that soja bean should prove to be a valuable plant in the United States as a food or fodder. Many years later soybeans became one of the most important crops in America.

The third and last report of the early Cornell station covered the period 1882-83 through 1884-85 and was published in 1885, the university having continued modest support with an appropriation of \$750 for the services of a chemist in 1883-84. This report covered seven investigations dealing with livestock. These included reports by Roberts on his extensive work on stable manures, ensilage for young cattle, effects of sudden changes in the ration on the composition of milk, and field experiments with several crops (corn, wheat, oats, and mangolds). Caldwell reported on his studies of the productive effect of the same ration with different breeds of cows and gains of steers on a fattening ration.

Interest on the part of farmers in the applications of research to agriculture was increasing rapidly, so the three reports of the station were soon out of print. As a consequence, the university published in 1886-87 a volume of papers selected from the reports under the title *Studies in Practical Agriculture*.

## Hatch Act Provided Funds for Research

With the publication of the third report, the activities of the first Cornell University Experiment Station were concluded. On March 2, 1887, the Hatch Act was passed by the Congress, providing federal support for an Agricultural Experiment Station in each state. This action was second in importance only to the earlier Morrill Act in its effect on land-grant colleges of agriculture in greatly extending their services to the people. Based on the provisions of the Hatch Act, the board of trustees immediately took action to reorganize the former station. The board appointed a committee composed of President Adams, Professors Roberts, Caldwell, and other key professors to prepare plans for the establishment of a new Agricultural Experiment Station. The job of this committee was simplified because there was already available an organization with several years of successful experience upon which the work of the new station could be planned without delay. Further, the professors already had definite ideas on the agricultural problems of the state, which they felt could be solved by research.

The report of the committee was adopted by the trustees of Cornell University on October 27, 1887, and the reorganization was officially completed on April 30, 1888, when the trustees appointed Professor I. P. Roberts as director of the new Cornell University Agricultural Experiment Station. Soon after the organization was completed, President Adams recommended that the departments involved in its work be incorporated into a College of Agriculture. This was done in June 1888 when the trustees united the Departments of Agriculture, Veterinary Science, Agricultural Chemistry, Botany, Entomology, and Horticulture into the College of Agriculture with Roberts as dean.

The Hatch Act provided \$15,000 yearly to each of the states, which made it possible to strengthen the faculty and to buy some badly needed equipment and materials for research. Without a doubt, the most profitable single investment made with these funds was the employment of Liberty Hyde Bailey from Michigan State College to become professor of horticulture in 1888. Later, the greatest period of development of the College of Agriculture was under the leadership of Bailey as dean and director during the period 1903 to 1913.

Another significant appointment was that of Henry Hiram Wing in 1888 as deputy director and secretary of the Cornell University Agricultural Experiment Station. Wing was a native of New York State and graduated from Cornell University in 1881. He returned after holding the positions of assistant director of the New York Agricultural Experiment Station at Geneva and assistant in agriculture and farm superintendent at the University of Nebraska. In 1891 Wing was appointed assistant professor in animal industry and dairy husbandry, but his work as deputy director continued for several years.

Worthy of note here is that one of Professor Wing's roommates while he was a student was W. A. Henry, who later went to the University of Wisconsin as its first professor of botany and agriculture. Although his leanings were to botany, Henry developed into an outstanding animal husbandman and nutritionist and wrote the book, *Feeds and Feeding*, first published in 1898, which became nationally and internationally known as a text and reference, the "farmers' and stockmen's bible." Later, Henry became one of the country's most famous and well-known deans of agriculture.

## New York State Agricultural Experiment Station at Geneva

Another development that took place earlier was the authorization in 1880 by the legislature for the establishment of the New York State Agricultural Experiment Station at Geneva. Cornell had sought the state appropriation, but because of some clever political maneuvering, Geneva won out. A more important factor might have been the unwillingness of the Cornell trustees to support agriculture at Cornell. The Geneva station became well known primarily because of its outstanding work in horticulture and other plant and food sciences, but it should be recognized that research was also conducted with dairy cattle and other livestock.

### Early Research in Animal Husbandry at Geneva

Four Jersey cows were acquired by the station at Geneva in 1882 and were used in feeding and management experiments. Complete records of milk production and feed consumption were kept.

Emphasis was given first to chemical analysis of milk colostrum and feedstuffs. During succeeding years, studies were made on the influence of different rations on the quantity and quality of milk; comparisons of dairy breeds with reference to production of milk, butter, and cheese; source of fat in milk; cheese and cheese making; costs of milk and fat production; glucose and starch wastes as food for animals; feeding of dairy calves; artificial digestion with pepsin; digestibility of maize stover and other fodders; flavors in milk and cheese; and alfalfa forage for milch cows.

Studies also were conducted with other animal species including fattening tests with steers, rations for fattening pigs, feeding for fat and lean meat in sheep, feeding trials with crossbred pigs, and economy of using animal food in poultry rations.

H. H. Wing was the first assistant to the director of the Geneva station and was succeeded in 1884 by C. S. Plumb who served to 1887. Professor Plumb later was the widely known and respected head of the Department of Animal Husbandry at Ohio State University. It is also worthy of special note that S. M. Babcock was the first chemist at Geneva 1882-1887. His illustrious career was continued at the University of Wisconsin where the Babcock test for butterfat in milk was developed in 1890. It became the standard, and still is, by which milk and cream are sold in North America.

Others among the early scientists included E. B. Hart, assistant and associate chemist (1897-1906), who later became the distinguished professor and chairman of the Department of Biochemistry at Wisconsin; L. A. Rogers,

assistant bacteriologist (1900-1902), who later served for many years as chief of the Research Laboratories, Bureau of Dairy Industry, United States Department of Agriculture; and L. L. VanSlyke, chemist, who remained at Geneva throughout his career, which began there in 1890.

Investigations in animal husbandry were given new life when Dr. W. H. Jordan, a Cornell student in agriculture in 1877-78, was appointed director of the station in Geneva, on July 1, 1896. He was the moving force in many of the experiments, and one of his major contributions was the classic book, *The Feeding of Farm Animals*, in 1901. This book was used widely by students at that time and was one of the Rural Science Series, edited by Liberty Hyde Bailey, published by the Macmillan Company.

Based on the annual reports of the Geneva station, there was little, if any, cooperation between its staff and those in animal husbandry at Cornell during these early years.

## New Cornell Agricultural Experiment Station Began Functioning

Headquarters of the new Cornell University Agricultural Experiment Station were in Morrill Hall, with Director Roberts in Room 18A and Deputy Director Wing in Room 17B. In their First Annual Report, for the year 1888, Roberts and Wing commented that at the time the station was organized "the Department of Agriculture was well equipped with land, buildings, tools, machinery, and domestic animals." This may have been an overstatement as reference was made in several subsequent reports on the need for improved facilities for both teaching and research. In the first report, Professor Wing stated that investigations completed, or in progress, included a more extensive repetition of their former work on the effect of feeding nitrogenous and carbonaceous feeds to sheep; digestibility by sheep of clover hay and ensilage; profitable production of lean meat in mature sheep and hogs; warming of water for milk cows; feeding animals in warm and cold quarters; and soils and fertilizers, including comparative values of manures and fertilizers.

Four bulletins were published during the year 1888, three of them on animal husbandry subjects, all written by I. P. Roberts. Bulletin I, "Experimental Dairy House," describes the structure that was built in 1885 for use in the manufacture of butter and cheese and for experiments in dairy husbandry. Bulletin II summarizes the work on feeding nitrogenous and carbonaceous feeds to sheep, including slaughter data and four artist's illustrations in color of cross sections of the carcasses, showing that the amounts of fat and lean on the lambs fed on nitrogenous food exceeded that produced by those on non-nitrogenous food. Part of the bulletin was from the thesis of a student from Brazil.

Bulletin IV, "Growing Corn for Fodder and Ensilage," reports on experiments that demonstrated the value of fairly mature corn (with tassels and past the roasting ear stage) over immature corn for fodder and ensilage. Also included are results of tests on two proprietary compounds that were being promoted and sold to farmers. An Economic Seed Manure was found to be of no value, and Curwin's Hog Powder was not useful in curing swine plague or hog cholera as claimed by the manufacturers.

During the early years, the bulletins were published as part of the annual reports, but it also was the policy to make copies available to farmers. One of

Secretary Wing's jobs was to edit the bulletins and prepare a mailing list for their distribution. He gave his personal attention to all investigations going on in the fields and barns.

It should be of interest to anyone who reads this history to note that expenses for the agricultural department for the year ending June 30, 1888, amounted to \$1,303.15. How times and conditions have changed over the past 90 years! One item of expense was \$9.80 for labor for G. W. Tailby. Many years later his son, G. W. Tailby, Jr., was a staff member and colleague of mine in the Department of Animal Husbandry.

## Student Instruction

After Professor Wing was appointed assistant professor in animal industry, he was given responsibility by Professor Roberts for teaching most of the subjects in these fields. Some new courses were added, and the college announcement for the year 1898-99 listed the following courses related to animal husbandry:

Animal Industry, 3 credits. Wing

Judging and Scoring Horses, Swine, and Sheep, 1 credit. Roberts

Dairy Husbandry - Milk and Butter, 4 credits. Wing

Dairy Husbandry - Cheese, 3 credits. Wing

Dairy Husbandry - laboratory work, 1-3 credits. Wing

Diseases of Farm Animals

Physiology of Domestic Animals

Taught in agriculture by professors  
in veterinary medicine

In just a few years, several new courses in poultry husbandry were taught by James E. Rice.

The number of students enrolled in agriculture remained relatively small (20-30), but increased gradually beginning in 1897-98. Total enrollments of regular and special students in the college over the period 1881-90 were 332, but almost doubled to 653 during the next decade, 1891-1900. During this same time, there was a 12-fold increase in the number of graduate students in some phase of agricultural science. Although a majority were graduates of Cornell, many came from 20 other states and Canada, and one from Russia (Colman 1963, pp. 134-35). Only a few of the graduate students were in animal husbandry, compared with horticulture and entomology.

## Winter Courses Established

In the winter of 1892-93 Cornell established its first short course, which was designed for working farmers who could get away from the farm only during the winter months. The only requirements for enrollment were a minimum age of 16 and "good moral character." In 1891 President Adams had recommended a winter course of study that would conform to "the necessities of agricultural life." Roberts was anxious to undertake such a course, modeling it after one that had been developed successfully by Professor Henry at the University of Wisconsin. A desire to get closer to the people prompted the establishment of these short courses. Accordingly, Director Roberts in-



vited a group of 80 farmers and agricultural educators and leaders to a conference to consider many aspects of agriculture, including methods of getting more students at Cornell to study agriculture. After much discussion, this group indicated its strong support for a winter short course, for university extension work in agriculture, and for larger appropriations for farmers' institutes (Colman 1963, p. 116).

The first short course was general in nature, but in 1894 a dairy course was added to teach butter and cheese making. During the next year, courses were added in breeds and breeding, feeds and feeding, and special lectures in poultry. The number of students enrolled increased from 61 the first year up to 201 in 1905; among them were 10 women.

The winter courses continued for about 50 years, and their importance is demonstrated by the fact that more than 10,000 students, "shorthorns" as they were labeled, enrolled during this period. When vocational agriculture instruction in high schools became generally available in the 1930s, the enrollment in the short courses declined and they were discontinued.

## Extension Work Started

As improved methods of production were developed by agricultural research, members of farm organizations such as the State Dairymen's Association, the Horticultural Society, and the Grange became interested in learning the latest findings in research. Professor Bailey's dynamic work in horticulture, especially in controlling diseases of grapes, stimulated the New York Legislature in 1894 to make a grant for extension work to enable the professors of agriculture to go out over the state and help farmers. Further appropriations for this work were made during the next 2 years, and the scope of the work was greatly enlarged by a state appropriation of \$25,000 in 1897. The legislation reads, "for giving instruction by means of schools, lectures and other university extension methods, or otherwise, and in conducting investigations and experiments...and in printing leaflets and disseminating agricultural knowledge by means of lectures." This appropriation made it possible to employ additional help to carry on instruction and investigations in fields not heretofore covered.

It is significant that these appropriations were made by the state to a privately controlled institution about 20 years before the Smith-Lever Act of the Congress, which established federal support for extension work in the agricultural colleges.

Some of the funds provided for this new appropriation were used for instruction in dairy husbandry throughout the state. Professor Wing described some of this early extension work in the Eleventh Annual Report (1898) as follows: "The theory of making butter and cheese is fairly well understood, but the art, in many cases, was found to be lamentably lacking. To bridge over this gap between art and science, two expert dairymen were employed (G. A. Smith and W. W. Hall)...men who not only knew much of the science but the art of dairy husbandry as well. These men went from factory to factory, called a few dairymen together and gave valuable instruction by first teaching the leading principles and then by practically applying them, thus showing how art and science in dairy husbandry could be joined." They held throughout the state over 50 dairy schools that were of value by calling attention to "untidy surroundings and irrational treatment of cattle." This

program was continued with a similar number of meetings each of the next few years.

A series of nature study leaflets was started, many of them on animal husbandry subjects, for the use of teachers in the schools. At this time, reading courses for farmers were also introduced, and within 2 years 20,000 farmers had been enrolled.

## Farmers' Institutes Initiated

Another method used to get closer to the people was through farmers' institutes. Professor Roberts had been an institute lecturer earlier in his career in Iowa, so it was not surprising that he introduced this form of education to New York farmers in 1877 while he was serving as president of the Ithaca Farmers' Club. This first institute was for farmers in Tompkins County, but later in 1886 an institute was held at Cornell for the leading agriculturists of the state. This gave Roberts and other faculty members an opportunity to describe their work and demonstrate how the university resources could be utilized for the improvement of agriculture. In addition to faculty, many of the speakers were practical farmers whose talks were based largely on their own experiences in crop and animal production.

One of the participants in this successful meeting was the secretary of the New York State Agricultural Society, who proceeded to organize institutes under the sponsorship of the society. One was held at Cornell, which was followed during the winter of 1886-87 with institutes at four other locations in the state. At least one Cornell professor took a prominent part in each of these institutes. Success of these meetings prompted the legislature to appropriate \$6,000 to the Agricultural Society for its institute work during 1887-88. The popularity of this form of agricultural education, along with public funds to pay travel expenses, soon gave the Cornell faculty access to nearly every agricultural community in the state (Colman 1963, pp. 90-91). Further, it gave increased recognition to the Cornell Department of Agriculture.

It was not until many years later, in 1918, that the farmers' institutes were transferred from the State Department of Agriculture to the Extension Service of the College of Agriculture. In fact, after about 1910 the institutes had become less important as a medium for extension. Many of the institute lecturers had difficulty mastering the increasing amount of technical information coming out of the research disciplines. Also, the first Farmers' Week was held in 1908 at the college; and because these events were held annually, they tended to lessen the need for the institutes.

## Early Milk Records

Professor Wing worked actively in the development of systems of milk records. He reported, "The practice of daily weighing of milk of each cow in the dairy herd was inaugurated by Professor Roberts almost from the beginning, but no continuous records were preserved before January 1889. Shortly after the Babcock test was introduced and its practicality demonstrated, the fat in the milk of each cow was determined at regular intervals beginning in November 1891. At first a sample of the mixed night and morning milk of one day was tested each week. Afterward, for several years, composite samples of

every milking were taken and tested each week. Later, to conform with the practice of the various breeders' associations in making official records, tests were made of each milking on two successive days each month" (Wing 1933).

In the Ninth Annual Report of the station, 1896, Professor Wing reported on the first 5 years of milk records for the Cornell herd, and he stated further, "We have also been able to test the weekly production of several herds of 'thoroughbred' cattle in various parts of the state." This work actually began in 1894 when in response to several breeders' associations the station agreed to send an authorized representative to supervise the milk and butter records of "thoroughbred"<sup>1</sup> cows for anyone desiring such records made, upon conditions laid down by the station. Nearly all calls for this service came from members of the Holstein-Friesian Association of America. This association in 1885 had adopted a set of rules establishing what became known as a system of Advanced Registry into which no cow was allowed to be entered until she made a certain record for milk or butter production, the amount of this record depending on her age. Tests were made for 7 days and later for 30 days.

The first report of these records made on breeders' herds was in Bulletin 152, "Studies Drawn from Officially Authenticated Tests of Holstein-Friesian Cows," by H. H. Wing and Leroy Anderson. These records were from eight different herds and 153 different animals. Eleven different men supervised the tests reported in this bulletin; among them were Professor Wing, George C. Watson, Leroy Anderson, and Hugh C. Troy. Later, Troy became a prominent professor in dairy manufacturing at Cornell.

This work on milk records gained wide recognition and soon extended to every state. Many changes and improvements have been made in the official milk-testing programs during the past 90 years, but these early records provided the basis for breeding and selection, which were of great significance for dairy cattle improvement.

## Research Expands during the 1890s

Work in the Agricultural Experiment Station continued to expand fairly rapidly each year, many of the earlier experiments being repeated to verify the results; but new investigations also were started to solve additional problems of farmers. Director Roberts and Deputy Director Wing were the leaders of most of the work. By the time the Fifth Annual Report was issued for the year 1892, 47 bulletins had been published, with 16 of them concerning dairying and livestock production. The most significant of these dealt with feeding experiments with swine and sheep; lean meat production studies; production and care of farm manures, including leaching and fermentation losses; effect of grain rations for cows on pastures; sugar beets as stock foods; and dehorning of cattle. The bulletin dealing with methods of dehorning and on the best means of preventing the growth of horns proved to be the most popular based on requests from farmers for copies.

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<sup>1</sup>In these early years, the term "thoroughbred" often was used incorrectly, for it is the name of a breed of horses. The proper term is purebred, which is commonly used today to identify an animal both of whose parents are duly recorded in the Registry Association for the breed or are eligible for registry.

Of special interest also was a report on the application of Dr. Babcock's centrifugal method to the analysis of milk, skim milk, buttermilk, and butter.

Clinton D. Smith assisted Wing with details in the fields and barns for a couple of years, but he resigned in March 1891 to accept a position as director of the Agricultural Experiment Station in Minnesota. He was succeeded by George C. Watson, a graduate of Cornell in the class of 1881. Another young man, James E. Rice, although not a staff member at first, aided the agricultural department during the year 1891. Later he became one of the world's leaders in poultry husbandry.

The Sixth Annual Report for 1893 contains Bulletin 52, "Cost of Milk Production," by Henry H. Wing. This was the first report to set forth clearly and emphatically that the variation in cost of milk production is due largely to a single cause, the individuality of the animal. Feed costs for producing 100 pounds of milk ranged from \$0.44 to \$1.48, and it was concluded that milk could be produced for \$0.65 per cwt. Cows consuming the most food produced both milk and fat at the lowest rate, and no food was so cheap as good pasture grass.

The second building to house dairy instruction on the Cornell campus was completed in 1893. It was built with state funds and is now the north wing of Goldwin Smith Hall, the main section of which was constructed at a later date for the College of Arts and Sciences. An outline of a Babcock test bottle and pipette was carved in one of the stones at the north entrance to the building and may be seen there today (even though this doorway was closed many years ago).

Because animal products are used for human food, careful consideration was given during these formative years of the college and the station to the relationship of disease among farm animals to public health. Assertions were being made that bovine tuberculosis and similar diseases could be transmitted to people through meat, milk, and butter. Professor James Law and his associates in the veterinary department made careful and extensive studies on this subject, and their bulletins were included in the regular station series. These bulletins did much to arouse public interest in the eradication of bovine tuberculosis and other animal diseases.

James Law also instituted investigations to secure a fuller knowledge of the causes of contagious abortion in milk cows. During the preceding quarter century, it had caused more losses in dairying than all other diseases combined. Many reports of mortality among swine also were coming into the college from farmers. Experiments were started to determine the cause and remedy for this problem.

Another staff member was added, A. R. Ward, to begin investigations on bacteria in milk. The staff in 1898 also included Dr. V. A. Moore as a consultant in dairy bacteriology. Later, he was to become the well-known and highly respected dean of the College of Veterinary Medicine.

Professor Wing's work included studies of the relation of food to quality of milk, tests of cream separators, investigations of milk pasteurization and sterilization and making butter from whey. He reported on his studies on the effect of feeding fat to cows (Bulletin 92, 1895); no increase in the fat in the milk resulted from feeding tallow to the cows in addition to a liberal grain ration.

Work on sheep and swine continued and was reported in Bulletin 88, "Early Lamb Raising," and Bulletin 89, "Feeding Pigs," both by G. C. Watson, during the year 1895. This work on pigs involved tests of cornmeal, corn gluten feed, and meat scrap.

Apparently, there was a lull in research in animal husbandry in 1896 and 1897, for the station reports did not contain any research bulletins. Professor Wing was on leave of absence for 9 months in 1897 to make an extended study of the dairy industries of England, Holland, Sweden, and Denmark.

After Wing returned, investigations in animal husbandry picked up, and the Twelfth and Thirteenth Annual Reports, 1899 and 1900, contained nine bulletins on studies of tuberculosis in cattle and its control, milk secretion, relation of food to milkfat, invasion of the udder by bacteria, tables for computing rations for farm animals, period of gestation in cows, ropiness in milk and cream, and construction of the vertical stave silo. Studies in progress included winter feeding experiments with steers and cows to determine the relative feeding value of beet pulp and silage and the relative value of both these materials compared with good mixed hay. Various rations were fed to pigs to determine the feeding value of skimmed milk when fed in combination with different grain rations, and feeding experiments were conducted with sheep. Use of silage was rapidly displacing soiling crops (chopped and fed green to animals), and increased inquiries on silos focused the need for expanded work in these areas.

Because a majority of the early investigations were concerned with animal feeding, it is significant to note that studies were made on milk records in the university herd. "The herd has been developed from the ordinary stock of the neighborhood by the use of 'thoroughbred' bulls and a rigid selection of the best heifers. This course of breeding was established by Professor Roberts in 1875 and has been continued ever since. In 1874, the average yield per cow was a little more than 3000 pounds. The descendants of these same cows... have produced an average of over 7500 pounds during the year 1897-98. This increase of two and one-half times is the result of judicious selection of sire and dam, together with careful feeding, and is a result which every farmer can obtain by following a similar course" (Bulletin 169, 1899, by H. H. Wing and Leroy Anderson).

During the year 1899, Leroy Anderson resigned to establish a Department of Animal Industry and Dairy Husbandry at the University of California. James A. Foord joined the staff in dairy husbandry in 1901.

The results of studies on sugar beet pulp as a food for cows were published in Bulletin 183 in 1901. Beet pulp was described as especially valuable as a succulent food. As it came from the factory, beet pulp was worth one-half that of corn silage, and dry matter in the pulp proved to be equal, pound for pound, with the dry matter in corn silage.

In the Fifteenth Annual Report, 1902, Professor Wing stated "A most notable advance has been in the inauguration of a series of cooperative experiments in poultry keeping." These investigations involved the cooperation of eight prominent poultry farms, one of which was owned by James E. Rice. Part of the results were published in Bulletin 204, "Cost of Egg Production," and Bulletin 211, "Cooperative Poultry Experiments: The Yearly Record of Three Flocks," both by Henry H. Wing. Some of the data are of interest: the average daily production of eggs was 34.7 percent of the flock population; yearly production was 129.7 eggs per hen; average cost of a dozen eggs was 9.2 cents; average cost of feeding a hen was 99.6 cents; 44 percent of the total value of the product was required for feed; average value of eggs at market exceeded the cost by \$1.31 per hen. How conditions have changed!

Otto F. Hunziker graduated from Cornell in 1900 and joined the staff as a dairy bacteriologist for a period of about 2 years. He wrote Bulletin 197, "Investigations Concerning the Germicidal Action in Cow's Milk," and

Bulletin 203, "The Care and Handling of Milk." Hunziker then joined the faculty of Purdue University and became widely known as a teacher and an author of two textbooks, *The Butter Industry*, and *Condensed Milk and Milk Powder*. Later, the major part of his career was in private industry.

Five years of experiments were reported by L. A. Clinton in Bulletin 199, "Separator Skimmed Milk as a Food for Pigs." The most economic returns were secured with skimmed milk when cornmeal was the grain used. Experiments were conducted on feeding of sprouted corn because it was believed to be higher in sugar and more digestible than dry corn. But there was no advantage in feeding value of the sprouted corn.

A beginning was made in producing steers on dairy farms; also some trials of a new Danish system (Hegelund) of udder manipulation were conducted in 1902. The results published in Bulletin 213 in 1903 by Henry H. Wing and James A. Foord were only slightly in favor of the Hegelund method of manipulating the udder to completely remove all the milk. Wing and Foord reported on attempts to increase the fat in milk by means of liberal feeding (Bulletin 222). "In a herd of poorly fed cows, an abundant ration easily digestible and rather nitrogenous in character, and continued through two years, resulted in an average increase of one-fourth of one percent of fat in the milk (or a percentage increase of about six percent). This was accomplished by an increase of about 50 percent in the total amount of milk and fat produced. The increased production was secured economically so far as the food cost of milk and fat is concerned."

Some interesting points of view on the role of livestock in farm management are noted by Roberts in his last report, the Sixteenth Annual Report of the Experiment Station, 1903. "Sheep should be substituted for cattle on the steeper hillside pastures, as such pastures constantly deteriorate when grazed by cows because the hoofs of the animals destroy the grasses by poaching the land wherever it is sharply rolling. Sheep tend to free pastures from weeds, while the more dainty cow selects the most palatable herbage. Sheep husbandry should be revived because the raising of winter lambs is more pleasant and profitable than the production of milk."

## Roberts Retires

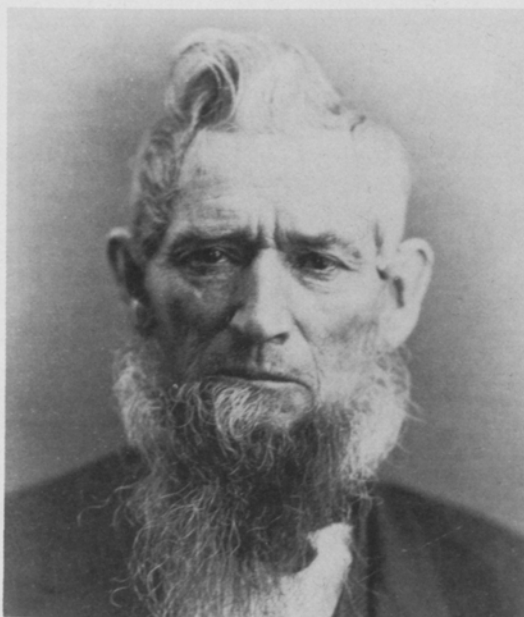
At the close of the year, June 19, 1903, Isaac P. Roberts retired and was succeeded by Liberty Hyde Bailey as dean of the faculty of agriculture and director of the experiment station. Roberts was the able pioneer leader who laid a sound foundation for the Department of Agriculture and guided its development for three decades. He taught the first courses in animal husbandry and other agricultural subjects. Reports of research were published in 211 bulletins over a wide range of subjects; but "the greatest and most beneficial feature of the Station's activities is found, however, in the phenomenal awakening of the rural population. History furnishes no other such educational advancement and improvement of methods among the rural industrial class, or any other class of people, as has taken place in America in the last quarter century....It is certain that the last quarter of the nineteenth century will be referred to by those who come after us as the great epoch-making period in the development of American agriculture" (Sixteenth Annual Report, 1903).

Growth was slow during the leadership of Professor Roberts because of limited financial support, but his policies always were sound. He has been described as "one of the great creators of Cornell of today" (Bishop 1962).

During its early years, the Cornell Department of Agriculture had encountered widespread hostility due to prejudice against theoretical "book farming" and also because it was a part of the so-called godless university that had no direct connection to any single church group. The press was not sympathetic nor were the older private colleges and universities. In spite of these handicaps, most of the graduates in agriculture obtained positions in which they demonstrated the value of their training. Acceptance by farmers was based on the ability of the staff and the graduates to solve farm problems and promote the welfare of rural people. Roberts's retirement marked the end of a significant era in agricultural education at Cornell and left a solid foundation for a College of Agriculture that was to develop very rapidly in the years that followed.

Work in animal husbandry and dairy industry lagged considerably during the latter part of Roberts's tenure compared with entomology, horticulture, and other plant sciences. As a consequence, there were relatively few graduate students attracted to animal husbandry at Cornell during this period. But this situation gradually changed in succeeding years as the importance of the animal industries became recognized.

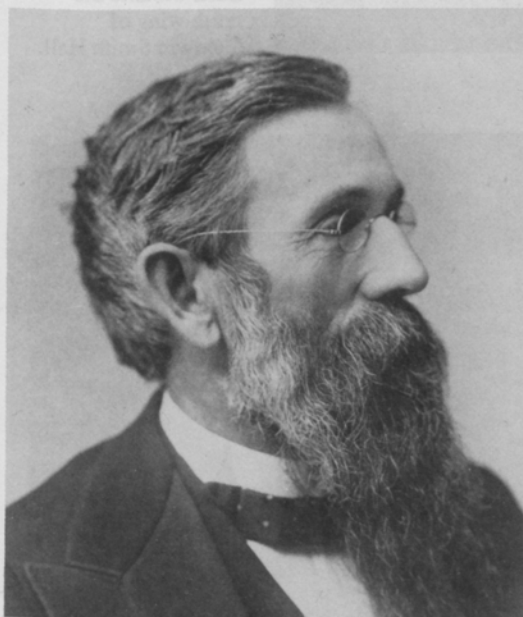




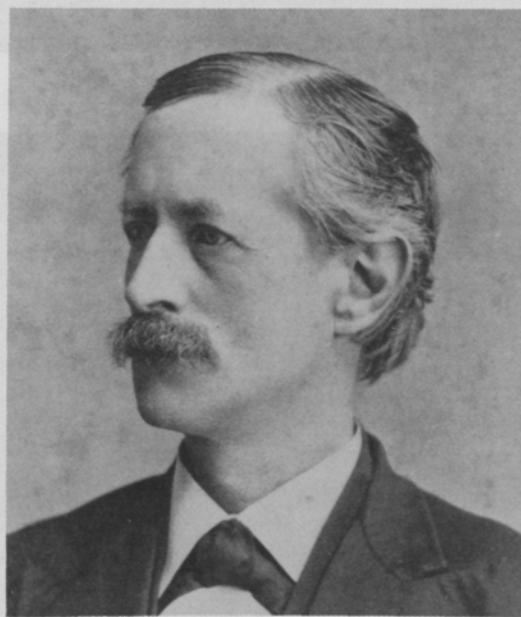
Ezra Cornell,\* founder of Cornell University.



Andrew D. White,\* first president of Cornell.



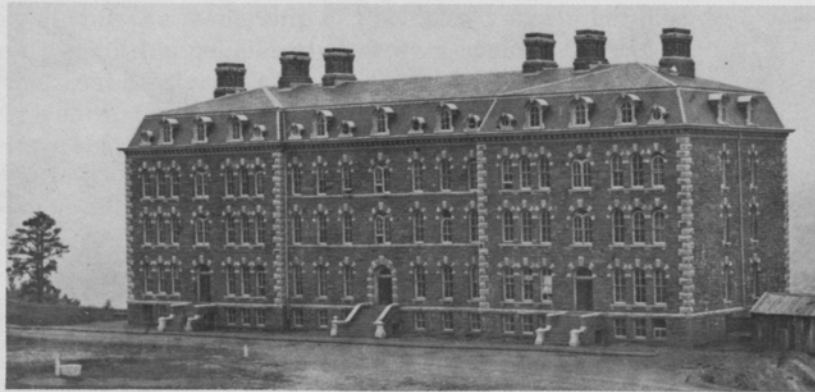
Isaac P. Roberts,\* 1874-1903. Professor of agriculture and first teacher of animal husbandry subjects at Cornell; director, Cornell University Agricultural Experiment Station; and first dean, College of Agriculture.



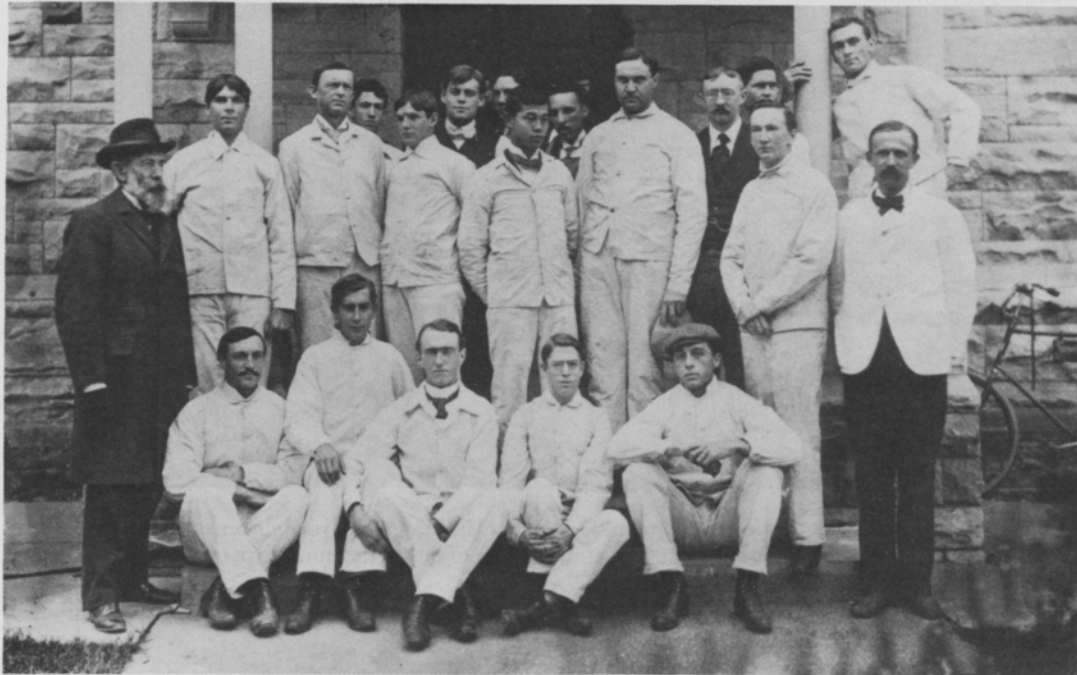
Henry H. Wing,\* as a young man and deputy director of the Agricultural Experiment Station.

\* Courtesy of Department of Manuscripts and University Archives, Cornell University Libraries.

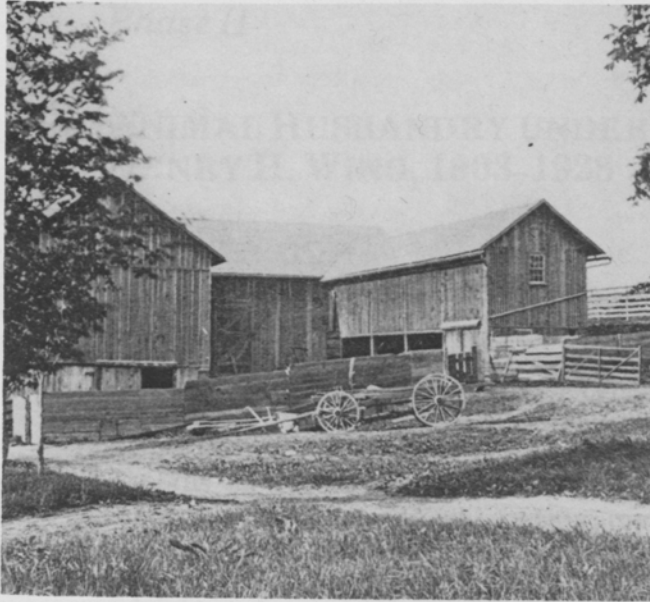
Morrill Hall—the first new building on the Cornell campus. Offices for Professors Roberts and Wing were in the basement.



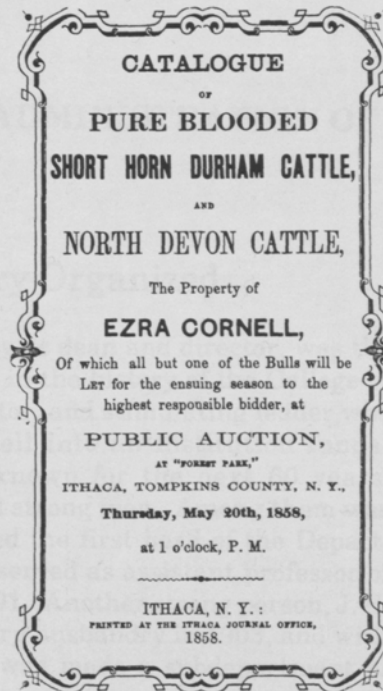
Dairy building constructed in 1893. Later became the north wing of Goldwin Smith Hall.



Group of students in dairy short course in front of dairy building with Professor Roberts (*on the left*) and Professor Wing (*on the right*).



Early farm barn on campus that stood between the present site of West Sibley and Lincoln Hall.\*



Catalogue cover of Ezra Cornell's cattle sale.



Roberts barn completed in 1879 on site of the former Comstock Hall.

\* Courtesy of Department of Manuscripts and University Archives, Cornell University Libraries.



## *Phase II*

### **ANIMAL HUSBANDRY UNDER ADMINISTRATION OF HENRY H. WING, 1903-1928**

#### **Department of Animal Husbandry Organized**

The decade from 1903 to 1913, with Bailey as dean and director, was the period of most-rapid growth and development in the history of the College of Agriculture. Bailey was the architect, innovator, and stimulating leader who guided the expansion of agriculture at Cornell into an institution fundamentally structured about as it was to be known for the next 60 years. Director Bailey organized departments around strong men. Among them was Professor Henry Hiram Wing, who was named the first head of the Department of Animal Husbandry in 1903. He had served as assistant professor of animal industry and dairy husbandry since 1891. Another strong person, J. E. Rice, was appointed assistant professor of poultry husbandry in 1903, and with the growth of this work, poultry husbandry was made a subdepartment of animal husbandry.

Professor Rice gave great impetus to poultry keeping, which made up a large part of the extension work in animal husbandry. Through his leadership, a new building of two stories was constructed for instruction and experimental work with chickens. In a few years the importance of the poultry industry was recognized, and in 1907 a separate Department of Poultry Husbandry was established with Professor Rice as head.

All instruction and research on milk and milk products, with emphasis on market milk, butter, and cheese, were placed in a separate Department of Dairy Industry with Professor Raymond A. Pearson as head. He came to Cornell from the position of assistant chief, Dairy Division, United States Department of Agriculture. The Department of Dairy Industry was transferred in 1906 from its former location to what is now called East Roberts. This new dairy building was widely acclaimed in the local newspaper as the most sanitary building in Tompkins County.

#### **New York State College of Agriculture Established**

After Bailey became director, he rapidly increased efforts that had been started earlier to obtain state support for essential buildings and for increased instruction to meet the needs of agriculture. The State Legislature appropriated funds in 1893 to build a small dairy building, and the following year the state took over the support of the Veterinary College. Except for these two appropriations, no other state funds were provided during the next 10 years. The budget for agriculture was small, and instruction was carried out in several different buildings scattered around the campus. So Bailey got busy, and with the approval of the president of the university, he organized a vigorous program with farmers and agricultural leaders to achieve his objectives for additional buildings and financial support from the state.

This program was successful, in spite of bitter opposition from leaders of other colleges and universities, chief among them being the chancellor of Syracuse University. The legislature passed the act in 1904 establishing the New York State College of Agriculture at Cornell. In addition, the legislature supported this action by appropriating \$250,000 to construct new buildings—a main building and others for agronomy, dairy, and animal husbandry. The main building was what has been known as Roberts Hall, and others were East Roberts and Stone halls. At the dedication of these buildings in 1907, Bailey stated some of the philosophy that guided his activities, "The College belongs to the people of the State. It will justify its existence only as it serves the people of the State" (Nineteenth Annual Report, 1906).

An Appropriation Act of 1906 provided \$100,000 for the promotion of agricultural knowledge throughout the state, as provided by earlier laws of 1899, and for the maintenance, equipment, and necessary material to conduct the college of agriculture. These funds became available on October 1, 1906, so that marks the time when the New York State College of Agriculture actually went into operation.

An Administration Act (chapter 218 of the laws of 1906) authorized the college to give instruction, to conduct research, and to disseminate agricultural knowledge throughout the state by publications, lectures, demonstrations, and in other such ways as may be deemed advisable. Entire control of the college was vested in the Board of Trustees of Cornell University, but it was specifically provided that "said university shall receive no income, profit or compensation therefor, but all moneys received from state appropriations for said College of Agriculture, or derived from other sources in the course of administration thereof, shall be credited by said university to a separate fund, and shall be used exclusively for said New York State College of Agriculture" (Nineteenth Annual Report, 1906).

Trustees of the university voted that receipts from the farms that had hitherto been turned into the university treasurer should be credited directly to the State College of Agriculture. This added considerable flexibility to the limited budgets in the Department of Animal Husbandry and other departments to use income derived from sales of milk and surplus animals.

Students in agriculture were permitted to take work in other colleges of the university at no cost to them. For example, during the year 1903-4, agricultural students took 1,669 credit hours in courses in other colleges.

An act of Congress in 1906 provided for an increase of \$5,000 for the experiment station above the original \$15,000 and a further increase of \$2,000 a year for the next 5 years, making the amount to be paid to each state experiment station up to \$30,000.

In the Nineteenth Annual Report of the Experiment Station, Director Bailey made this significant statement: "Of necessity, every teacher in a college of agriculture who keeps alive is an investigator; this investigation should be organized and the results published. The student catches the spirit of it and develops a scientific habit of mind, taking nothing on authority but everything on evidence." This was the beginning of the Cornell tradition that every professor is expected to conduct research in addition to teaching in order to be a leader in his or her field.



## Status of Animal Husbandry Department

During these early years, instruction in animal husbandry was offered by H. H. Wing and J. E. Rice. Subjects offered in animal husbandry were a general course, advanced and seminary work in animal technology, animal mechanics, a practice course in feeding and stable management, and elementary animal husbandry given only to students in the veterinary college. Enrollment in these courses, 1905-6, totaled 93 during the first semester and 99 during the second semester. Five courses in poultry husbandry were offered to regular students. Instruction to 221 students was given in two courses (Breeds and Breeding, and Feeds and Feeding) and in special lectures on poultry in the winter courses.

There were 508 students in the college as a whole with more than 300 enrollments in animal husbandry subjects. Additions to the teaching staff were imperative to meet the demands of increased numbers of students in the department.

In his annual report on the most urgent needs of the college, Director Bailey gave strong support for the construction of several barn structures for animal husbandry: a central or administration barn; dairy and other cattle barns and barns for horses, pigs, and sheep; and buildings for poultry. It was emphasized that additional livestock must be secured if the college was to represent the state in a satisfactory manner. Wing recommended doubling the number of breeds that were presently represented in cattle, sheep, and swine. Further, he felt that adequate numbers of livestock should include at least 150 cattle, an equal number of sheep, from 30 to 50 breeding swine, and 20 horses for teaching purposes and for performance of farm work. A small herd of grade Angus cattle was procured in 1905 for pasture experiments and class work.

Faculty members gave a few lectures to farmers' meetings, but the major extension effort in animal husbandry was in the supervision of the milk records of purebred cattle for owners of several of the leading dairy breeds. This work had started in 1894 when only 2 records were supervised, but had grown steadily up to 1905-6 with the supervision of over 1,000 records in five breeds (Holstein, Jersey, Guernsey, Brown Swiss, and Ayrshire) owned by 117 breeders. The expense for this work was largely borne by the breeders, but the supervision of the men employed for the field work and checking of their reports entailed considerable work for the office staff of the department. But Professor Wing recognized the value of this activity: "The usefulness of the work in stimulating greater interest in selecting, breeding, and developing cattle, and its appreciation by the breeders during the past 12 years, leads us to believe that it is probably as useful a form of extension work as could demand our attention and activities."

The demands upon the time of the staff of the department for teaching and extension were so great as to preclude very much attention being given to experimentation. But some of the investigations that had been conducted for several years on beef, mutton, and pork production were continued as opportunities offered during the early years of the new department.

A continuing important factor limiting expansion of animal husbandry research at this time was a lack of funds and facilities. The administration of the college had decided to use most of the federal Hatch funds to maintain two or three strong departments rather than spread the limited funds over many enterprises. It was recognized that some phases of animal work were being

handled by the veterinary college, so for the time being animal husbandry was not favored in the allocation of Hatch funds.

Several reports that had significance to livestock production were issued from agronomy. These included Bulletin 241, "Second Report on the Influence of Fertilizers on the Yield of Timothy Hay"; Bulletin 242, "Cabbages for Stock Feeding"; Bulletin 243, "Root Crops for Stock Feeding"; and Bulletin 244, "Culture and Varieties of Roots for Stock Feeding."

## Growth in Staff and Programs

Significant additions were made to the staff in animal husbandry over the next few years. Elmer S. Savage was appointed instructor in 1907 following his graduation from the University of New Hampshire. He took graduate studies, earning the M.S. degree in 1908 and the Ph.D. in 1911. Professor Savage continued on the faculty as an outstanding leader in dairy production until his death in 1943.

G. Walter Tailby, Jr., was appointed instructor in animal husbandry in the year 1906-7 and, after serving as livestock superintendent for a few years, worked effectively on the staff in the dairy records program until his retirement.

Merritt W. Harper came to Cornell in 1905 from the University of Missouri as an assistant in animal husbandry to work primarily with horses. After promotions through the ranks to a professorship in 1913, Professor Harper was on the faculty until he died in 1938.

The Round-Up Club, a group of students interested in animal husbandry, was organized at the home of Professor Wing in March 1907. The name of the club was suggested by Mrs. Wing. The Round-Up Club became one of the most active student organizations on the campus and continues to this time to function. During the 1940s, the club affiliated with the National Block and Bridle Club, which had chapters at most of the colleges of agriculture. The club at Cornell, however, retained its original name.

In December 1910 a team of three students competed at the National Dairy Show in Chicago against teams from seven other agricultural colleges and won the trophy for high score in judging all breeds. Members of the team included F. W. Bell, who later was one of the most successful college coaches of livestock judging teams at Kansas State College, and William D. Brown, who became a successful breeder at West Winfield, New York, and later served for many years as the secretary of the New York State Holstein Association.

It should be recorded here that Professor Wing was placed in charge of the breeding and management of the dairy herd on January 1, 1889, and eventually developed the Glista family of Holsteins. At one point every animal in the herd was a descendant of the original cow, Glista. The most famous cow in the family, Glista Ernestine, was born on November 12, 1908, and died on December 10, 1924, with a lifetime production of 202,006 pounds of milk and 7,342 pounds of fat. She was truly a remarkable cow and, during her time, was one of the famous cows of the breed.

Professor Wing was very versatile, working with all classes of livestock, even though his first love undoubtedly was Holstein cattle. In 1909 he reported that, starting 5 years earlier with a single pair of Cheshire swine, a herd had been developed "that stands second to none in the country in this breed." Animals from the herd won a large share of the prizes offered for this



breed at the state fair. Plans were drawn to establish a breeding herd of sheep along the same lines and to increase them as fast as facilities would permit. Meanwhile, on a farm near Batavia, he made studies on apoplexy in winter-fed lambs and demonstrated that the cause of the problem was mainly over-feeding and not the proportion of protein in the ration.

### **Reaching the People**

Faculty members in animal husbandry participated in the first Farmers' Week, which was held in 1908 and attracted about 300 persons to the College of Agriculture. The following year Farmers' Week combined lectures, demonstrations, and exhibits, with 2,000 rural people in attendance. Parades of some of the department's animals down Tower Road were featured. Farmers' Week was popular and continued to attract large audiences for many years. It helped to bring the college closer to the rural people, serving an effective educational function. The name was changed to Farm and Home Week in 1928, and in 1960 the program was shortened to 3 days and further streamlined under the name of Agricultural Progress Days.

As a novel approach in 1908-9, two educational trains were operated by the Erie and New York Central railroads in cooperation with the college. On the tours around the state, these trains, carrying exhibits and professors to give lectures and demonstrations, reached, directly, 25,000 persons and, indirectly, many more. In addition, most departments of the college were represented with exhibits at the state fair. The following year five different special railway trains were used so that lectures and demonstrations could be offered in different parts of the state. Some animals were included in exhibits and demonstrations.

In addition to bulletins that summarized the results of investigations, professors in animal husbandry gradually became involved with the preparation of leaflets for teachers in the nature study program to provide information on many livestock subjects. Some examples of these early leaflets included *Different Breeds of Goats*, *A First Lesson on the Horse*, *Estimating Age in Horses*, and *Horse Training*.

Two series of reading courses, one for farmers and the other for farmers' wives, were introduced in 1898 as a means of making rural life more profitable and enjoyable. Each lesson (bulletin) was accompanied by a list of questions designed to encourage the readers to apply the lessons to their own farm situations. Farmers were further encouraged to form study clubs to discuss the lessons and their application to their farms. Also, books were recommended for further study. Some of the early animal husbandry subjects were balanced rations for farm animals, the dairy herd, keeping sheep for profit, silos and the production and feeding of silage, contagious abortion of cattle, the curing of meat and meat products on the farm, production of clean milk, farm butter making, the Babcock Test and testing problems, and the beef breeding herd in New York State.

### **Public Sales of Surplus Animals**

Beginning in February 1911 an annual public sale of surplus animals at auction was held in the Livestock Pavilion. In the announcement of the first sale, Professor Wing wrote: "The Department of Animal Husbandry of the New York State College of Agriculture maintains its herds and flocks

primarily for instruction purposes, breeding them as carefully as circumstances allow. From time to time, surplus animals are produced and heretofore these animals have been disposed of privately as opportunity offered. The herds have now reached a size where the number of animals to be disposed of is increasing, and it seems best to dispose of these surplus animals publicly; hence this small offering."

The first sale listed 10 Holstein-Friesians—5 bulls, 2 cows, and 3 heifers—and 3 Jersey bulls. Also, 21 sows and 7 boars of the Cheshire breed were sold.

These sales of surplus animals were held annually during Farmers' Week, with the 19th sale held on February 15, 1929. This last sale listed 14 Holsteins (10 bulls and 4 females), 2 Guernsey bulls, 1 Jersey bull, 2 Ayrshire bulls, 1 milking Shorthorn bull, 10 Duroc-Jersey swine (1 boar and 9 sows), 6 Chester White sows, 1 Berkshire sow, plus a group of 10 grade Dorset ewe lambs. During the intervening years, a few Percheron stallions were sold in these surplus sales.

During the latter years there were some criticisms among livestock breeders who felt these sales served as a means of culling inferior animals, which should have gone to the butcher. Incidentally, I have all the old catalogues that were obtained from Professor Savage's files. I have studied these old sale catalogues and read a note written by Professor Savage on the back of the catalogue for the 19th annual sale, "poor animals should not be sold." Another item of particular interest in my files is Catalogue of Pure Blooded Short Horn Durham Cattle and North Devon Cattle, the property of Ezra Cornell, at public auction, at Forest Park, Ithaca, Tompkins County, N.Y., Thursday, May 20th, 1858. Eight "Short Horn" bulls and nine cows and heifers were listed, and two North Devon bulls and five cows and heifers.

### **More Space and Equipment Needed**

Student enrollments in the college continued to grow each year from 296 in 1904 to 840 in 1908-9 and 968 in 1909-10. These growth rates led Director Bailey to write President Schurman, "We are now face to face with the problem of either developing space and equipment in the College of Agriculture, or limiting the number of students who shall be admitted" (Twenty-second Annual Report, 1909). Actually, a few departments did deny some admissions during the next year or two because of a lack of facilities.

In this same report, Bailey gave strong support to the needs of the Department of Animal Husbandry. "On the livestock side, there should be departments of animal nutrition, animal breeding, stock farm management or some other division representing the practice and business of rearing and handling animals, an officer who shall devote himself largely to stock judging, and other officers who are expert in the different groups of species of animals. There is a special need for scientific and long-continued investigation into the principles and practice of the breeding of domestic animals, a subject that remains practically unattacked, notwithstanding voluminous writings on it. The proper study of this subject would entail much expense for animals, lands, equipment and men; but sooner or later the inquiry must be undertaken. It is useless to begin work of this kind without ample facilities and the assurance that the work will be continuous. At this college, the livestock interests have grown in recent years and we have no apologies to make as far as we have gone; but the work is far short of meeting the needs of the State."

As evidenced by their annual reports for the next few years for the college and experiment station, Professor Wing, Director Bailey, and President Schurman all continued to emphasize the needs for staff, equipment, and facilities for animal husbandry. In his annual report for 1910, Professor Wing wrote, "The department has now completely outgrown its accommodations; we need larger classrooms; larger offices and additions to the teaching force; new equipment, especially for sheep and swine; and one or two breeds of cattle." President Schurman gave his support and described "animal husbandry as one of the largest and most important agricultural interests in the state and the facilities for this part of the College work are meager and totally inadequate. It is necessary that new laboratories, barns and equipment be provided before the students can be given proper instruction." All these efforts got results, and state funds were obtained for new facilities.

Bailey wanted to put the new livestock barns near the Roberts Hall complex of buildings, but President Schurman insisted they should be located at the eastern edge of the campus. The dairy barn was located just east of Judd Falls Road and immediately south of Tower Road and was occupied in 1910. A little later new barns were constructed nearby for horses, sheep, and swine.

Provision was made in the legislative requests in 1913 for a new office and laboratory building to house the department and for a livestock pavilion for use in teaching judging and selection. These buildings were constructed and put into use during the year 1915. The animal husbandry building (later named Wing Hall) cost \$90,000, with an additional \$20,000 for equipment. It provided offices, classrooms, and teaching laboratories. Of particular significance was the inclusion of a chemistry laboratory for research and facilities in the basement for slaughtering of animals and processing of meat products. The stock-judging pavilion cost \$38,000. Several years earlier, a livestock pavilion was constructed in the eastern part of what is now called the Ag Quadrangle. When I came to Cornell in 1930, it was being used by the Department of Agricultural Economics and Farm Management.

The livestock inventory, taken on September 30, 1912, for the department, showed the following: 58 horses (Hackney stallion, percherons, work-horses, grades, mules, and colts); 90 cattle (Holsteins, Jerseys, Ayrshires, Guernseys, Shorthorns, and 9 grade cows); 58 sheep (Dorsets, Rambouillets, Shropshires) plus 46 grades and 75 lambs; and 25 swine (sows and boars), plus 40 suckling pigs (Cheshires). This showed considerable growth over the first inventory that had been taken some 38 years earlier by I. P. Roberts.

In his report for the year 1911-12, Professor Wing stated that 408 students were enrolled the first semester and 282 students, the second semester, in animal husbandry courses. There were 354 students in winter courses and 58 in summer school. Three graduate students received M.S. degrees in animal husbandry in June 1912.

## Research Expands

With additions to the staff of Savage, Tailby, and Harper, there was modest expansion of experimental work in the department, even though facilities and equipment were still very meager. Under the direction of Professor Wing, Savage continued the experiments started earlier on the substitution of roots for concentrated foods in rations for milk production. As reported in Bulletin 268, less dry matter was required to produce 1 pound of butterfat

when mangels were fed as a succulent food with a full grain ration than was required with any other combination. Dry matter in mangels was a little more than equal to dry matter in silage and could replace one-half of the grain ration when fed with mixed hay and silage.

Savage and Tailby reported on calf-feeding experiments in Bulletin 269, "Substitutes for Skim Milk in Raising Calves." It was found that good, strong healthy calves could be raised without skimmed milk, or milk of any kind, after the first 30 days. The best substitute for skim milk was dried skimmed milk powder. Several commercial calf meals were tested. Among them, Schumaker Calf Meal, manufactured by the Quaker Oats Company, was the best substitute for milk on the market at that time. Blatchford's Calf Meal was described as satisfactory, but too expensive. The same was the case for Lactina Suisse, a vegetable milk powder manufactured in Switzerland and France. An extension of this work was reported later in Bulletin 304 by Savage and Tailby.

The most-significant early research by Savage was his doctorate thesis completed in June 1911, "A Study of Feeding Standards for Milk Production," which was published in Bulletin 323 in 1912. This was a 2-year study of the Haecker and Armsby feeding standards that had been proposed, with favorable attention from dairymen. Savage's work suggested a modification of Haecker's feeding standard, recommending an increase of 35 percent of protein needed for milk production, but the amounts of nutriment and protein for maintenance were left the same. Also, in his standard, Savage gave the requirements in terms of digestible protein and total nutriment (digestible nutrients) instead of in terms of digestible protein, digestible carbohydrates, and digestible fat. This approach was more feasible because with varying feeds in the ration it was impossible to construct rations to meet three different requirements of protein, carbohydrates, and fats. Although they never attained wide usage, the Savage feeding standards were of great value as a model over the years in the preparation of the more-modern feeding standards for dairy cattle, especially the Morrison standards, which did become widely used.

The first horse-breeding experiments were conducted under Harper's direction in 1908. The number of horses was increased that year with the purchase of a team of purebred Percherons, a team of crossbred hackney-standardbred mares for driving purposes, a team of draft-type grade Belgian geldings, and four teams of draft workhorses. Research with horses was gradually extended as facilities became available, and studies were made on the effect of various rations in developing colts and fillies. Because of the meager facilities and the length of time required to grow a horse, results accumulated slowly; but the beneficial effects of protein-rich rations and of exercise in the sunshine were demonstrated in developing animals of quality and substance.

The relative value of oats and corn as a grain for the mature workhorse was investigated; it was found that corn had a higher feeding value than was commonly believed at that time. These studies aroused considerable interest among farmers. Subsequent studies included the proportion of grain to hay that should be fed to the working horse, the value of grinding or chaffing hay of good quality, and a comparison of a ration of grain and succulents with a ration of grain and clover hay.

Other experiments during the early years of the department under the direction of Professor Wing included economy of raising winter lambs—hothouse lambs—for the New York City market, utilization of skimmed milk

in the production of pork, breeding and development of dairy cows, cabbages for stock feeding, and the utilization of molasses as a food for animals.

## Growth in Extension

Director Bailey's viewpoint on training for extension work was expressed in the Twenty-fifth Annual Report in 1912: "The extension work should be in charge of an extension staff. An extension staff should be as well trained for its work as another staff member is trained for regular teaching or for research. The members should be paid as well as members of other staffs. These persons should be students by nature. They must keep up with the best scientific work in their fields, and all of them should have opportunity to make tests, experiments, and studies of their own. If a person is to impart much, he must acquire much."

This philosophy was significant because of the general feeling that faculty members engaged in resident teaching and research had more status than those involved in field extension education. And it was probably true throughout these earlier years that, although the staff members with responsibilities in extension were highly qualified in the art and practice of animal husbandry, they generally lacked the scientific training of most of those in research and teaching. It was not until the 1940s, as will be discussed later, that, in the administration of the Department of Animal Husbandry, emphasis was given to equal training through the Ph.D. level as a qualification for extension specialist positions, the same as for positions in resident instruction and research.

Whereas the staff had conducted educational meetings with farmers for several years, the first to be named extension specialist in animal husbandry at Cornell was Herbert A. Hopper, who was employed for 3 months during the winter in 1911 and again in 1912. He then took up full-time duties as extension professor of animal husbandry. Professor Hopper was born on a farm in Tompkins County and graduated from the College of Agriculture at Cornell in 1903. After graduation he served as instructor in dairy husbandry at the University of Illinois until 1907 and earned the degree of master of science. He was a charter member of the American Dairy Science Association, being one of 17 founding members at the University of Illinois in 1906. While at Illinois Professor Hopper inaugurated a system of testing dairy herds for milk production, which was one of the forerunners of the present-day system of dairy herd improvement testing. From 1907 to 1908 he was an extension dairy husbandman at Purdue University and from there went to the University of California where he was assistant professor of dairy husbandry until 1911. At California, Professor Hopper started a dairy course for butter and cheese makers, and began a series of educational butter-scoring contests for butter makers, which continued for many years. In 1911 he returned to New York and operated his dairy farm near Ithaca.

Professor Hopper gave his attention to all aspects of dairy herd improvement, with special emphasis on cow testing associations. This work was beginning to gain attention in New York and other states as a means of recording the production of all cows in a herd. Before this time, Professor Wing had promoted official 7-day and 30-day records on selected cows, which had become known as the Advanced Registry.

In his early work at Cornell Professor Hopper made an extensive examination of the cost of milk production in Jefferson County in cooperation with Mr. F. E. Robertson, county agent. The results of this study were published in Bulletin 357, "The Cost of Milk Production," March 1915.

The Animal Husbandry Department presented educational exhibits at six district and county fairs in 1915. The staff gave about 50 lectures over the state to farmers.

### **Cow Testing Associations Started**

The first cow testing association in New York State was started in northern Tompkins and southern Cayuga counties in December 1908. There is evidence this development resulted from leadership of some of the staff of the Dairy Industry Department, but they were informed by Professor Wing that this activity fell within the province of the Department of Animal Husbandry. The association was a loose organization of 15-20 dairy farmers who banded together to employ a cow tester or supervisor to visit their farms one day each month to weigh the milk for each cow and test it for butterfat, using the Babcock test. Progress of this development was slow; but about the same time a circuit was started in Allegany County, and others were initiated in 1911 and 1912 in Chautauqua and Delaware counties.

This plan of testing all cows in a herd had been started in 1905 in Michigan and was imported by Helmer Rabild, an immigrant from Denmark, who was working in a creamery. Mr. Rabild was appalled by the low milk production of herds shipping to the creamery and developed this plan as a method for herd improvement through the use of the milk records as guides for better feeding and for culling of the lower producers.

When official production-testing programs were started earlier, the breed associations asked the colleges of agriculture in all the states to assume the responsibility of providing men to do the testing and to supervise the record programs. The colleges accepted this responsibility, and it has been estimated that at one time Professor Wing had more than 200 men working under his direction in the supervision of the 7-day and 30-day tests. In these early years the test for butterfat was used as a means for calculating the production of butter by the cows.

It would seem logical that when cow testing associations were developed, the College of Agriculture would assume a role of leadership in this phase of dairy records. But such was not the case at first, for the New York State Department of Agriculture had the supervision and control of this cow testing program during the early period.

Professor Wing wrote several bulletins on cow testing work as a means to improve the dairy industry, including *The Formation of Cow Testing Associations*, Circular 17, April 1913. These publications indicated Professor Wing's interest in cow testing association work, yet there is also evidence that he did not hold this form of herd testing with the same esteem that he did the official Advanced Registry type of record because of the more stringent supervision with the latter system.

From the census data for 1899 and 1909, it was clear that little progress was being made in milk production per cow before the initiation of the testing associations. In 1909 there were 1,509,594 cows in the state that produced 4,410 pounds of milk per cow.

A very significant development occurred in 1916 when a planning committee of the College of Agriculture recommended that the cow testing association program should be brought under the direction and administration of the Extension Service and conducted as "on farm demonstrations." When this transfer was made from the State Department of Agriculture to the college, the name was changed from cow testing to Dairy Improvement Association and then later changed to Dairy Herd Improvement Association (DHIA) as the official name for the national program.

With the transfer of the cow testing program to the administration of the Extension Service, its supervision became the responsibility of the staff of the Department of Animal Husbandry. Growth was slow; but through a gradual evolutionary process in the years ahead, the dairy herd improvement records provided the backbone of the department's dairy extension educational program.

### **National Extension Program Initiated**

The Smith-Lever Act of the Congress, signed by President Wilson on May 8, 1914, provided funds to be matched by each of the states for extension work based on rural population. Even though some state support for extension had been provided to the college for the previous 20 years, the passage of the Smith-Lever Act launched the state and national system of extension education as the vital third dimension of the college in serving the people of the state. Administration of the extension program was based upon a memorandum of understanding signed by the secretary of agriculture and the president of the college or university receiving the funds. This memorandum called for the establishment of a distinct division in each cooperating agricultural college for the supervision of all extension work.

### **Director Bailey Retires**

After threatening to resign for several years, Liberty Hyde Bailey did resign as dean and director of the College of Agriculture in 1913. World famous as a botanist, horticulturist, and educator, Bailey was one of the truly great leaders of American agriculture. Much of the early development of the Department of Animal Husbandry can be attributed to his recognition of the importance of the livestock industry to the agriculture of the state and nation.

President Schurman reported Bailey's retirement in this way: "He has given to the college and to the agricultural interests of the State for many years not only enthusiasm and devotion—precious as these are—but also his great abilities as a scientist, an organizer, and a leader; and the College of Agriculture at Cornell will long retain the impress of his efficient and highly successful administration as Director" (Twenty-sixth Annual Report, 1913).

In recognition of his contributions, a new auditorium, named Bailey Hall, was built by the state for the university and was first used in June 1913. This building was erected for the use of state college students, and in the lower level there was space for three agricultural departments. The auditorium, with its fine organ, provided the university, as a whole, a place for concerts and other large gatherings, such as public lectures and commencement exercises.

In addition to rapid improvement in physical facilities, the first 10 years as a state college, under Bailey's leadership, saw dramatic growth and

development in student enrollments and faculty and in programs of service to the people. In 1904 the faculty in agriculture comprised 6 professors, 1 assistant professor, and 2 instructors. In comparison, in 1913-14, the number had increased to 46 professors, 26 assistant professors, and 57 instructors. Student enrollment totaled 296 in 1904 and had increased to 2,557 (regular students 1,328, graduate 151, special 135, winter course 555, summer school 388) in 1914 (Twenty-seventh Annual Report, 1914).

Many people have reported that, as a young man, Bailey had resolved to devote the first third of his life, 25 years, to learning and preparation, the second 25 years to practicing a vocation, and 25 more years to doing "whatever I like best." This last period actually was 41 years, during which time he devoted himself to building up his hortorium, searching for and collecting new palms and other plants from all over the world, to writing, and to lecturing. He died on Christmas night, 1954, at 96 years of age.

It was my great privilege to hear Bailey speak on several occasions when he recalled many of his experiences at Cornell from his early days until his retirement. The first talk I heard was one he gave to the Cornell Extension Club in 1937. He reviewed some of his early meetings in the north country and how he took a microscope with him so the "farmers could see things their eyes had never seen before." Describing his retirement on another occasion, he said, "I had written my resignation to the President several times but it was not accepted. But on the afternoon of July 31, 1913, I left my office, turned the key in the door, and have never been back since. I assumed they accepted my resignation since they stopped sending my salary check."

One of the most inspirational experiences I had at Cornell was the opportunity to attend Director Bailey's 90th birthday party on April 29, 1948, in the Memorial Room of Willard Straight Hall. In a warm response to the many tributes extended to him, Bailey expressed some of his philosophy, "It is a marvelous planet on which we ride. It is a great privilege to live thereon, to partake in the journey, and to experience its goodness. We may cooperate rather than rebel. We should try to find the meanings rather than to be satisfied only with the spectacles. My life has been a continuous fulfillment of dreams." Bailey counted that he had written 65 books and told us of the satisfaction he found in the physical effort of writing a book and stated, with a smile, "My opus magnum has not yet been begun."

Dr. William A. Stocking, Jr., head of the Dairy Industry Department, was appointed acting director of the experiment station to succeed Bailey for the fiscal year 1913-14. In 1914 Dr. Beverly T. Galloway was appointed dean of the New York State College of Agriculture and director of the experiment station. Galloway was not popular with the faculty and stayed only 2 years. Upon Galloway's resignation in July 1916 to accept a position in the United States Department of Agriculture, Dr. Albert R. Mann was appointed acting dean and director; and in 1917 the appointment was made permanent by action of the board of trustees. At an earlier stage in his career, Dr. Mann held the title of assistant professor of dairy industry.



## Open-Formula Feeds

In a talk to the American Feed Manufacturers Association in Chicago in 1914, Professor E. S. Savage made recommendations that commercially mixed concentrate feeds for dairy cattle and other livestock should be sold on an open-formula basis with the amount of each ingredient shown on the feed tag of each bag of feed. Also, the feed tag should list the guaranteed minimum amount of protein and fat and the maximum of crude fiber in the mixture. This concept was strongly opposed by feed manufacturers because at times some of them used low-quality, inferior ingredients. But Savage got support from agricultural leaders in New York, and in 1915 the Grange Purchasing Agency put on the market a ration known as the Cornell Dairy Feed. Later, the open-formula concept was adopted by the Grange League Federation (G.L.F.), after it was organized in 1920, and by other farm cooperatives. Over the years this development was of great value in helping to safeguard the farmers in their purchases of commercial formula feeds.

## Work in Animal Nutrition Initiated in 1915

As mentioned earlier, provision was made in the new animal husbandry building, completed in 1915, for a chemical laboratory. Dr. Leonard A. Maynard was added to the faculty at that time as an assistant professor of animal nutrition for instruction and research. His first job was to equip the laboratory and develop studies in animal nutrition. This step in adding the position of a chemist was taken largely through the influence of Professor E. S. Savage who recognized the need for chemical techniques in the solution of animal production problems and believed this need would be served to best advantage by bringing the chemist into close contact and working relationships with animal husbandmen. In fact, Professor Savage had asked Maynard, while he was a graduate student, to help plan the chemistry laboratory for the building then under construction for animal husbandry.

Professor Maynard grew up on a farm in Washington County, New York, where the rural environment of his youth stimulated his interest in plants and animals and was the basis of his lifelong work in biology and agriculture. He graduated in 1911, cum laude, from Wesleyan University, Middletown, Connecticut. It was here in a course in chemistry that he learned of the pioneer work of William O. Atwater, who established and directed the first agricultural experiment station in the United States at Middletown in 1875. Fascinated by the accounts of Atwater's varied research activities in applying chemical knowledge and techniques to the problems of agriculture and human and animal nutrition, Maynard determined to specialize in chemistry.

Maynard enrolled in Cornell University in the fall of 1913 as a graduate major in chemistry, after serving 2 years as an assistant in chemistry at the agricultural experiment stations in Iowa and Rhode Island. He received the Ph.D. from Cornell in 1915 and joined the staff in animal husbandry. He was promoted to a full professorship in 1920.

Other new staff members in 1915 included four instructors: Karl J. Seulke, Edwin S. Ham, Thomas A. Baker, and Devoe Meade. In his annual report for the year, Professor Wing wrote, "A notable addition to instruction given was a course in slaughtering and the preparation of meats" (Twenty-eighth Annual Report, 1915). Mr. Seulke started this work and later became

a professor in the department. Mr. Ham later became a successful dairy farmer in Dutchess County; and Baker and Meade became professors and department heads at the University of Delaware and University of Maryland, respectively.

Not too long after Mr. Seulke started the work in slaughtering, cutting and curing of meats, a meat salesroom was opened in order to use the meat products and provide badly needed income. Meat products from class work and research were sold to staff members and others in the community. For a number of years, a delivery service was provided, using a single-horse-drawn light wagon or cart. A. I. Manning, long an "institution" in the department, was responsible for this job. He also assisted with the slaughtering, cutting, and curing work.

## World War I Affects College Activities

World War I brought about rearrangements of plans throughout the university, especially in the College of Agriculture under the impetus of a nationwide movement for increased food production. Larger appropriations were made by the Congress to most of the states and to the U.S. Department of Agriculture for increased agricultural production. On every hand, new lines of war work were being developed, resulting in an overwhelming demand for trained men and women. Many valuable teachers left the university, some to work on national programs and others in military service.

Student enrollments were down, and in April and May 1917, 794 students left the College of Agriculture for war work. Of this number, 567 went into agricultural work, 184 into the Army, Navy, or ambulance corps, and 43 into munition factories and other industries (Thirty-first Annual Report, 1918). If in good standing, these students got full credit for their courses the semester they left. Professor L. A. Maynard served his country as a lieutenant, captain, and major in the Sanitary Corps in France from 1917 to 1919. Edwin S. Ham served in the quartermaster corps.

Greater emphasis on food production by the New York State Food Supply Commission brought about increased extension work to assist in making farms more efficient in production of animals and food crops. For example, in 1917-18, 57 farm demonstration schools were held in 35 counties by animal husbandry specialists, and there were greatly increased numbers of community meetings with farmers. Large numbers of leaflets and reading course lessons covering almost every aspect of animal production were distributed to farmers and consumers. Sheep demonstration cars were run by the New York Central lines and the New York, Ontario, and Western Railroad.

Staff in the Department of Animal Husbandry cooperated with several other departments of the college in the National Milk and Dairy Farm Exposition at the Grand Central Palace in New York City in May 1918. Emphasis was given to graphic representation by means of charts, pictures, animals, feeds, model structures, and equipment used in the production of milk, raising the calf, and maintenance of the cow. There were on-the-spot demonstrations of manufacture of butter, ice cream, and several kinds of cheese and demonstrations of milk testing and examinations for purity, along with special charts illustrating the food value of milk. An attendance of 72,199 people was reported.

The 11th Annual Farmers' Week was held in February of 1918, but because of war conditions, attendance was down compared with previous years. The Farmers' Institutes, which had been conducted by the State Department of Agriculture, were transferred to the State College of Agriculture as part of its extension service.

In addition to the war, other factors contributed to the marked decrease in the number of new students and winter-course students during the 1916-18 period. By this time six secondary schools and 80 high schools were teaching agriculture as part of their curriculum; they provided opportunities for farm boys to obtain some training in agriculture without leaving their farms.

A modest amount of research in animal husbandry was continued during this war period. Professor Wing's annual report for 1918 stated that work was continuing in animal nutrition, animal breeding, and keeping of milk records. The results of an extensive study of color inheritance in guinea pigs was almost ready for publication. A sheep barn was completed, and an appropriation for a piggery was obtained. Experiment station Bulletin 397, by L. A. Maynard and William I. Myers, was published in April 1918, "The Refinement of Feeding Experiments for Milk Production by the Application of Statistical Methods." Feeding trials had begun to contribute greatly to the art and science of animal production; but criticisms had developed from some basic scientists regarding this type of study, and they felt such work should be discontinued. Maynard and Myers believed there was an important place for practical feeding trials and felt the data reported in this study should prove valuable to others who would be conducting feeding experiments. It should be noted that W. I. Myers was a young faculty member in farm management at that time.

In cooperation with two county agents, Professor H. A. Hopper made a useful study of cow testing association records on the relationships between feed consumed and milk production. Among the conclusions was the statement that individual cows may vary greatly in the efficiency with which they use nutrients (Cornell Univ. Agr. Exp. Sta. Bul. 398, 1918).

Professor Wing reported (Thirty-second Annual Report, 1919) that teaching in the department was almost entirely in abeyance from October 1, 1918, to January 1, 1919, because of interference by the Student Army Training Corps. But there was considerable expansion in the staff in animal husbandry during these years, primarily in extension and in increased efforts for more food production. Staff appointments included Clarence A. Boutelle, Charles H. Royce, and Mark J. Smith as assistant extension professors; John C. Maddy and Wayland P. Frost, extension instructors; and George Haines, instructor. Charles L. Allen was appointed as an assistant during this time and remained on the staff as an assistant professor throughout Wing's tenure as head of the department.

Renewed interest in sheep that began during the war was maintained, and there were increased demands for more information on swine and beef cattle.

Student enrollments in the College of Agriculture during the 1919-20 year showed a partial return to prewar conditions with a total of 2,356, including 229 graduate students.

The extension programs in animal husbandry were among the largest of the college, with great demands for the service. Five members of the department staff devoted full time to extension, and several others, part time. Better stock and bull associations were operating in 26 counties; dairy and pig feeding projects in 18 counties; sheep and wool marketing associations in 36

counties; 30 active breeding clubs; cow testing associations in 33 counties; 30 or more barn demonstrations; and exhibits were set up at many county fairs. Junior extension projects included rabbit, calf, pig, and sheep raising (Thirty-third Annual Report, 1920).

Research staff during this period consisted of Wing, Savage, Harper, and Maynard, with G. W. Tailby, Jr., serving as superintendent of livestock. Work continued to expand, especially in animal nutrition and feeding. Significant studies were in progress: raising of calves on substitutes for skim milk; value of fish scrap as swine feed; relation of amount of vitamins in animal food to milk production and to amount of vitamins in the milk; the nutritive value of coconut oil meal in relation to several other feeding stuffs; and breeding work with dairy cows. Additional studies included grain as a feed for horses; maximum hay for workhorses; silage for raising colts; protein supplements for swine; salt mixtures for sheep; value of buckwheat middlings, as a substitute for wheat middlings, for growing pigs on pasture; types of corn for silage; and growth-promoting value of the proteins of various feeds, singly and in combination.

## Semicentennial of the University

On June 20-22, 1919, Cornell University celebrated its semicentennial in connection with the 50th commencement of the university. Conferences of faculty and former students of each college were held to consider the work and progress, its present condition, needs, tasks, and hopes for the future. Reports from the College of Agriculture were given and committees established on administrative organization and policy, research and experiment station, the extension service, and the organization and objectives in resident teaching.

Informal monthly conferences were organized for the faculty to consider the broad problems of research and to stimulate expanded research in the College of Agriculture. Graduate students were invited to these conferences, which included distinguished speakers from Cornell and the Geneva station and from the Universities of Illinois and California and Pennsylvania State College. After these conferences the faculty of agriculture voted not to have a separate research staff, thus favoring joint faculty appointments for teaching and research, in agreement with Director Bailey's philosophy of earlier years.

## Farmer Interest in the College Increases

During the year 1919 groups of leading farmers were invited to the College of Agriculture, at their own expense, to consider many problems that were affecting the college. They reviewed the work of each of the departments, including instruction, research, and extension activities, buildings and facilities. There was a committee for each department, and most of them called attention to the urgent necessity that a new and higher salary scale be established. Two members of each committee were asked to return to Ithaca for a joint conference in December 1919, which adopted a series of 14 recommendations. Among them was the recommendation that the dean be given relief from some of his administrative duties, with the appointment of a vice-dean for resident instruction and a vice-director of research. Another dealt with salary scales, recommending minimum salaries of \$10,000 for the dean,

\$6,000 for the vice-dean and vice-director, \$5,000 for department heads, \$4,000 for professors, \$2,500 for assistant professors, \$1,500 for instructors, \$800 for assistants, and \$900 for stenographers.

These and other recommendations were discussed with the Conference Board of Farm Organizations and other farm leaders. They were then approved by the Agricultural College Council, composed of leading farmers and agriculturists, which made its recommendations to the Cornell Board of Trustees. An appropriations act was formulated, passed by the legislature, and approved by the governor. This demonstration of support by the agricultural leadership of the state paid excellent dividends, especially to animal husbandry, for dairy cattle and other livestock provide major sources of farm income in New York State.

The Agricultural College Council, which had been organized earlier, has continued to function effectively ever since. As a result of efforts by Howard E. Babcock, former county agent leader, and Edward R. Eastman, editor of the *Dairymen's League News* at that time, the Conference Board of Farm Organizations was organized in 1919 to act as an official advocate for New York agriculture. Formation of policy by this board was to be by unanimous vote of the members—originally the State Grange, the Dairymen's League, the State Farm Bureau Federation, and the Western New York Horticultural Society.

## Relationships with the Geneva Experiment Station

During this period discussions were taking place between the leaders of the College of Agriculture and the New York State Agricultural Experiment Station at Geneva on the need to unify the administration of both institutions for the benefit of New York agriculture. The Cornell Board of Trustees took action on February 14, 1920, approving a policy of appointing selected staff members of each institution to the staff of the other. This arrangement, worked out 4 years earlier by Director Galloway, provided for staff of each institution to use the facilities of the other and bring about closer cooperative relationships, greater coordination in planning and executing related research projects, and improved training of graduate students. Eight staff members at Geneva were appointed to professorships in the college. Those in animal husbandry and dairy science included Dr. L. L. VanSlyke, dairy chemistry; Dr. R. S. Breed, dairy bacteriology; R. J. Anderson, animal nutrition; and Dr. W. H. Jordan, animal nutrition. From Cornell, Dr. L. A. Maynard was appointed to the Division of Biochemistry and Dr. W. A. Stocking to the Division of Bacteriology at Geneva.

### Animal Husbandry Research at Geneva

A large proportion of the research in animal husbandry was concerned with dairy cattle nutrition and herd management, dairy farm sanitation and milk quality. R. J. Anderson was the leader of long-term studies on the metabolism and physiological effects of phosphorus compounds on milch cows. He published a series of 14 papers and bulletins on organic phosphoric acids (Phytin) of wheat bran. George A. Smith, dairy expert, and Harry A. Harding, bacteriologist, conducted many studies on effects of machine methods of milking upon milk flow and bacterial content of the milk. Problems were encountered with incomplete milking by the machines

compared with good hand milking. Dr. Robert S. Breed succeeded Harding as bacteriologist in 1913. In his early work he gave special emphasis to the production of sanitary milk and methods of determining milk quality. George J. Hucker joined the staff as assistant bacteriologist in 1919 and started long-term studies on bacteria in milk and the problem of mastitis in dairy herds.

Dr. Arthur C. Dahlberg joined the Geneva staff as associate in research in dairying in 1921 and was promoted 3 years later to chief of research in dairying. In addition to his primary interests and work with manufactured dairy products, Dahlberg gave special attention to the development and management of the dairy herd.

After 25 years of service, Dr. W. H. Jordan retired as director of the station in 1921 and was succeeded by Dr. Roscoe W. Thatcher. Director Thatcher soon proposed a program of development for the Geneva station and emphasized several lines of research needed. Included was a recommendation for a new division of nutritional investigations, increased emphasis on dairy management problems and methods of production and distribution of fluid milk. But he did feel that it was unwise for the station to work on general problems of breeding and management of other livestock because this would require maintenance of several herds and flocks, new barns, and other facilities. Instead, major emphasis was to be given to techniques of manufacture of dairy products—butter, cheese, ice cream, and milk powders (Forty-first Annual Report, N.Y.S. Agr. Exp. Sta., 1922).

A major change in the administration of the Geneva station was made by the State Legislature in 1923 when it was placed under the authority of Cornell University on July 1 of that year. Some of the Geneva staff became members of the Cornell graduate faculty. Up to this time the station had operated under a Board of Control. Dr. R. W. Thatcher became director of experiment stations, under the dean of the New York State College of Agriculture at Cornell. Director Thatcher's responsibilities were to direct the staff research at the Cornell University Agricultural Experiment Station, the New York State Agricultural Experiment Station, and the Long Island Vegetable Research Farm. Director Thatcher divided his time between the Geneva and Ithaca campuses (Forty-second Annual Report, N.Y.S. Agr. Exp. Sta., 1923).

Work in dairying expanded considerably under the leadership of Dr. Dahlberg. Milk production increased in the Jersey herd to a level double that of the average New York cow. The herd was enrolled in the semiofficial testing program of the American Jersey Cattle Club and was free of tuberculosis and Bang's disease. Several cows were awarded gold and silver medals by the American Jersey Cattle Club in recognition of their high milk and fat production levels. Milk records were used for proving of bulls and dams. Studies of milking machines and milking methods were expanded, and effects on milk yields from two-times- vs. three-times-a-day milking and feeding were measured.

Dahlberg worked actively with dairy farmers and served as president of the New York Dairymen's Association in 1926-27 and also as president of the New York Jersey Cattle Club, 1926-28.

Dr. R. W. Thatcher retired as director of experiment stations and assumed the position as president, Massachusetts Agricultural College, on June 30, 1927. He was succeeded by Professor Frank B. Morrison on October 1, 1927. During the year he served in this position, Director Morrison did much to reorganize the business affairs of the station and made notable changes in scientific work (Forty-eighth Annual Report, N.Y.S. Agr. Exp. Sta., 1929).

## Progress during the Twenties to 1928

### Staff Changes

Many significant changes were made in the staff in animal husbandry as the department grew and developed during the 1920s.

Two professors resigned from the faculty in 1919-20, Karl J. Seulke, meats specialist, to take a position in private industry and Mark J. Smith, extension sheep specialist, to go into farming in western New York.

R. B. Hinman joined the faculty as assistant professor in 1920 after completing the M.S. degree at Iowa State College. Hinman had graduated from the Ontario Agricultural College in 1915 and worked for a year as a Farm Bureau agent for the Ontario government before he enlisted in the Canadian army in 1916. He served until 1919 when he was discharged. His first publication at Cornell dealt with protein supplements of animal origin for swine. Professor Hinman's interests were in animal breeding, but later he devoted his major efforts to meats and beef cattle.

Staff additions in 1920-21 included several new instructors: Roland G. Knapp, James A. McConnell, Leo C. Norris, and William T. Grams, extension instructor, who replaced Mark Smith as sheep specialist.

Charles H. Royce, who had been on the extension staff in animal husbandry, died in August 1921. He graduated from Cornell in 1891, earned the M.S. degree in 1892, and joined the staff after successfully managing farms and estates for 20 years. Professor Royce "brought to his work as an extension teacher, a broad and intimate knowledge of farm problems and operations, based on good technical education, which made him an effective teacher of farmers. Self-reliant, frank, loyal, ever-ready and hard working, he achieved a high place among farmers and colleagues" (Thirty-fifth Annual Report, 1922).

W. Truman Crandall was appointed extension assistant professor in 1922 to succeed Professor Royce. Professor Crandall was a graduate of the University of Wisconsin, with an M.S. from the University of Illinois, and had served on the staff of the University of Illinois and Kansas State Agricultural College before coming to Cornell.

The New York State Legislature of 1922 created a position for an extension veterinarian for educational work in livestock sanitation and in the control and prevention of animal diseases. The person filling the post was to be on the staff of the College of Agriculture, but to be closely associated with the Veterinary College. Dr. Herbert J. Metzger, a graduate of the New York State College of Veterinary Medicine, was appointed to the position as extension assistant professor in animal husbandry in 1922.

New staff in 1923 included instructors Edmund E. Vial and William E. Krauss, and Cecil D. Schutt as assistant. C. A. Boutelle, extension assistant professor, resigned on June 30, 1924.

A significant addition to the extension group of animal husbandry was the appointment of John P. Willman on August 1, 1925, for work with rural youth, later labeled 4-H livestock extension. This position was established in place of one of the dairy production specialists. Willman was a graduate of Pennsylvania State College and had an M.S. degree from Kansas State College.

Dr. Clive M. McCay joined the faculty in 1927 as assistant professor of animal husbandry and assistant animal nutritionist in the experiment station. Funds for this position were made available under the Purnell Act for

research on physiological phases of animal nutrition. After his undergraduate work in chemistry and physics at the University of Illinois, McCay taught chemistry at Texas A&M College for a year before enrolling for graduate study in Iowa State College, earning the M.S. degree in biochemistry in 1923. He transferred to the University of California for further graduate studies and was awarded the Ph.D. in biochemistry in 1925. From 1925 to 1927 McCay studied nutrition and conducted research at Yale University on a National Research Council Fellowship under L. B. Mendel.

Professor Maynard took a sabbatic leave in 1926 and carried out postdoctoral studies at Yale University also under L. B. Mendel. When Maynard arrived at Yale, he found that laboratory space in Mendel's Department of Physiological Chemistry was very limited. A young postdoctoral fellow in the laboratory, Clive McCay, offered to share his space, which Maynard accepted. Out of this incident and experience grew a close lifelong friendship and scientific collaboration. It was Maynard in 1927 who convinced McCay to accept an assistant professorship in animal husbandry at Cornell.

### **Research Emphasis in Feeding and Nutrition**

Soon after he joined the faculty in 1915, Dr. L. A. Maynard took up studies, at the suggestion of Professor E. S. Savage, on further potentials of the calf-meal method of raising calves to replace part of the milk commonly fed. This made it possible to obtain the first expansion of nutrition research facilities, namely, the addition of a rat colony in 1916, which was housed on the top floor of Wing Hall. The rats were used as pilot animals for testing the growth-promoting properties of different combinations of ingredients, and the more-promising ones were tried out with calves. These calf studies were interrupted in 1917 because of World War I, but were resumed again in 1919.

As mentioned earlier, some work on calf meals had been done in 1907-9 by Savage and Tailby, and several feed companies were selling proprietary calf meals to farmers. Digestive problems, as indicated by scours, were generally more frequent when calf meals were being fed. It was believed that the change in the character of the feed from whole milk to calf meal must involve a change in the bacterial flora of the intestinal tract, which might, in turn, be a factor in these digestive disturbances. Maynard's first Ph.D. graduate student, a young instructor in the department, Leo C. Norris, conducted studies to find out if excessive putrefaction was a factor in the digestive troubles. It was found to be neither a cause nor an accompaniment of the troubles. Accordingly, the question of fermentation was next considered. These studies showed that calves during the period of change from milk to gruel and for a time thereafter on gruel alone excreted a much larger amount of acetic and propionic acids and ethyl alcohol than did calves that received milk only. These results, with other observations, were interpreted to indicate that an abnormal amount of fermentation was going on in the digestive tract of the calves fed the calf meal, due presumably to inability to digest the carbohydrates properly. Thus, this excessive fermentation was a factor in the increased digestive troubles occurring with the ration of calf meal. This work served as the Ph.D. thesis for Norris and was published in Cornell University Experiment Station Memoir 90, 1925.

As a consequence of these studies on the causes of digestive troubles, additional trials were conducted with many different formulas, and eventually a formula and method of feeding that gave markedly better results than



any previously tried at Cornell or reported elsewhere were arrived at. On the basis of these trials, this formula was adopted by the Cooperative Grange League Federation Exchange at Ithaca, New York, and was manufactured and sold under the name of G.L.F. Calf Meal (Cornell Univ. Agr. Exp. Sta. Bul. 439, 1925). This calf meal was sold for about 25 years. It was also widely adopted as a stock diet for experimental rat colonies.

Another young instructor, William E. Krauss, was involved in these further studies, but his thesis research involved the digestibility of nonprotein nitrogen and its utilization by cows fed dairy rations based upon clover and timothy hay (Ph.D. thesis, 1926). This was part of a larger group of studies led by Dr. Maynard on protein metabolism, mineral metabolism, and digestibility, with clover and timothy rations (Cornell Univ. Agr. Exp. Sta. Memoir 113, 1928).

Dr. Leo Norris transferred to the poultry department in 1923 as a specialist in poultry nutrition for work with Dr. Gustav F. Heuser. Later with other nutritionists, they developed one of the strongest poultry nutrition research programs, especially on vitamin and mineral requirements and functions, in the country.

Dr. William E. Krauss went to the Ohio Experiment Station at Wooster after completing his Ph.D. at Cornell. He became an internationally known dairy nutritionist, served a term as president of the American Dairy Science Association, and for many years was associate director of the Ohio Agricultural Experiment Station.

Another early graduate student who worked with Maynard was a Filipino, Francisco M. Fronda, who spent several years studying the relative growth-promoting value of the protein of coconut oil meal and combinations of it with protein from various other feeds (Cornell Univ. Agr. Exp. Sta. Memoir 50, 1921). After returning to the Philippines, Dr. Fronda became widely known and respected as "Mr. Poultry" throughout Southeast Asia for his work in poultry science. Eventually, he became a professor of animal husbandry and later head of the department and director of the Agricultural Experiment Station, University of the Philippines at Los Baños.

In 1922 Maynard conducted a study in cooperation with Dr. S. A. Goldberg, pathologist of the Veterinary College, on a problem in growing pigs, then called stiffness, but later commonly referred to as posterior paralysis. These studies established calcium deficiency as the causal factor and demonstrated the value of sunlight in promoting bone development in these species. During the period through 1927, six calcium metabolism studies were carried out with pigs, rats, and lactating cattle, involving either bone analyses or balance experiments. The rat was used as a pilot animal for lactation studies, and protein and mineral balances were conducted with lactating cows.

During the first decade of the animal-nutrition laboratory's activity, 21 research papers were published and 12 graduate students working in the laboratory received advanced degrees.

The annual reports of the experiment station record the publication of the results of eight feeding trials with different classes of stock, carried out from 1915 to 1927 by Professors Wing, Harper, and Savage, with the cooperation of assistants and a few graduate students. Professor Wing continued to give most of his attention to the development of the dairy herd and kept records of milk and fat production and, in many cases, of feed intakes as a basis for herd improvement. He continued his previous studies on possibilities for increasing fat percentage of milk by feeding high-fat ingredients.

Professor Harper carried out many feeding trials with colts and workhorses. In 1921 he published a detailed study of 34 mares and colts raised from them during the period 1909 to 1919, with summaries of cost items and practices found best for farm work. Later in 1925 he published the results of comprehensive studies on the effects of various combinations of feed on weight, physical condition, and "spirit" of workhorses.

For a number of years the college had entered into agreements with farmers' organizations and industrial concerns for the study of special agricultural problems, financed by the cooperating agencies. Some of these were for work in animal husbandry. For example, in 1927 a temporary fellowship was provided by the American Dry Milk Institute for the purpose of promoting the study of the usefulness of dry skim milk in animal feeding. It provided \$1,200 a year for compensation and expenses.

During the same year a temporary investigatorship was provided by Charles Pfizer and Company for the purpose of studying the usefulness of calcium citrate in the feeding of animals. It provided \$1,200 a year in compensation and research expenses for the holder.

Plans were developed during the late twenties, through the leadership of E. S. Savage with assistance from Edwin S. Harrison, to expand research into the proper level of protein intake for optimum milk production. Stimulus for this work came from the large number of dairy farmers who were feeding concentrate mixtures containing 24 percent total protein. The importance of this subject was recognized by the Cooperative Grange League Federation Exchange at Ithaca and the Dairymen's League Cooperative Association Incorporated at New York City. Each of these farm cooperatives contributed \$7,500 to assist in the cost of this experiment for 2 years. A special investigatorship was established for this purpose.

It was necessary to rent a suitable barn and enough land for proper conduct of these experiments for a period of 2 years from October 1, 1928, to September 30, 1930. The land was purchased later by the state from Professor G. F. Warren and became known as the Warren dairy cattle experimental farm. This was the beginning of several years of investigations on protein levels in grain mixtures. The results will be reported in the next phase of this history.

Under the leadership of Maynard and McCay, fundamental processes involved in the secretion of milk were studied from several angles. Because the constituents of milk are brought to the mammary gland through the blood, this medium must reflect the fundamental factors concerned in milk secretion. Hemoglobin studies were made on each member of the dairy herd. Studies on the relationships between blood and milk fats were initiated. Also, fundamental studies on the relation of high protein levels in the diet to the secretion of milk were carried out with laboratory animals of short life cycles, mainly rats. These experiments showed that if the ration contained a definite minimum of protein, no increased secretion of milk resulted from extremely high feeding levels of protein. The amount of milk secreted was gauged by the growth produced in the offspring up to weaning. Also, higher levels of protein above an adequate amount for maintenance had no influence on hemoglobin of the blood.

To obtain more fundamental knowledge in nutrition, Dr. McCay undertook experiments with trout, one of the lowest forms of vertebrates. Among many dry feeds used, dry skim milk was found to produce the most-rapid growth and the healthiest fish. But it had to be supplemented with about one-fourth of the calories in the diet in the form of raw meat, which contained a large amount of a thermolabile factor, termed H, essential for the

life and growth of trout. Basic information was obtained from these and later experiments, leading to the development of practical diets for fish capable of effecting large savings in production costs in fish hatcheries in the United States and Canada.

### **Resident Instruction**

Course offerings in animal husbandry increased slowly from 6 in 1904-05 to 17 in 1927-28. To meet the changing needs of students, advanced level courses in animal nutrition and in animal genetics and breeding were added. Also, there was some segregation of production courses according to the different classes of livestock. For example, the course that covered beef cattle, sheep, and swine was divided into two separate courses in 1924-25, one for swine and the other for beef cattle and sheep. Two years later, this latter course was divided into separate courses for beef cattle and sheep. A separate course had been offered in dairy cattle since the year 1915-16.

During the academic year 1925-26 the system of numbering courses was modified. Numbers less than 100 were primarily for beginning undergraduate students; the 100 series was for advanced undergraduate and graduate students; and the 200 series was primarily for graduate students.

Courses offered in the department, selected years 1910-11 to 1924-25, are summarized in appendix 1.

During the last year that Professor Wing served as head of the department, 1927-28, the announcement of the college listed the following courses in animal husbandry:

1. Principles and Practice of Feeding Animals, first term. 3 cr. Savage and Harrison.
2. Principles of Animal Breeding, second term. 3 cr. Wing and Allen.
5. The Horse, second term. 3 cr. Harper.
6. Horse Training, practical course, first term. 2 cr. Harper.
10. Dairy Cattle, first term. 4 cr. Wing and Allen.
11. Breed Study, second term. 1 cr. for each breed. Wing and Allen.
12. Swine, second term. 3 cr. Hinman.
13. Beef Cattle, first term. 3 cr. Hinman.
14. Sheep, first term. 3 cr. Hinman.
20. Meat and Meat Products, first or second term. 3 cr. Schutt.
27. Advanced Judging, Dairy Cattle, second term. 1 cr. Wing and Allen.
101. Principles of Animal Nutrition, advanced course, second term. 3 cr. Maynard.
102. Problems in Animal Genetics, first term. 3 cr. Harper.
130. Health and Diseases of Animals, first term. 3 cr. Birch.
131. Horseshoeing, second term. 1 cr. Asmus.
201. Special Topics in Animal Nutrition, first and second term. 1 cr. Maynard.
240. Seminary, first and second terms. Departmental staff.

Professor Wing had his problems getting adequate appropriations from the State Legislature for teaching. In his annual reports throughout the 1920s, Professor Wing continuously emphasized the need for illustrative teaching materials in the form of adequate types and breeds of livestock. He needed a definite assignment of sufficient land to support the herds and flocks essential to practical instruction and research; adequate buildings for the housing of beef cattle, sheep, and swine and some additional facilities for dairy cattle; and a building that would provide facilities for metabolism experiments for farm animals. These were requested year after year, yet the legislature failed to provide the funds needed for teaching purposes and also the funds for badly needed salary adjustments. In 1924, however, there was a bit of relief for general maintenance with additional funds for fuel, equipment, and supplies. These reports by Professor Wing still have a familiar ring.

In 1927 each department reviewed its contributions in resident instruction, extension, and research (Fortieth Annual Report, 1927). The Department of Animal Husbandry gave emphasis to three special features of instruction that originated or were first put into successful practice at Cornell: "(1) It was the first, or among the first, to give a definite course of instruction in horse training. For several years, until its own stud became large enough, green colts were purchased each fall as material for this class; (2) It was probably also the first to establish a meat laboratory and to provide definite instruction in slaughtering animals and in cutting, curing, and marketing meats. This course had now been given for about 12 years and has been eminently successful; (3) It was also among the first to establish, as a part of the instruction in the formulation of rations, a feed laboratory in which, after the student has satisfactorily computed a ration mathematically, he then makes it in miniature from the actual feeds. All of these special features of instruction have been eminently satisfactory and several of them have been introduced into many other agricultural colleges.

"The courses of instruction in the department have been arranged with the view of affording theoretical and practical instruction in those lines of animal husbandry most practiced by the general farmer of New York. Like all such courses, it is probable that theoretical instruction rather overbalances the practical, although the latter has been emphasized so far as the facilities and means at hand allow. The proper balance for these two features had been and probably always will remain one of the debatable questions concerning agricultural education."

The report stated further that "while the department has always offered graduate instruction and has had a considerable amount of graduate students, it has always held the view that graduate instruction, intended to prepare the student for teaching or research, is incidental to the instruction in the department as a whole, and that the best preparation of a graduate for teaching or research should be found in practical experience on a successful livestock farm or in a successful breeding establishment." Later, of course, some shifts in this philosophy of graduate education and training will be noted. Actually, after a decline in 1922 and 1923, there was a marked increase in the number of graduate students in the college during the period 1919 to 1928, whereas the number of undergraduates was declining.

As the college grew and developed during the twenties, activities of the Department of Animal Husbandry were closely associated and correlated with several other departments, especially Agronomy, Agricultural Economics and Farm Management, and Dairy Industry. The Department of Animal Husbandry used the crops grown by the superintendent of farms and, in return,

supplied horse labor to that department and several others. Also, there was increasing cooperation in research and extension programs with these departments.

### **Extension Reaches Out to the People**

Major extension teaching activities in the twenties continued to give emphasis to increased milk production of dairy cows through better breeding, feeding, and management practices and to improvement in other classes of livestock. When extension work began some 35 years earlier, the average milk production per cow was about 3,000 pounds yearly and had now almost doubled to about 5,500 pounds yearly. Efforts in extension were an important factor in bringing about this improvement. There were four extension specialists on the staff in 1922, and the number increased to six in 1925. Two of the specialists were in dairy production (feeding, breeding, and management), one in dairy herd improvement associations and dairy record clubs, one in sheep and wool production, one in livestock health and sanitation, and one in junior livestock work.

A special livestock committee, composed of responsible livestock producers, was used effectively by the extension specialists. The specialists met with the committee two or three times each year to develop a program of work. Demonstrations on farms were the most popular form of educational meetings with farmers; also demonstrational judging at fairs as encouragement to small breeders was in growing demand. The extent of the program is shown by the summary of extension activities in the 1922 annual report: 179 farm demonstrations; 235 lectures; participation in 98 conventions and conferences; 438 inspections and farm visits; 11 extension schools; 7 exhibits at fairs; 140 farm and home institutes; plus 37 articles written, 21 circular letters, and 2,159 personal letters in response to requests for information. Specialists spent 660 days in the field working with farmers.

As of July 1, 1921, there were 25 dairy herd improvement associations (8 had been discontinued during the year and 14 new ones were formed). During the year, 23 counties made a sire survey; 104 purebred sires were placed on farms; 17 calf clubs were functioning; and 5 community bull associations were formed.

A slow revival was taking place in sheep production; a state wool pool was formed, and records were kept on 25 flocks. The sheep specialist gave demonstrations and lectures, and prepared articles that dealt with ram selection, culling of ewes before breeding, docking and castration of lambs, and other management practices. There was a growing interest in the feeder-lamb business in western New York. Successful ram sales were held to arouse interest in better breeding through the use of improved rams.

From 1845 to 1925 the number of sheep on farms in New York decreased from about 6,500,000 to less than 500,000. During the same period, the number of dairy cows increased from about 1,000,000 to about 1,400,000. The change in the utilization of the milk produced had been as striking as the changes in the relative importance of sheep and cows. Whereas butter and cheese were the most important dairy products in 1845, a large and increasing proportion of the milk produced was now being used as fluid milk by the rapidly growing cities of the state.

The extension feed service program provided monthly ration information to each of the counties to use in their *Farm Bureau News*. Later on this

became the *Full Milk Pail* and afforded an opportunity to discuss in a personal way timely topics, feed prices, and suitable concentrate mixtures to be used.

Two other service sheets were put out by the department. One known as the *Sheep Fold* was designed to bring flock owners seasonal information on handling the flock. The other called *Swine Facts* served swine owners in essentially the same manner. These timely educational materials that were sent out at intervals to classified lists of livestock farmers made it possible to supply information of current importance as well as to help meet emergencies.

Two correspondence courses in animal husbandry were initiated early in the twenties through the Office of Reading Courses. These were continued for many years, and other subjects were added from time to time.

Demands from farmers increased for extension schools, 1- and 2-day meetings on several related subjects. An example was a joint effort of several departments in a lime-legume-livestock campaign.

Interest in steer feeding was on the increase during the mid-twenties even though a relatively small number of farmers were involved. For example, during the winter of 1926-27 in the counties of Orleans, Erie, Genesee, and Wyoming, steer feeding demonstrations were conducted, with 12 cooperators feeding 350 steers according to plans suggested by the animal husbandry specialist and the county agent.

Lamb feeding demonstrations were conducted in 1926-27 on a farm near Perry in western New York with 200 lambs. Lamb feeders in the area differed in their ideas as to the most economical and satisfactory methods of fattening western lambs. Some favored the use of light feeds made up mainly of oats, bran, and salvage grains and fed in a self-feeder. Others believed that heavier feeds such as corn and barley gave better results. Cull beans and silage were being used by the farmers, but there were differences of opinion in their value in the fattening rations.

Extension work on prevention of animal diseases expanded during this period. After his appointment, the extension veterinarian spent an increasing amount of time in the field each year. Emphasis was given to the control of tuberculosis, contagious abortion, and mastitis in dairy herds. As areas became nearly free from tuberculosis, farmers became more receptive to measures to control abortion. A few breeders were induced to keep systematic herd-health records. Raising of healthy calves was given attention in view of demands for dairy replacements in downstate areas.

In all the animal-disease extension activities by animal husbandry specialists, close cooperation was maintained with the New York State Veterinary College and with practicing veterinarians in the field. On many occasions veterinary specialists made farm visits and held farm meetings with the animal husbandry specialists to advise livestock owners on practices that should be followed. A number of communities were experiencing outbreaks of hog cholera, and lamb feeders had some losses from "stiff lambs." Intensive work was started with sheep growers in 1925-26 to control losses from stiff lambs, but after 2 or 3 years of work it was not yet possible to demonstrate methods that would completely control the trouble. This was the beginning of a long-term effort to find the cause and to control the problem. The final answer was not discovered until 30 years later.

Of particular importance in the overall extension program was the aggressive leadership of the junior livestock specialist, John P. Willman. Interest in the work increased rapidly with the formation of many new clubs, especially dairy calf clubs. Pig and lamb clubs were less numerous at first. Members of the many clubs met at intervals to receive instruction in feeding

and management of livestock. They served as mechanisms for placing many purebred animals on farms. Often the purchase of a purebred calf, or other animals, by a club member served as a stimulus for starting a better breeding and management program on the farm itself. Club members received assistance in preparing demonstrations to be presented later at fairs or elsewhere. Also, many of them exhibited their animals at local and regional fairs and at the state fair. These competitions helped to develop and maintain interest in better livestock among the youngsters, as well as their parents.

To help meet consumer demands for more market milk during the fall season of short supply, special milk-production meetings were held throughout the state in July and August 1926 and again in June 1927. A marketing specialist discussed the milk market situation while the animal husbandry specialist gave suggestions to dairy farmers on feeding, care, and management to increase milk production.

A "Better Bull Train," in cooperation with the Erie Railroad, provided 15 all-day stops in southwestern counties in 1926 for demonstrations on sire selection, feeding, and management.

Another type of demonstration was used effectively during these years when New York State cooperated with other states and Canada in conducting dynamometer horse and mule pulling contests. These demonstrations and contests attracted widespread interest and large attendance. They seemed to be worthwhile in increasing interest in good horses, good horse handling, and properly fitted harnesses.

## Professor Wing Retires

The most-significant staff change during the late twenties was the retirement of Henry Hiram Wing on June 30, 1928, after 40 years on the faculty. Since his return to Cornell in 1888 as deputy director and secretary of the Cornell University Agricultural Experiment Station, Professor Wing had served the university continuously—the last 25 years as professor and head of the Department of Animal Husbandry. The early history and development of animal husbandry at Cornell were practically coincident with Professor Wing's responsibility in this field. He played an active role in the growth in physical facilities, from a one-room combined office, library, and laboratory in the north end of Morrill Hall to the substantial facilities in the classroom and laboratory building (later named Wing Hall in his honor), the livestock pavilion, and barns, and in herds of livestock. Similar growth and development of the staff and its teaching, extension, and research programs took place. He left a legacy of a well-established, ongoing department.

Professor Wing's contributions to the dairy and livestock industries were in many areas: improved feeding practices and livestock management; testing and recording of milk and fat production as a basis for dairy cattle improvement; pioneer service in the introduction, establishment, and supervision of the system of official testing and advanced registry of purebred animals; and notable development of the Glista family of Holstein-Friesian cattle in the university dairy herd. All these achievements were of great practical value not only to dairy farmers in New York, but also to those of the country. In his teaching, Professor Wing never lost sight of the practical problems and conditions of the farmer, and he always kept in mind the requirements of application. He was regarded as a friend by the students and knew them on a first-

name basis. They referred to him affectionately as "Hi" Wing (but never to his face). He was respected by all faculty members who served with him, as well as by faculty in other departments of the college.

Professor Wing's unusually retentive memory, his sound judgment, and, above all, his lofty personal ideals, his frankness and sincerity endeared him to his associates and his students and won for him confidence and respect among farmers throughout the state (Forty-first Annual Report, 1928).

In recognition of his contributions to the Holstein breed and dairying as a whole, Professor Wing was elected president of the Holstein-Friesian Association of America, serving in 1930. *The Holstein-Friesian World*, official publication for the breed, published a book, *Holstein-Friesian History*, that same year. Recognizing that Professor Wing was a profound student of the breed and always keenly interested in it and its affairs, the *World* invited him to write the first chapter covering the antiquity of the breed, its early introduction in America, and all significant events leading up to the birth of the Holstein-Friesian Association of America.

Another recognition came to Professor Wing when the Coliseum at the New York State Fair in Syracuse was named the Henry Hiram Wing Coliseum on September 4, 1934. The inscription on the bronze tablet reads: "In honor of Henry Hiram Wing whose services of forty years for the advancement of agriculture in the State of New York as Professor of Animal Husbandry at Cornell University, 1888-1928, was devoted to the cause of better livestock and the development of knowledge and character of men."

In his dedication address, the Honorable Owen D. Young included this paragraph: "No higher compliment can be paid to a teacher than the fact that his students wish to honor him. Back of this dedication, back of these exercises, stands a loyal body of Professor Wing's students under the leadership of Mr. James Beiermeister. They make this bronze tablet live with their grateful appreciation and their affectionate tribute. Back of them are not only the dairy farmers of New York, but the dairy farmers everywhere, who are the beneficiaries of Professor Wing's important contributions to that useful branch of agriculture. They indeed are free men honoring a modest and useful man."

A few years earlier, through the efforts of E. S. Savage, Professor Wing's former students had contributed funds for an oil portrait of their esteemed professor. This portrait hung in Wing Hall until 1961, when it was transferred to Morrison Hall. Wing Hall was renovated for use by the Department of Biochemistry at that time.

In the preface of their book, *Better Dairy Farming*, written and published by Savage and Maynard in 1923, they made this statement: "We wish to take the opportunity at this time to express our appreciation to Professor H. H. Wing. For many years, we have been associated with him in the Department of Animal Husbandry at Cornell University, of which he is the head. His ideas have been sound, his direction of our study and work all that could be desired. Living and working with him is a pleasure."

I had two personal experiences with Professor Wing that may be of interest to readers. Soon after I came to Cornell as a graduate student in September 1930, I learned that Professor Wing was still working in an office on the third floor of Wing Hall, preparing a history of the Cornell dairy herd. This was the year that he was president of the Holstein-Friesian Association of America. Because I had been awarded a scholarship of \$500 by the association at the National Dairy Show in 1929 for being a member of the winning team from the University of Missouri and high man in judging



Holsteins in the National Intercollegiate Judging Contest, I thought it would be appropriate to get acquainted with the president of the association and to provide him with one example of how the scholarship money was being used. We had a good discussion for about an hour that was a most stimulating experience for a farm boy from Missouri and a brand new graduate student.

Some 4 years later, after completing my graduate studies and then working as an extension instructor on the faculty, I had the unusual pleasure of having Professor Wing as one of my "students" for part of a 2-day dairy cattle breeding school in Herkimer County. He had retired to Little Falls where one of his daughters was living, but still maintained his interest in dairy cattle and other livestock.

Professor Wing died at Little Falls on November 21, 1936.

After the retirement of Professor Wing, Professor E. S. Savage served as acting head of the department from July 1, 1928, until October 1 that same year. Savage had been in the department since he first arrived in 1907 as a graduate student. After joining the faculty, he had been Wing's "right-hand man," especially for work with dairy cattle, and it was natural for Savage to feel that he would be Professor Wing's successor. But such was not to be, and Professor F. B. Morrison was appointed head of the department, assuming these duties on October 1, 1928.

## F. B. Morrison Succeeds Professor Wing as Head of the Department

Professor Morrison had come a year earlier (October 1, 1927) to succeed Dr. R. W. Thatcher as director of research in the State College of Agriculture at Cornell and director of the station at Geneva. He and his family lived in Geneva.

Professor Morrison graduated from the University of Wisconsin in 1911, majoring in agricultural chemistry. Immediately after graduation, he was appointed as an assistant and later an instructor on the staff of the University of Wisconsin College of Agriculture. He pursued graduate studies along with his teaching and research duties. In 1914 he became assistant professor of animal husbandry, in 1917 associate professor, and in 1919 professor of animal husbandry. He served also as assistant director of the Wisconsin Experiment Station from 1915 until he came to Geneva. With all his administrative duties at an early age, he never completed the degree of Doctor of Philosophy. "Director Morrison's writings and lectures have made him known to scientists and to livestock men in every state. He brings to the post excellent scientific training in animal nutrition, a broad practical knowledge of livestock feeding and management, and years of teaching and administrative experience. His long association with the Wisconsin Experiment Station acquainted him with the problems and methods of station research. He is eminently qualified for the post to which he has been appointed" (Forty-first Annual Report, 1928).

During the year 1927-28, Dean Mann and others had begun to look to F. B. Morrison as the most highly qualified person to succeed Professor Wing as head of animal husbandry in the college. There were a number of livestock leaders and others who felt that animal husbandry at Cornell had not kept pace in recent years with that at some other universities, especially the University of Wisconsin. Also, many livestock farmers thought it was time to give greater emphasis to horses, beef cattle, sheep, and swine. Morrison had

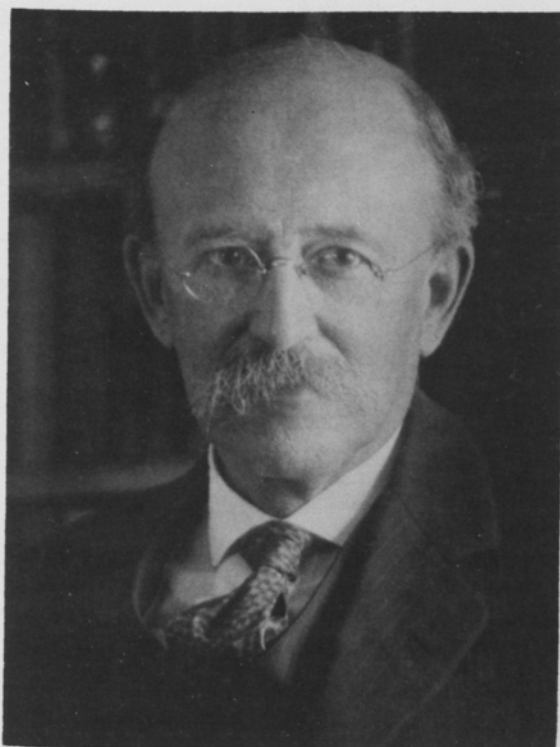
achieved an international reputation for his work at Wisconsin. In addition to his reputation in research and administration, he had served as a coauthor with W. A. Henry of the book, *Feeds and Feeding*, which had become well known as the "farmers' bible" and was a standard textbook throughout the United States and Canada and in other countries. Financial support and offers of cooperation were made by livestock interests in the state to induce Professor Morrison to accept the headship of the department. Special legislation was secured in 1928 to permit paying him an annual salary of \$7,500 as department head. An additional \$2,500 toward his salary was contributed by the New York Farmers, an organization of New York City businessmen (who also owned farms), at the urging of Oakleigh Thorne, owner of Briarcliff Farms at Pine Plains in Dutchess County. Thorne indicated that members of this organization were all of the opinion that the state should adequately support the work in animal husbandry and agreed this was simply a matter of proper organization and information (Colman 1963, p. 397). At that time, Briarcliff Farms was an internationally recognized Aberdeen-Angus breeding establishment managed by William Pew, a former professor of animal husbandry at Iowa State College.

About 2 years later, soon after I first arrived at Cornell for graduate studies in animal husbandry, Professor Morrison reviewed one day some of the incidents relating to his appointment at a salary higher than other well-established professors were getting. "After I had been in my office about a week, Professor George F. Warren, head of Agricultural Economics and Farm Management, came to see me. Among other things he said: Morrison I want you to know how tickled I am that you have been brought in at this high salary. We've been trying to break the low salary ceiling for years, and now that it has been done we will be able to get higher salaries for the rest of the deserving members of the faculty." This was an attitude that paid off in succeeding years.

## Death of I. P. Roberts

The first director of the College of Agriculture and the first teacher of animal husbandry at Cornell died on March 17, 1928, in San Francisco, California. "Although he had retired from his directorship of the College in 1903, his spirit and ideals continued to permeate the institution, and his teachings, his personality, and his example were portrayed to the succeeding generations of students. He was held in marked affection by farmers throughout the State and by all his former colleagues who are still among us" (Forty-first Annual Report, 1928).

In earlier comments on Roberts's work at Cornell, Liberty Hyde Bailey wrote: "He gathered about him many specialists, gave them every facility and equipment he could secure, and left them with great freedom. His hold on the students and on the people of the state was remarkable. His talks and addresses always had practical wisdom combined with vision, he was patient and self-contained under criticism, he made friends and he held them" (Roberts 1916).



Henry H. Wing, 1888-1928. First head,  
Department of Animal Husbandry, 1904-1928.  
Photograph at retirement.



Dean Bailey holding plow pulled by students breaking  
ground for new buildings for agriculture.



Buildings of the New York State College of Agriculture about 1910. *From left to right:* agronomy (Stone Hall),  
main building (Roberts Hall), dairy building (East Roberts), and judging pavilion.



First class held in new dairy building, October 10, 1906. Note three women in the front row.



Barns at the College of Agriculture. Horse barn *at left* and dairy barn *at right* were occupied about 1910.



New building for animal husbandry completed in 1915, later named Wing Hall, at east edge of campus.



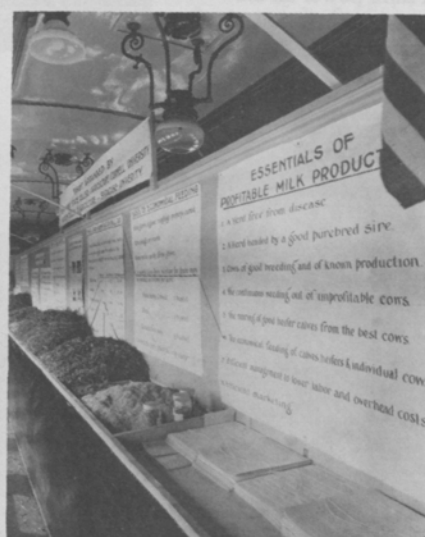
New livestock pavilion for animal husbandry was constructed in 1915. It is still in use in 1988.



Parade of cattle along Tower Road before cattle auction at end of Farmers' Week.



Dairy demonstration train used in extension in 1914. Professor Hopper at extreme right; next to him is Professor Riker, Syracuse University.



Dairy feeding exhibit in train jointly arranged by Cornell and Syracuse universities.





Glista Ernestine (1908-1924), one of the remarkable cows of the Holstein breed, had a lifetime production of 202,006 pounds of milk and 7,342 pounds of butterfat.



Professor Hopper demonstrating desirable type in dairy cows to group of farmers. Note the two women *at right* who arrived on roller skates.



Horses were the source of farm power on the college farm during the early years.



Harvesting corn for silage during the twenties.

**New Faculty in Animal Husbandry, 1905-1927**  
(those who attained rank of professor or associate professor)



M. W. Harper,  
1905-1938. Teaching,  
research—horses.



E.S. Savage, 1907-  
1943. Teaching,  
research—dairy cattle.



G. W. Tailby, Jr.,  
1907-1950. Extension—  
dairy records.



H. A. Hooper,  
1913-1937. Extension—  
dairy cattle.



L. A. Maynard,  
1915-1955. Teaching,  
research—animal  
nutrition.



K. J. Seulke,  
1916-1920. Teaching,  
research—beef cattle,  
meats.



R. B. Hinman,  
1920-1943. Teaching,  
research—livestock  
production, animal  
breeding.



W. T. Crandall,  
1922-1954. Extension—  
dairy records, feeding.



J. P. Willman,  
1925-1957. Extension—  
4-H livestock; teaching,  
research—sheep and  
swine.



C. M. McCay,  
1927-1962. Teaching,  
research—animal  
nutrition.





### *PHASE III*

## **GROWTH AND DEVELOPMENT OF ANIMAL HUSBANDRY UNDER ADMINISTRATION OF FRANK B. MORRISON, 1928-1945**

### **Animal Husbandry Advisory Committee Formed**

Professor Morrison brought aggressive, dynamic leadership to the development of the programs in research, resident instruction, and extension in animal husbandry. Almost immediately, he started working on the formulation of a program to expand the physical facilities, improve the livestock herds, and obtain increased financial support. One of Professor Morrison's first steps was to enlist the cooperation and support of the livestock industry. In February 1929, he arranged a conference at the college with representatives of farm organizations, livestock associations, and the farm press. He requested suggestions for more-effective use of the staff in serving the livestock interests of the state.

The group elected an Animal Husbandry Advisory Committee of 10 members, with Harold L. Creal, dairy farmer of Homer and member of the state assembly, as chairman. All members of the advisory committee were prominent, highly respected leaders in livestock production and related fields. For example, two of them, Holton V. Noyes, Oneida Community, and Paul Smith, Newark Valley, each served later as commissioner of the State Department of Agriculture and Markets.

The committee worked closely with Professor Morrison in the preparation of a definite program for further development of the department's activities and for obtaining funds to make possible implementation of the program. It was agreed the greatest immediate need was for increased maintenance and operating funds and for improved facilities for dairy cattle. The committee presented its recommendations to the state Department of Education and also to the Agricultural Advisory Commission appointed by Governor Franklin D. Roosevelt. The report was endorsed by the commission, and the main items were incorporated by the governor in his recommendations to the legislature for action. Through the cooperation of leaders in the legislature, an appropriation was made that year (1929); it provided for an increase of \$54,050 in operating and maintenance funds in the annual budget of the department, plus \$30,000 for alterations and repairs to the dairy barn and for construction of a calf barn and additional silos. It was felt these funds would permit significant improvement in the work of the department and would provide satisfactory housing for the purebred dairy herd.

Further, the advisory committee recommended that additional funds should be requested in the budget for the next fiscal year, 1929-30, for new barns for beef cattle, sheep, and swine, for the purchase of better foundation purebred livestock, and for additional land needed to provide feed and pasture. Again, the committee worked effectively with legislative leaders, and the 1930 appropriations to the department provided \$160,000 additional funds. During the year, the main dairy barn was completely renovated, and the horse barn nearby was extensively remodeled. A new barn was constructed and included

box stalls for cows on official test on the ground floor, calf stalls and pens on the second floor, and storage space for straw, hay, and feed on the third floor.

The Warren farm of about 500 acres, which had been rented earlier for protein level experiments with dairy cows, was purchased at a cost of \$60,000. Over the next couple of years, new barns for sheep and swine were built on the Waite farm, on Pine Tree Road, about 2 miles south of Wing Hall. The new sheep barn cost \$21,218, including installation of water system and drainage, fencing of pastures and paddocks, and construction of roads. The cost of the swine barn with similar facilities was about \$26,000. The new barn for beef cattle cost \$24,354 and was constructed on Dryden Road about 200 yards southeast of the dairy barn. Attached to the barn was a feeder shed and pens to handle 40 experimental steers. Before it was occupied by beef cattle, the hayloft of this new barn provided excellent space for a barn-warming party sponsored by the Round-Up Club for students and faculty.

Another appropriation of \$60,000 was provided in the 1931 budget for the purchase of new foundation livestock for the department. This also was recommended by the special Animal Husbandry Advisory Committee and the governor's Agricultural Advisory Commission. These funds made possible the acquisition of high-quality animals of the most-important breeds for use in instruction, demonstration, and research. These included carefully selected additions over the next couple of years to the dairy herd of Holsteins, Guernseys, Jerseys, Ayrshires, Brown Swiss, and a few dairy Shorthorns; Angus and Herefords of the beef breeds; Percheron and Belgian horses; Shropshire, Dorset, Hampshire, Merino, and Southdown breeds of sheep; and Berkshire, Chester White, and Duroc breeds of swine.

The old sheep barn, which was located just east of the dairy barn, was renovated for housing dairy bulls of the several breeds. The building that had been occupied by swine was remodeled for use as an isolation unit and part of it for a dairy heifer shed.

These special appropriations for animal husbandry were made in spite of the fact that the country's Great Depression occurred during the early 1930s. The 1932 appropriations for the College of Agriculture were less than for the previous year, but one new project for animal husbandry that provided \$10,000 for additional livestock experimentation did get included.

## Department Reorganized

Although there had been some alignment of the faculty according to their interests, especially in the Laboratory of Animal Nutrition, with the coming of a new head, the department was reorganized according to a clearly defined plan, with a faculty member in charge of each of the divisions. The organization with a listing of faculty according to the main divisions, or areas of responsibility, is illustrated in table 2 for the year 1929-30.

### Changes in Courses

Professor Morrison soon recognized the need for improvements in teaching, so some changes were made in the courses offered in the department. A general course in animal husbandry dealing with the types, breeds, judging, and management of all classes of livestock was offered in 1929-30. The students were introduced at the outset to the various classes of farm animals.

**Table 2. Organization and faculty of Department of Animal Husbandry, 1929-30**

<b>Head of Department</b> Professor F. B. Morrison	<b>Sheep and Swine Division</b> Instructor J. P. Willman
<b>Animal Nutrition Division</b> Professor L. A. Maynard Assistant Professor C. M. McCay Assistant Professor S. A. Asdell <sup>1</sup>	<b>Extension Division<sup>2</sup></b> Professor H. A. Hopper, general extension Assistant Professor W. T. Crandall, dairy records, dairy feeding Assistant Professor C. L. Allen, <sup>3</sup> dairy production Assistant Professor S. J. Brownell, dairy cattle breeding Assistant Professor H. J. Metzger, <sup>4</sup> herd health Instructor W. T. Grams, sheep production Instructor G. W. Tailby, Jr., dairy herd improvement associations Instructor H. A. Willman, junior livestock programs
<b>Dairy Cattle Division</b> Professor E. S. Savage Instructor E. S. Harrison Instructor R. C. Bender	
<b>Beef Cattle and Meats Division</b> Assistant Professor R. B. Hinman Instructor C. D. Schutt	
<b>Horse Division</b> Professor M. W. Harper	

<sup>1</sup>Appointed March 1, 1930.

<sup>2</sup>Professor Morrison served as extension leader.

<sup>3</sup>Resigned January 30, 1930, to go into farming.

<sup>4</sup>Resigned June 30, 1930, to enter Graduate School.

They also became acquainted with the professors in each phase of animal production, for all of them were involved in instruction. The course was taught by Savage, Harper, Hinman, and J. P. Willman, each of them teaching for 3 or 4 weeks covering the study of different species of farm animals.

Professor Morrison assumed the responsibility for teaching the course in livestock feeding, and Professor Savage taught the dairy cattle course after Professor Wing retired. Enrollment in all undergraduate courses in the department increased quite rapidly over the next several years, doubling in 5 years beginning in 1930.

Space for teaching and research in animal nutrition was very limited in Wing Hall, so arrangements were made to provide research laboratories and offices next door in Stocking Hall. Space also was provided for the rat colony, a seminar room, and a teaching laboratory.

Professor McCay initiated a new course for advanced undergraduates and graduate students, course 111, Advanced Nutrition, laboratory course, in the fall term 1930. This course was designed to familiarize the student with the application of chemical methods to the solution of the fundamental problems of nutrition.

Two separate courses were offered in meat and meat products for students in the School of Hotel Administration and the College of Home Economics, in addition to a course for agricultural students.

Morrison conducted the department seminar, which brought together faculty and graduate students from all fields within animal husbandry. Frequently, he would cover an area of research that he had recently reviewed for use in his book. During these years, the annual meeting of the American Society of Animal Production was held regularly in Chicago on Friday and Saturday after Thanksgiving and immediately preceding the International Livestock Show. After members of the faculty returned, they were expected to

review in the seminars, for the benefit of other staff and graduate students, some of the most-significant papers presented at the meetings.

A summary of courses offered in animal husbandry, selected years, 1929-30 to 1944-45, is given in appendix 1.

### **Staff Changes, 1929-1944**

Several staff changes took place early in Professor Morrison's administration. Professor Charles L. Allen, a long-time faculty member working with dairy cattle, resigned on January 30, 1930, to go into farming.

Dr. H. J. Metzger, a veterinarian who had worked in herd health and animal disease extension for several years, resigned on June 30, 1930, to enter the Cornell Graduate School for work in animal nutrition. Later, he served on the faculties of the University of Kentucky and Rutgers University.

John P. Willman, who had developed an outstanding 4-H club livestock program after he joined the extension staff in 1925, was transferred to the teaching and research staff in 1929 in charge of sheep and swine. Holding the rank of instructor, he was able to enroll part-time in graduate school and earned the Ph.D. in 1933 under the direction of Professor Morrison. His thesis research dealt with studies on prevention of the stiff-lamb disease.

Several significant new appointments were made in 1929-30. Stanley J. Brownell was appointed extension assistant professor in the fall of 1929 to give new leadership to the dairy cattle breeding extension educational programs. He came to Cornell following 6 years of successful extension work at Pennsylvania State College. He graduated from Michigan State College and obtained his M.S. degree there. After this, he spent a year in the Extension Service in Michigan before moving to Pennsylvania.

Harold A. Willman succeeded his older brother on September 11, 1929, as extension instructor in charge of the 4-H livestock programs. Harold was a graduate of Pennsylvania State College, with an M.S. degree from the University of Minnesota, and worked as an extension agent in Pennsylvania before he came to Cornell.

Dr. Sydney A. Asdell joined the faculty for teaching and research in animal reproduction and physiology, in the Division of Animal Nutrition, effective March 1, 1930. He was born in England and received his education there, with university degrees from Cambridge. Asdell obtained his Ph.D. in 1925 under the direction of Dr. Gowland Hopkins and continued to study at Cambridge for 2 additional years with Dr. F. H. A. Marshall and Sir John Hammond, two of the world's leaders in animal breeding and reproductive physiology. Dr. Asdell was awarded a Rockefeller Fellowship in 1926-27 for research and further study at the Universities of Rochester and California. From there, Dr. Asdell moved to New Zealand, serving as lecturer in physiology and nutrition at the Massey Agricultural College for a couple of years before coming to Cornell.

Dr. Asdell started a new course, Physiology of Reproduction, that was first offered in the second term, 1930-31. The following year he teamed up with Professor Maynard and offered another new course, Physiology of Lactation. Beginning in 1934-35, Dr. Asdell taught the animal breeding course very effectively for 5 years.

Clarence G. Bradt, former county extension agent in several counties in New York, joined the staff as extension assistant professor of animal husbandry

on July 1, 1930. His major responsibility was the organization of dairy record clubs, a type of mail-order milk testing.

Later on, in 1934, Dr. G.W. Salisbury was appointed instructor for teaching and research in animal husbandry after he completed his graduate studies under the direction of Professor Morrison. Salisbury was a graduate of Ohio State University. Over the next few years, his work earned Salisbury a rapid promotion to the rank of professor.

Dr. John I. Miller was added to the staff as instructor in 1936 to teach the courses in judging, including coaching the livestock-judging team.

Dr. John K. Loosli joined the staff in 1938 as research instructor in animal nutrition and quickly moved up through the ranks to professor. His graduate work for the Ph.D. was under the direction of Professor Maynard. Loosli did his undergraduate work at Utah State University and earned the M.S. degree from Colorado State University.

Professor E. S. Harrison resigned from the university early in the fall of 1943 and took a position as manager, Harden Farms, Camden, N.Y., where he developed an outstanding herd of Holstein-Friesian cattle.

After serving as extension instructor and extension assistant professor from 1934 to 1938, I spent  $5\frac{1}{2}$  years at the University of Maryland as professor of dairy husbandry and 3 years as head of the department. Late in 1943 I was invited by Professor Morrison to return to Cornell as professor of animal husbandry to succeed Professor Savage. I rejoined the faculty on April 1, 1944, in charge of the dairy cattle division.

Dr. Charles L. Norton was the last graduate student of Professor Savage. He joined the staff as instructor on July 1, 1944, after completing the Ph.D. and was promoted to assistant professor a year later.

Dr. Arless A. Spielman joined the staff on October 1, 1944, as assistant professor in the vice-Harrison position. Dr. Cloy B. Knodt was appointed instructor on September 1, 1944, to work with Professor Salisbury in animal breeding research.

Several new positions, primarily in extension, were established in 1943-44 and will be discussed later in that section.

### **Role of Herdsmen**

An expression of appreciation for the work of the several livestock herds-men is in order at this point. Their work requires a high degree of devotion and sense of responsibility, along with the personal qualities necessary to work well with people. The herdsman for each class of livestock had the responsibility for developing and maintaining high quality herds and flocks, a duty shared with the staff member in charge. Successful experiments depend in large measure upon the attention to all details by the herdsman and his fellow workers in the barn and on exact record keeping.

Hundreds of students in animal husbandry, farm boys and girls and many from the cities, received some of their best instruction from the herds-men in their work in the barns. Each of the livestock units provided employment opportunities for many students. In the discussions that follow, I will comment specifically on the fine herds-men that served during the period 1928-45 and into the next phase 1945-63. Those of us who were at the university during these periods of time were fortunate to have had a group of high-class men on whose integrity and capabilities the management of the herds and flocks so much depended.

All of us in the department during this period, especially graduate students in animal nutrition, have pleasant memories of Alf Armitage, handyman and carpenter, who was always ready to put up a shelf, to supply a bolt, or do whatever was needed.

### **Secretarial and Clerical Staff**

I would be remiss if I did not acknowledge the contributions of all the clerical staff during the early years of the department. All university professors recognize the importance of the secretaries, stenographers, typists, statisticians, calculator operators, and others. Professor Morrison used to say, on occasion, that the university could dispense with a professor more readily than with a good secretary. Certainly, a good secretary greatly enhances the work of the professor.

During the first few years of Professor Morrison's tenure as department head, staff members and graduate students looked to Miss Viola Elver, head statistical clerk (in modern terms the title would be administrative assistant or administrative aide), for help on matters of policy, requisitions, vouchers, and other budgetary matters. Professor Morrison brought Miss Elver from Wisconsin when he came. After her death in 1936, she was succeeded by Mrs. Madeline Bower, who continued to give loyal, dependable service for more than 25 years in the top clerical position.

### ***Tragedy Strikes the Department***

During his administration, Professor Morrison gave liberally of his time to colleagues in the department—professors, students, and others. Frequently, he would go out with visitors to look over some of the experiments. One day in September 1936, he was out of his office for about an hour, looking over some pastures, when a sudden rainstorm came up. He got soaking wet and went home to change his clothes before going back to his office. This event probably saved his life. While Professor Morrison was out of his office, a disgruntled, mentally deranged custodian who had worked in Wing Hall for several years, went to the office and asked to see him. When told that Professor Morrison was not in, the custodian turned and walked out the door. As he did so, the secretary noticed that he was carrying a shotgun. He walked down the hall into another office where Miss Elver was working. The custodian shot and killed her as she sat at her desk, then sat down on a bench in the hall and shot himself. Four other shells (bear slugs) were found on his body, and it was pretty obvious that one of them had been marked for Morrison.

Custodians in the buildings on campus worked under a universitywide supervisor, with no administrative control by the department heads. Both Professor Morrison and Miss Elver had reported from time to time some dissatisfaction with the work of the custodian. This was his revenge.

### **Increase in Graduate Students**

There was a gradual increase in the number of graduate students in animal husbandry during the later years of Professor Wing's administration. Most of them were attracted primarily by the work of Maynard and Savage. After Professor Morrison came, the number increased more rapidly. He was

widely known and respected throughout the world, especially for studies in feeding and nutrition, and he attracted many graduate students from other states and other countries.

As a personal comment, I came to Cornell as a graduate student in 1930 because Professor Morrison was here. I owe a great deal to him. His influence shaped my life's work.

There were only five graduate assistantships listed in animal husbandry in the 1929-30 college announcement, but this number increased gradually over the next several years. Further, additional research grants provided fellowships and support for graduate students. In fact, much of the department's research was conducted by graduate students under the guidance and direction of their major professors. This was an important part of graduate training.

Course offerings gradually reflected the increased emphasis on graduate study. As new courses were offered, many were at more-advanced levels, involving the fundamental physiological and biological functions and relationships in animal production.

Throughout this period of reorganization and further development of the department, with greatly expanded research programs and upgrading of graduate studies, Professor Morrison still devoted time to speaking engagements in the state and around the country. In addition, he took on some foreign assignments. Meanwhile, he kept his book, *Feeds and Feeding*, up-to-date for the benefit of fellow scientists, students, and livestockmen. The 20th edition was published in 1936, and he was well along on the 21st edition when he asked to be relieved of his administrative duties in 1945. This edition was published in 1948. I heard him say many times that he felt it was his duty and responsibility to keep the book up-to-date.

The only way Professor Morrison could do all these things was through long days of hard work. He knew how to work "the old fashioned way"—from early morning until late at night, and on Saturdays, Sundays, and holidays.

As a graduate student, 1930-1934, I was fortunate to have my desk in an office across the hall from Professor Morrison. No matter how early I got there in the morning, he was already there ahead of me. I usually left about 11:00 at night, but the evening was still young for him! Professor Morrison would frequently come at night into the office I shared with Glenn Salisbury, another graduate student, and talk about a piece of research that he was reviewing and abstracting. This was relaxation for him and a great learning experience for Glenn and me. Possessed with a keen, analytical, and brilliant mind, Professor Morrison was an inspiration to those of us who were privileged to study under his direction or to be closely associated with him.

Before he came to Cornell, Professor Morrison was president of the American Society of Animal Production in 1919-20. This was an early recognition of his capabilities by his fellow animal scientists who elected him. He always participated actively in the society (later the American Society of Animal Science), and the American Dairy Science Association. He was the honored guest of the American Society of Animal Production in 1938 when his portrait was hung in the famous Saddle and Sirloin Club in Chicago.

Soon after Professor and Mrs. Morrison and their two sons, Roger and Spencer, moved to Ithaca, they bought a house and tract of land near Sheldrake on the west side of Cayuga Lake to use as a summer place. Beginning about 1930, they held an annual picnic at Sheldrake for staff members in the department and their families and members of the administration in Roberts Hall. We had an opportunity to get better acquainted under informal, pleasant

conditions during an afternoon of fun, relaxation, and good food. Some years later, the Animal Husbandry Wives Group took on the responsibility for the annual picnic. But Professor Morrison always provided the milk and ice cream for the party.

Mrs. Morrison had the idea originally of organizing the faculty and grad wives into a group that met once a month at members' homes. It was purely social in nature (although programs of interest were presented), but it served the wholesome purpose of providing cohesion as well as developing a certain sense of loyalty and caring in the department. Evidence of such caring often emerged in the form of a casserole, a cake, or flowers at the door of a family experiencing an illness or just in need of a little pick-me-up.

## Major Programs, 1928–1944

After the reorganization of the department into several divisions, including separate livestock-production teaching and research units, the organizational structure remained relatively unchanged throughout Professor Morrison's tenure as head of the department. The major accomplishments, projects, and programs will be discussed for each of the divisions in the remainder of this early history.

It should be recognized, of course, that most programs cut across divisional lines, and there was much cooperation among the faculty and graduate students of the different divisions. This was especially true with animal nutrition, which involved faculty of all divisions and the utilization of all species of farm animals, as well as nonfarm species. In general, much of the more-basic, fundamental research was centered in the animal nutrition division and later in animal breeding and artificial insemination, whereas a majority of applied research was carried out in the production divisions. The chemical laboratories in nutrition provided analytical service on feeds for all staff. All the teaching and research faculty became involved in extension programs in varying degrees from time to time. This was especially true in the production divisions of dairy cattle, beef cattle, sheep, and swine.

In the following discussions on research accomplishments, emphasis will be given to those projects, pursued on a long-time basis, that serve to illustrate the variety and scope of programs yielding important results.

During this period of time, as was the case earlier, almost all the resident staff were engaged in both teaching and research, with the proportion of time devoted to each varying somewhat for the different individuals. Specialists in extension devoted full time to this function; they were housed in the department for close interaction with the teaching and research staff and, for all intents and purposes, were members of the faculty. However, extension specialists did not have faculty status until May 3, 1939, when the agricultural faculty voted to recommend that members of the extension staff be admitted to full membership in both the faculty of agriculture and the university faculty. This received the support of the university faculty and was approved by the trustees in June 1939, making all extension professors, associate and assistant professors voting members of the faculty of agriculture and nonvoting members of the university faculty. Actually, it was apparently assumed in the earlier years that the few professors then engaged in extension work in agriculture and home economics had faculty membership by virtue of their professorial appointments. But in 1916–17, the board of trustees ruled that



only those professors and assistant professors "who give instruction to regular students" are members of any faculty.

As will be discussed more fully later, the extension specialists played an exceedingly important role in educational programs with livestock farmers and breeders, interpreting research for application on farms and bringing problems to the attention of the teaching and research staff. Livestock farmers and breeders looked to the college for service, and strong relationships developed.

## Animal Nutrition Division

### Animal Nutrition Research

Extensive investigations were initiated by Maynard and McCay in 1928 to study the influence of different levels of fat intake upon milk secretion in dairy cows. These studies were continued for 15 years and included 17 different experiments. In the earlier trials, low-fat concentrate mixtures, having an average of 2.7 percent fat, were compared with higher-fat mixtures, averaging 6.5 percent fat. These mixtures were fed with mixed clover-timothy hay and corn silage or beet pulp. In every trial there was a small, but consistent, difference in milk yield favoring the higher-fat concentrate mixtures, showing that fat in a ration for dairy cows is worth more than its calculated total digestible nutrient value. On the average, the yield of milk was 4 percent greater on the high-fat mixtures.

In these experiments, basic data were obtained on lipid changes in the blood during lactation. The lowering of the fat intake was accompanied by a gradual lowering of the total fatty acids, the phospholipid fatty acids, and the cholesterol of the blood plasma. Blood sugar values were unaffected by changes in the ration.

Out of this work came the practical recommendation that concentrate mixtures fed to dairy cows should contain approximately 4 percent of fat when fed with average quality hay and corn silage. Much of this work was done when dairy concentrate mixtures often had less fat than formerly because of the increased use of the solvent process in the extraction of oil and the production of soybean oil meal and other oil meals. It was important to know, therefore, how low-fat content of rations would affect milk yields (Cornell Univ. Agr. Exp. Sta. Bul. 543, 1932; 593, 1934; and 753, 1941; and Memoir 265, 1944).

Continuing research on milk-fat metabolism demonstrated that neutral fats in the blood are some of the precursors of milk fat (Cornell Univ. Agr. Exp. Sta. Memoir 211, 1938).

In 1931 Professor McCay and his graduate students began a pioneer study with rats on the effects of certain restricted diets on life span, productive life, and the onset of senility. Several years of research demonstrated that diets for rats restricted only in calories, but adequate in other nutrients, while causing growth retardation, greatly extended the life span and postponed the biochemical and pathological changes of aging. These results challenged the view that maximum growth in weight and size early in life produces optimum development for long life in animals. These investigations were given major support by the Rockefeller Foundation.

The first publications were greeted with some skepticism as to their significance, but the continuing studies stimulated experiments by other scientists,

which showed practical advantages of restricted rations under some conditions. Professor McCay actually was 50 years ahead of his time in these life-span studies that have made large contributions to our understanding of the chemistry, physiology, and pathology of aging. After spending all these years on life-span studies, Professor McCay concluded: "The best method we have discovered for retarding the onset of old-age diseases is to keep animals thin upon a modest allowance of a diet more than adequate in foods rich in vitamins, minerals, and proteins." More than 50 papers were published reporting the results of various nutritional factors on the aging process and life span of rats and hamsters.

These life-span studies were extended to dogs later (about 1936) and were continued for many years.

In 1936 Miss Gladys Sperling was appointed instructor in animal nutrition to take charge of the small animal colony and to assist McCay, Maynard, and others in the research program. About the same time, Dr. LeRoy L. Barnes of the Department of Physics began cooperating with Dr. McCay in experiments in which biophysical techniques were needed. In 1938 this arrangement was formalized with the appointment of Dr. Barnes as assistant professor of biophysics to work regularly with McCay on a part-time basis. Funds for his salary came from the Rockefeller Foundation grant. Dr. Gordon H. Ellis was appointed an instructor in animal nutrition in 1937 for research with McCay and others.

After Professor Asdell joined the faculty in 1930, he conducted important research on relationships between dietary restriction and reproductive performance. In cooperation with McCay, this work showed that growth retardation delayed sexual maturation. Professor Asdell's major thrusts during his first few years at Cornell included hormone studies on the development and functioning of the mammary gland in rabbits and goats. These investigations contributed to the understanding of the specific roles of ovarian hormones (oestrone and progesterone) and the pituitary hormone (prolactin) in mammary growth and secretion. It was demonstrated that an abnormally rapid decline in milk secretion in the course of the lactation period may be due to an insufficiency of prolactin (Cornell Univ. Agr. Exp. Sta. Memoir 198, 1936).

Later, Asdell shifted his emphasis to studies on reproductive physiology in dairy cattle and other species. A major project that he initiated was a controlled attempt to restore fertility in dairy cattle by treatment with gonadic and gonadotropic hormones. This work was in cooperation with Dr. M. G. Fincher of the Veterinary College, with much of it conducted by Sedgwick E. Smith for his Ph.D. thesis. Cows with fairly regular estrous cycles were brought together under a uniform system of management and were divided into control and experimental groups. Treatment consisted of the injection of an estrogen; and if conception did not follow, anterior-pituitary extract was injected. In the control group, 50 percent of the cows conceived and had calves; in the injected group, 42.9 percent conceived and had calves. Without adequate controls, the results of this experiment might have been interpreted as a considerable success in treatment (Cornell Univ. Agr. Exp. Sta. Memoir 243, 1942).

The use of synthetic diets composed of individual nutrients in purified form had contributed greatly to the modern knowledge of nutrition up to the 1930s. The development and use of purified diets, however, were limited almost entirely to laboratory rats, with little or no application to herbivora, especially ruminants. This was an important reason why the knowledge of specific nutritive requirements of herbivora had lagged behind that of other species. Therefore, investigations were started in 1928 by Maynard, McCay,

and several graduate students with the ultimate objective of devising a satisfactory synthetic diet for ruminants. Over a period of 3 or 4 years, various synthetic, or purified, diets were formulated, and their suitability was studied with guinea pigs, rabbits, goats, and sheep, a total of approximately 200 animals being used. After several failures, it was found that finely ground, regenerated cellulose (with trade name Sylphrap) was a suitable ingredient to ensure satisfactory food consumption.

A diet was developed, free from hay or grain, on which sheep were raised successfully from weaning and maintained satisfactorily over a period of 480 days. Much of this work was conducted by L. L. Madsen for his Ph.D. thesis research. The development of the body as a whole and of its parts, as shown by postmortem examination, was very nearly normal. Goats were reared from weaning and maintained over a period of 580 days on the purified diet, but their development was less satisfactory than in the case of the sheep. Distinctly less success was achieved with guinea pigs and rabbits (Cornell Univ. Agr. Exp. Sta. Memoir 178, 1935). A constant symptom of the failure with guinea pigs and rabbits was the development of a paralysis due to a degeneration of the skeletal muscles; there also were some lesions of the heart muscle and a characteristic fatty liver. These symptoms were first noted with the synthetic diets containing cod-liver oil. The addition of cod-liver oil to a diet of natural foods produced the characteristic muscle lesions in guinea pigs, goats, and sheep.

These experiments also demonstrated the need of goats and sheep for some vitamin B factor, and evidence was obtained that a high level of yeast lessened the injury produced in goats by the purified diet containing cod-liver oil. Additional research at that time failed to identify the factor in the oil that caused the muscle dystrophy (Cornell Univ. Agr. Exp. Sta. Memoir 217, 1938).

The discovery that cod-liver oil caused skeletal and heart muscle degeneration on certain diets laid the basis for the subsequent finding by others many years later that the harmful effect was caused by the destruction of vitamin E by unsaturated fatty acids in the oil.

Professor McCay and his graduate students continued fisheries research for many years in cooperation with the Connecticut State Hatchery and the New York State Conservation Department at its Cortland Hatchery. This work contributed to the development of special feeds for trout, including purified diets that could be chemically defined. Studies were conducted to determine the requirements of protein, fat, minerals, and vitamins for growth and the effects of water pollution and temperatures on growth rate and mortality. Also, information was obtained on the effects of nutrition on the body composition of trout.

### **Research with Fur Animals**

A program with fur animals was initiated in the summer of 1936 when the Fish and Wildlife Service in Washington, D.C., invited Dr. L. A. Maynard to begin research on the development of dry diets for foxes and mink in cooperation with Charles F. Bassett, director of the Federal Station, Saratoga Springs, New York. Dr. J. K. Loosli had just completed his Ph.D. in animal nutrition and was asked by Dr. Maynard to build pens and metabolism cages and start digestion studies with these species at the Blair barn. Animals were brought from Saratoga, and in the spring of 1939 growth studies were started with fox pups and mink kits. After a year Loosli was transferred to a salary item in the

department, and Dr. S. E. Smith was placed on the fur animal project for the next 3 years before he went to the Federal Nutrition Laboratory. Dr. Lorin E. Harris next worked on the project for a few years.

During these early years, the Cornell staff worked closely with many breeders in the United States and Canada, who gave good support to the program. Out of these studies came many scientific publications, as well as popular articles, which were of significant value to breeders of fur animals.

### **Additional Facilities for Animal Nutrition**

In 1938 the university purchased the Reed farm of 90 acres, located about 2 miles east of the campus near the State Game Farm, to provide the nutrition division with a herd of dairy cattle, a barn, and other facilities for lactation experiments. It was felt that a dairy herd for this work, separate from the main teaching and research herd, would provide more freedom and flexibility in use of animals. Animals and equipment were purchased largely from grants from interested industries to expand the research on the role of fat in lactation that had been going on for several years. Dr. J. K. Loosli was the leader of work at the Reed farm, and Charles Perce was the herdsman. A high-quality herd of Holstein cows was developed.

In 1939 greatly enlarged quarters for animal experiments were provided on the second floor of the recently constructed horse barn. This provided space for cages for white rats, guinea pigs, rabbits, and other small animals. These facilities also provided an air-conditioned room for controlled animal experiments; laboratories for x-ray studies, cardiography, and histological work; and service rooms for storing, grinding, and mixing experimental rations.

### **Instruction in Animal Nutrition**

Professor Maynard long felt the need for a textbook for his own classes, and this prompted him to prepare the book, *Animal Nutrition*, first published in 1937. The material presented was selected as a result of some 20 years' experience in teaching the principles of animal nutrition to undergraduate and graduate students at Cornell. The book received wide acceptance throughout the world.

Maynard had taught principles of animal nutrition since 1919. This course and animal nutrition laboratory taught by McCay, starting in 1930, were for many years the major courses available to graduate students. Special topics in animal nutrition became the animal nutrition seminar and attracted graduate students from other colleges and departments of the university.

Seminars under Maynard and McCay were known as the Mendel type, similar to the ones in which they had participated earlier at Yale. Each graduate student reported briefly on one or several papers involving a specially selected current topic in biochemistry, physiology, and nutrition. Maynard or McCay selected the topics and assigned the papers, often published in German or French, languages required for the Ph.D. in those days. The professors knew the contents of each paper and the significant points they wanted brought out in the presentation. Every graduate student was privately given a pertinent evaluation of his or her presentation. Needless to say, new graduate students each year rapidly learned the value of doing their homework thoroughly.

Early each fall students in the animal nutrition seminar were invited to the McCays' home on a small farm on Hanshaw Road for an apple-picking party. This would be followed by a bountiful dinner of chicken and dumplings and many other goodies, prepared by Mrs. Jeanette B. McCay, and an evening of fun, liberally supplemented with discussions on a wide range of nutritional subjects. After much urging, Dr. McCay would sometimes get out his violin to entertain the group.

Graduate students working in the animal nutrition laboratories soon learned discipline and the importance of proper techniques, methods, and procedures. An incident to illustrate this came up one day when I was conducting some analyses on blood sugars in McCay's laboratory. While Dr. McCay was out, a graduate student from another department used the Van Slyke apparatus and failed to clean up properly afterward, leaving some mercury lying around. After McCay returned and observed the situation, he immediately called the student's major professor and in no uncertain terms told him to send the student over immediately to clean up. Further, the student was told not to come back in the future unless he knew how to care for a piece of equipment. We all learned from experiences like this.

As a part of the educational process, Maynard would not permit graduate students from the other divisions of the department to conduct their analytical work in his laboratories until they had demonstrated to him their capabilities to handle the equipment and do the chemical procedures. In my own case, for example, I was majoring with Professor Morrison and was conducting nitrogen balance studies with sheep for my thesis research and wanted to get the experience of doing my own chemical analyses. Although I had 30 credit hours of chemistry in my undergraduate work at the University of Missouri, plus McCay's laboratory course in animal nutrition, I still had to pass an oral examination on all of the chemical reactions involved in the laboratory procedures necessary for my research. And, further, I had to provide evidence that I had thoroughly reviewed the literature relating to my research problem; only then was I permitted to work in the laboratory.

Maynard was a superb lecturer. His lectures were highly organized, concentrated, up-to-date, and interestingly presented. He was always well prepared and routinely rehearsed his lecture verbally, pacing around his office just before the lecture. He patterned himself after Professor Mendel, who could put into one sentence more clarity and understanding than another person could put in two or three paragraphs.

He was noted for his dry wit and sense of humor. In the early days of the Laboratory of Animal Nutrition, Maynard took care of the annual inventory with the help of a graduate assistant as recorder. On one of these occasions after completing the list in a young assistant professor's laboratory, he surveyed the scene; and noting his young colleague busily at work, Maynard remarked to his student recorder, in a voice that was easily heard throughout the room, "You had better put one working chemist on that list also."

Professor Maynard took a leave of absence from Cornell in 1928 to study as an International Education Board Fellow at the University of Strassburg and the Ecole Veterinaire, Lyons, France. In addition to enriching his teaching and research, this experience made him a valuable member of the language examination committees of the Graduate School.

In 1934 Maynard spent a sabbatical leave as a visiting professor of nutrition at the University of Nanking, China. After returning, he described his surprise on a visit to an orphanage outside the city to find a large modern dairy enterprise and his great disappointment to learn the milk was not given to the

orphans. Instead, it was sold in the city for cash to help maintain the orphanage. Such early experiences broadened Maynard's interests and strengthened his later participation in international organizations and programs involved with food and nutrition problems in developing countries. In my own travels in China in 1981, it was apparent that children still were not getting much milk.

Both Maynard and McCay loved the outdoors. In the early thirties they bought a tract of land in the Caroline hills for personal recreation. They each built a cabin there and often invited graduate students to go out with them to give a hand now and then with such projects as building a fireplace or cleaning out some of the brush, or just to take walks through the woods. It was good exercise and fellowship and a change from laboratory routine, and these outings usually ended with a treat—steak dinner cooked over an open fire.

The department had a softball team in those days, composed mostly of graduate students, that competed once or twice a week each spring against teams from other departments. A good rivalry developed with the Veterinary College. Both Maynard and McCay often joined with the graduate students in these games. Professor Maynard threw the ball left-handed, so he played second base because he was too short in stature to play first base. Maynard's close friends, but not graduate students, called him "Stub." Professor McCay was often the pitcher. These recreational experiences developed good rapport between the professors and graduate students. Incidentally, the animal husbandry team usually did well in these games with other departments.

Professor McCay's teaching responsibilities were primarily concerned with graduate students. In addition to the graduate course in laboratory methods in nutrition and the seminar in cooperation with Professor Maynard, a graduate course in the history of nutrition, which provided specific training and experience in library research, was initiated in 1938. From his own early days as a graduate student, McCay read the classic papers in chemistry and physiology that laid the foundation for the development of the science of nutrition. This interest in history was maintained throughout his active life. During sabbatical leaves in 1935–36 at Oxford, England, and in 1953 at Basel, Switzerland, he visited laboratories where early research had been done. He spent much of his time in libraries reading books and papers that had not been available to him before. The notes he made became invaluable for the course he developed on the history of nutrition, which was described in the college announcement as follows: "Lectures and conferences on the nutrition of animal species from the invertebrate to man with special emphasis on the fundamental discoveries of such fields as growth, comparative biochemistry, and physiology that have been synthesized into the modern science of nutrition."

McCay was an inspiring teacher and was at his best on the history of nutrition, based on his broad knowledge of the field and his continuing studies and search for new discoveries. I often observed McCay having his lunch of a sandwich and apple at his desk and reading a German newspaper or scientific paper.

Maynard started teaching another advanced level course, Biochemistry of Lactation, during the second term of the 1938–39 academic year. And the title of Asdell's course, Physiology of Reproduction, was changed to Endocrinology, Reproduction, and Lactation. A couple of years later Asdell started another course, Problems in Animal Physiology. Asdell and Frederick B. Hutt, poultry husbandry, offered a graduate seminar in animal breeding, beginning in 1936.

### **Federal Laboratory Established on Campus**

The Agricultural Research Service of the United States Department of Agriculture established the United States Plant, Soil, and Nutrition Laboratory on the Cornell campus in 1939. Professor Maynard was appointed the first director and served in this capacity until 1945. During this time various cooperative research projects were conducted involving staff of animal nutrition and those of the new laboratory. In addition to Professor Maynard, several other staff of the federal lab held joint appointments in the Animal Husbandry Department.

### **Biochemistry Transferred to Animal Nutrition**

In 1940 the biochemistry unit, headed by Dr. James B. Sumner, of the former Ithaca Division of the Cornell Medical College, was transferred from the College of Arts and Sciences to the College of Agriculture and was provided with space in association with Maynard and McCay in animal nutrition. Modern knowledge of enzymes dates from 1925 when Dr. Sumner isolated urease from jackbeans in crystalline form and proved the crystals to be protein. For this and related work, Dr. Sumner was awarded the Nobel Prize for chemistry in 1946. This affiliation of Dr. Sumner with the staff in animal nutrition continued for about 5 years. Along with other graduate students in animal husbandry, I was extremely fortunate to be one of Dr. Sumner's students in biochemistry classes in the early 1930s. Only a few may have the opportunity to study with a Nobel laureate!

### **School of Nutrition**

Through the efforts of Professor Maynard and Howard E. (Ed) Babcock, the first general manager of the Cooperative G.L.F. Exchange and chairman of the Board of Trustees of Cornell University, the School of Nutrition was established at Cornell in 1941. Professor Maynard was appointed as the first director of the school, the first of its kind at an American university. Ed Babcock's primary interests were the happiness and prosperity of the farm family and the improvement of the standard of living of all Americans. He felt that better human nutrition was a goal toward which everyone should work for a healthier, happier, economically sound, and therefore politically free, America. The basic philosophy of the new School of Nutrition was to develop a formula for teamwork in nutrition between the various colleges and divisions of the university, industries, and the people who produce and market food. In its organization the school drew on the resources of the Colleges of Agriculture, Veterinary Science, Home Economics, Engineering, and Arts and Sciences and the Medical Clinic. Also, the U.S. Plant, Soil, and Nutrition Laboratory cooperated closely with the school. The staff of the school was small, and cooperative projects were developed with nutritionists throughout the university. In addition to Maynard, those from animal husbandry who held joint appointments with the school included McCay, Asdell, Loosli, Savage, and Morrison at the beginning. Others were added later. Dr. Maynard continued his appointment as a professor of animal nutrition in

animal husbandry during the time he served as director of the federal laboratory and the School of Nutrition.

### **Cornell Bread Developed**

Late in the 1930s, McCay was asked to help the New York State mental hospitals improve the nutritional value of their diets. He chose primarily to improve the quality of the bread because the patients tended to eat more bread than average persons did, and sometimes it was the only food they would eat. This, he felt, would bring the greatest benefit at the lowest cost.

Through the joint work of Clive McCay and his wife, Jeanette, and the help of the hospitals' dieticians and bakers and a specialist from the American Dry Milk Institute, the high-protein "Cornell formula" bread was developed. It was called Triple Rich bread and contained 9 percent nonfat dry milk solids, 6 percent full-fat soybean flour, and 2 percent wheat germ. This bread was used widely in the hospitals and other state institutions and then in school-lunch programs and by commercial bakers, home bureaus, and home bakers all over the United States. World War II contributed to the interest in the Cornell bread because of meat rationing and the need to find other sources of protein (McCay and McCay 1980).

Mrs. Jeanette B. McCay earned her M.S. and Ph.D. degrees in nutrition at Cornell; and during World War II, while Dr. Clive McCay was on active duty with the U.S. Navy, she joined the extension teaching faculty in foods and nutrition at Cornell. She was a member of the nutrition division of the Emergency Food Commission of New York, appointed by Governor Thomas E. Dewey, and collaborated in the writing of many leaflets on foods and nutrition and food preservation. She still keeps the bread book up-to-date.

At the beginning of World War II, Professor McCay undertook food and nutrition research for the New York State Defense Council. The new bread was used widely; and alternative sources of foods were studied, and methods were developed for using soybeans, brewer's yeast, and other materials in case of emergencies. McCay enlisted in the Navy in 1943 and was commissioned and assigned to take charge of research on food and nutrition. His work included the improvement of rations for men on naval aircraft, for landing forces, and for men on submarines. He also served with the Eastern Seaboard Air Command aboard the Essex Class Carrier, USS *Bon Homme Richard*, and in various areas in the Pacific, including Saipan, Okinawa, and the Philippines. Studies were published on the nutritional value of large naval messes and messes on large carriers and battleships. McCay was advanced to the rank of commander and was awarded the surgeon general's commendation, U.S. Navy, upon being honorably discharged in 1946 (Loosli 1973).

Professor Maynard taught a special course, War-Emergency Food Problems, for a couple of years beginning in 1943-44. He continued to teach his course, Principles of Nutrition, and Dr. Loosli taught Biochemistry of Lactation.

In recognition of his skills as an organizer, Maynard was asked to serve as commissioner for nutrition of the Emergency Food Commission beginning in 1943 and as liaison member of the postwar New York State Food Commission until its termination in 1948. He served as nutrition expert on Interallied Food Missions to London, England, in 1943, 1944, and 1945 and to Germany in 1945. Maynard was elected to the National Academy of Sciences in 1944. Dr. Maynard was chairman of the Food and Nutrition Board from 1951-55 and of the Division of Biology and Agriculture, 1955-58, both of the National



Research Council, National Academy of Sciences. The American Institute of Nutrition honored Professor Maynard with the Borden Award in Nutrition in 1945 and the Osborne and Mendel Award in 1954. He received the Order of Rodolfo Robles from the Republic of Guatemala in 1959 and was presented with honorary degrees of doctor of science in 1945 by Wesleyan University and in 1958 by Rhode Island State University.

## Department of Biochemistry Established

Through the efforts of Professor Maynard and Dean W. I. Myers, a Department of Biochemistry was established in the College of Agriculture on April 1, 1945. An appropriation for that purpose was made by the 1945 State Legislature. Professor Maynard was appointed head of the new department. He and Dr. J. B. Sumner were the first staff members. Maynard expected Professor McCay to move with him into the new department, but McCay chose to remain in animal husbandry. When I talked with McCay about this, he said, "No, I don't want to go into biochemistry, because here I have access to animals in this department. If I move over there, I would have to ask for use of your animals. As it is, I have them." We were pleased that he chose to remain in animal husbandry.

The same year an initial grant of \$200,000 was provided by farmers through the Cooperative Grange League Federation Exchange, Inc. (G.L.F.) for the construction of a building to house the School of Nutrition. This building would also provide offices, laboratories, and classrooms for the new Department of Biochemistry.

## Quality of Protein for Ruminants

Professor Morrison was especially interested in developing research on quality of protein for ruminants. He had been involved with some experiments on this subject at Wisconsin in 1914 and recognized the importance of protein quality for nonruminants, swine and poultry. Many years later several published reports indicated that the proteins in alfalfa hay had a low nutritive value. Professor Morrison questioned these results and thought this subject needed further investigation; so when I came along as one of his graduate assistants in 1930, he suggested that I conduct some experiments on protein utilization by ruminants for my Ph.D. thesis research.

Nitrogen metabolism studies were conducted over a 3-year period, using growing wether lambs as experimental animals, to measure the nutritive value of the proteins of alfalfa hay and clover hay when fed alone and in combination with the proteins of corn. The rations were equalized in energy and protein content by the addition of cornstarch and cane sugar in various amounts to provide 10 percent levels of protein. No significant difference was found in the efficiency with which the different proteins were utilized for growth and maintenance as measured by apparent digestibility, nitrogen storage, and biological values of the protein. The average biological values were 81 percent for clover protein, 79 for alfalfa, 80 for the combination of clover and corn, and 77 for the combination of alfalfa and corn. These studies were in cooperation with Dr. L. A. Maynard in animal nutrition.

In other tests alfalfa hay fed without addition of starch and sugar gave biological values that averaged only 50 percent, whereas, after the addition of starch and sugar to provide a 10 percent level of protein in the ration, the average biological value was 72. These results demonstrated the influence that the energy content and the plane of protein intake of the ration may have on the biological value of the protein.

Another series of metabolism studies showed that the proteins of soybean oil meal (expeller process) were superior to those furnished by linseed meal and corn gluten meal when each of these supplements was added to a semi-purified low-nitrogen ration. Wheat straw and ground cellulose were used as sources of fiber. Slightly but significantly higher biological values were obtained for the soybean oil meal rations.

These experiments on protein quality with lambs were continued by J. I. Miller for his Ph.D. thesis research. Afterward in 1936 when he joined the full-time faculty, Dr. Miller was appointed leader of an expanded project in cooperation with Professor Morrison. Over the next 10 years, more than 325 nitrogen-balance measurements were made to determine the efficiency with which lambs utilize various sources of protein or nitrogen. In these experiments, three general classes of feeds were studied: (1) protein-rich supplements, (2) roughages, and (3) urea.

No differences in efficiency of utilization were found for the proteins furnished by soybean oil meal (expeller process), corn gluten meal, and linseed meal when fed as the primary source of protein or in rations when fed as supplements in the rations. Other experiments compared raw soybeans, unextracted soybean flakes, solvent-process soybean oil meal, and "toasted" solvent-process soybean oil meal when each furnished nearly all the protein in the ration. Little or no difference was found in the efficiency of utilization of the digestible protein of each feed, although the proteins of the soybeans and soybean flakes were less digestible. Heat treatment improved the digestibility of soybean proteins for lambs, but made little or no improvement in quality of the protein.

Urea, when used to provide nearly all the nitrogen, was found to have a much lower biological value than the nitrogen furnished by linseed meal, dried skim milk, or casein. But when used to provide only a part of the total nitrogen in the ration, urea was utilized satisfactorily.

As a whole, the data from these metabolism experiments showed that for lambs there is probably little or no difference in the quality of protein furnished by most feeds when fed in good, well-balanced rations.

## Dairy Cattle Division

### Improvements in the Dairy Herd

Professor E. S. Savage was placed in charge of the dairy cattle division and the dairy herd in 1928, following the retirement of Professor Wing and the appointment of Professor Morrison as department head. E. S. Harrison joined the staff in 1926 with the rank of instructor, while doing graduate work. He worked closely with Savage, handling most of the details involved in the management of the herd. He was placed in direct charge of the dairy herd in 1930 after completing his graduate studies.

Harrison had a keen eye for a cow and selected a fine group of purebred and grade Holstein-Friesian cows, which he described as commercial cows, for the protein experiments started in 1928 at the Warren farm. A rather ordinary looking, but well-bred bull, Pietertje Ormsby Mercedes Ollie, was borrowed from W. D. Robens, Poland, N.Y., primarily to breed the cows in the experimental herd. But as his daughters started developing into animals of superior quality, both in type and production, the Ollie bull became recognized as an outstanding herd sire.

During the time the Ollie bull's daughters were developing, the main dairy herd was greatly improved with the purchase of carefully selected foundation females and herd sires. These purchases were made possible from the newly appropriated funds for the improvement of the department's herds and flocks. After a few years, the herd consisted of about 150 cows of milking age and a similar number of calves and heifers. Almost one-half of the animals were Holstein-Friesians, with the remainder about equally divided among the Ayrshire, Brown Swiss, Guernsey, and Jersey breeds.

Over the next several years, the accomplishments of the Holstein herd in the show ring and in records of milk production brought it to a high rank among the outstanding Holstein herds in the country. Milk records were kept on all cows, but selected cows were placed on Advanced Registry Test, which was the common practice in those days by purebred breeders. Several world's records were made for milk and fat production, and many class-leader milk and fat yields were recorded.

By the mid- to late 1930s, the Cornell Holstein show herd was beginning to dominate the New York State Fair, the Eastern States Exposition, and other leading eastern shows and also competed successfully at the National Dairy Show. Several All-Americans and reserve All-Americans were bred, developed, and exhibited. Most notable among these animals were Cornell Ollie Pride and Cornell Ollie Catherine, half sisters sired by the Ollie bull in the Warren farm experimental herd. At maturity these cows each weighed a ton, classified excellent, and were outstanding in dairy quality. For several years Cornell won premier breeder and premier exhibitor honors at the New York State Fair. After this happened several times, a few of the breeders who were competitors began to "grouse" a little and suggested that, although they wanted Cornell to continue showing, it might be better if the university did not accept prize money since it is state supported. This was interesting, for about 10 years earlier some of these breeders were critical because the Cornell animals were not good enough to exhibit. But a vast majority of breeders and farmers of the state were proud of the progress made in the development of the herd during this period of time. They came to the college in increasing numbers to see the herd and the improvements being made; they recognized that a high-quality dairy herd was essential for instruction of students, for research, and for demonstration of desirable breeding and management practices.

Because of the influence of the Ollie bull, Harrison followed a line-breeding program in the Holstein herd, using the inheritance of this sire through his daughters, Pride and Catherine, and their sons.

Progress with the improvement of other breeds was not as spectacular as it was with Holsteins, but still was very substantial. The numbers were smaller, but it was planned that each breed would eventually reach about 30 cows. With this number it would be easier to develop constructive programs than with only 10 or 15 cows. As with the Holstein breeders, those with other dairy breeds cooperated closely with the department in the herd improvement programs. For example, the Foremost Guernsey Association, owned by James C.

Penney, generously aided Cornell in the establishment of the Guernsey herd by supplying the service bulls. This cooperation made possible the use of bulls of higher quality than otherwise would have been possible. Strathglass Farms, Port Chester, N. Y., aided in the establishment of the Ayrshire herd by providing bulls representing the best of Strathglass breeding. Later on, of course, as the rest of the different breeds became established, carefully selected bulls were purchased to continue the breeding and improvement programs. Jersey bulls were purchased from Edmund Butler, Chester, New York, and from John Luchsinger, Syracuse. In the Brown Swiss breed, the cow Jane of Vernon satisfied all the measures of a great cow: excellent type, high production, and outstanding transmitting ability to her daughters and sons. It was logical, therefore, that Harrison would try to bring some of the inheritance of this cow into the Cornell herd. Because she had no sons available, a grandson was purchased, Jane's Columbus of Vernon, out of Jane of Vernon 3d. He sired a group of outstanding animals in the Cornell Brown Swiss herd.

Sam Eddins was the herdsman when Savage and Harrison were given the responsibility for the overall supervision of the dairy herd. An important addition was made on August 1, 1932, when Paul H. Dean was brought in as assistant dairyman. Paul had worked on two farms in Ohio and came to Cornell from the Butler Jersey Farm, Chester, N. Y. After Sam Eddins resigned in 1933 to enter the Veterinary College as a student, Paul Dean was promoted to the job of herdsman (the title was dairyman at that time, but eventually it was upgraded to dairy cattle superintendent).

There was a separate dairyman, Howard Bardwell, responsible for the Warren farm experimental herd. It was not until 1944, after Harrison resigned, that a change was made and this herd also was placed under Paul Dean's supervision.

The choice of Paul Dean as herdsman could not have been better. He was an excellent dairy husbandman from every standpoint and possessed the personal qualities to work well with people. He appreciated the functions of a college dairy herd and cooperated fully with the faculty and graduate students at all times. In his work with students, Paul was one of the department's most successful and respected teachers, working quietly, but effectively, with hundreds of students over the years.

Paul was a master in presenting the cattle to the public. Any time a group of farmers and breeders came to visit the herd, the department head and professors always knew the animals and the barns would be in tip-top condition. He was unequalled in the show ring at the major shows in the 1930s and early 1940s. He was always a gentleman—courteous, polite, and cool—no matter where the animal he was leading might end up in the class.

By 1938 the numbers of animals in the dairy herd increased to the point where the barns were overflowing. It was felt, for the first time after the expansion and development period started, that the department was able to offer at public auction a limited number of carefully selected individuals that combined outstanding production inheritance and correct dairy type. Accordingly, a Cornell University Dairy Cattle Sale was held in the livestock pavilion on February 18, 1938, the last day of the 31st Annual Farm and Home Week. The sale offering consisted of 22 lots of Holsteins (10 bull calves and 12 females) and 6 bull calves of the other breeds (2 Guernsey, 2 Jersey, and 1 each of Ayrshire and Brown Swiss). The sale was successful, but did not become an annual event like the sales in the earlier years of the department. Sales of surplus animals were by private treaty and consignments to breeders' sales, and inferior animals were sold for slaughter.

During the early 1940s, Harrison decided it was time to dispose of the small herd of Ayrshires. Their milk production was less than satisfactory, and the number of cows was not large enough to be of much value in research.

### **Instruction in Dairy Courses**

Student enrollment in the dairy cattle classes went up markedly beginning in 1930. No doubt the quality of teaching and better animals and facilities had something to do with this. Savage and Harrison taught the dairy cattle portion of the elementary livestock production course, the course in dairy cattle, and a third course, Advanced Judging of Dairy Cattle.

Harrison had full responsibility for the dairy cattle judging course and the laboratory instruction in the other courses after 1931. From the judging class, a team of students was selected each year to compete in regional and national intercollegiate contests. Cornell University's team in 1934 was very successful, winning the intercollegiate judging contests at the Eastern States Exposition and the national contest at the Waterloo Dairy Cattle Congress. Team members were William Stewart, Joseph King, Ronald Wilson, and Richard Price, with E. S. Harrison, coach. Joe King later had a long, distinguished career as a leader in New York agriculture and a strong supporter of the College of Agriculture and served on the Cornell Board of Trustees. Ronald Wilson was a successful Guernsey breeder and farm manager, and Richard Price served as the capable editor of the *Guernsey Breeders' Journal*.

Savage and Harrison started offering an advanced course in dairy cattle in 1934-35 for graduate students and advanced undergraduates. Soon thereafter, Harrison had full responsibility for the course that dealt primarily with the operation and management of purebred dairy farms. The title was later changed to Advanced Dairy Production and attracted a good enrollment. Harrison was promoted to full professor rank in 1935. As time went on, he had a growing popularity at meetings with dairy cattle breeders throughout the country.

### **Research with Dairy Herd**

Experimental work with the dairy herd expanded rapidly during the thirties. Savage and Harrison were the leaders of a major series of feeding trials, conducted at the Warren farm, on the effect of different planes of protein intake upon milk production. In five experiments, there were no significant differences in milk production among 16, 20, and 24 percent total protein concentrate mixtures when fed with early cut timothy-clover mixed hay and corn silage. Milk production was slightly higher on the 20 percent protein mixture than on the 16 percent concentrate mixture, but the difference was too small to be significant. On the other hand, the milk yield was decidedly less and the digestibility of the ration was lower when a concentrate mixture was fed containing 12 percent total protein. Cows fed this ration had to draw on their bodies for some of the protein they put out in their milk (Cornell Univ. Agr. Exp. Sta. Bul. 540, 1932, and 578, 1933).

The results of these experiments were widely used by dairy farmers, as well as by feed manufacturers in the formulation of more economical rations for dairy cows. Before these experiments, most of the concentrate mixtures that were fed contained 20-24 percent protein and were more costly than the

16 percent protein mixtures that were found to be satisfactory. The data from this series of experiments contributed much to the establishment of protein requirements of lactating dairy cows.

A considerable amount of experimental work with dairy cattle was conducted under the supervision of Professor Morrison. One of these studies, conducted by G. W. Salisbury for his Ph.D. thesis, evaluated early cut, nitrogen-fertilized timothy hay compared with alfalfa hay for feeding dairy cows. These studies were supported by an investigatorship established by the American Cyanamid Company. It was well known that ordinary timothy hay, cut after full bloom, is not a good roughage for dairy cattle compared with alfalfa and other legumes. But all farmers could not grow legumes; and because of the great importance of grass hay in the northeastern states, these experiments were made to determine whether timothy could be made satisfactory for dairy cows by a combination of early cutting and fertilization with nitrogen. Yields of the timothy hay were greatly increased by fertilization. Also, there was a marked increase in protein content. The early bloom period was found to be the best stage at which to cut timothy for maximum yield of protein and of good quality hay per acre. The difference in protein content of the two kinds of hay was adjusted by feeding a concentrate mixture higher in protein to the cows receiving the timothy than that fed with the alfalfa. No significant difference in milk production or in hay consumption in favor of either ration was observed. Vitamin A and D assays on the two hays fed and on the butter produced by cows fed the hays showed there was no difference in the vitamin content of the two rations (Cornell Univ. Agr. Exp. Sta. Bul. 694, 1938).

A new series of calf-feeding experiments was initiated by Savage and Harrison in 1929 to develop a dry concentrate mixture that could be used successfully for young dairy calves when fed a limited amount of whole milk. Charles H. Crawford, graduate student, assisted with these trials for the first few years and was followed by Paul E. Newman and several other graduate assistants. Earlier experiments had developed calf meals to be fed as gruels. These meals were being sold by the G.L.F. and other feed manufacturers, but it was felt there would be many advantages if calves could be raised just as satisfactorily on a calf meal fed in dry condition.

Many formulas were developed with varying amounts of different ingredients, and feeding trials were conducted with large numbers of calves to measure effectiveness of the different dry starters in producing calves of high quality. Eventually, the limited whole-milk, dry calf-starter method was developed and widely adopted by thousands of dairy farmers. This method used about 350 pounds of whole milk fed over 7 weeks to Holsteins and other larger breeds and over 10 weeks to calves of the smaller breeds. Dry starter was fed as early as the calf would consume it and in amounts up to 4 or 5 pounds daily for the first 16 weeks of age. At this time, a lower-protein, simple growing mixture was fed. High-quality hay, fed free choice, was recommended (Cornell Univ. Agr. Exp. Sta. Bul. 622, 1935).

The first formulas that were developed all contained about 20 percent total protein and 20 percent dried skim milk, but later experiments showed that the animal protein ingredients could be largely replaced with protein feeds of plant origin, such as soybean oil meal. Some tests showed an advantage in consumption of the starter when coarsely ground ingredients, such as cracked corn, were used. Pelleting of the starter gave no advantage over the same starter fed in meal form.

Continuing work over the next several years demonstrated that many changes and substitutions of ingredients in the dry-starter formulas could be

made with satisfactory results. Some of the ingredients tested experimentally included dried brewer's yeast, cereal yeast feed (mixture of dried yeast, corn-gluten feed, and corn-oil meal), dried molasses and yeast by-product, dried whey, distillers' dried solubles, alfalfa leaf meal, irradiated yeast, cane molasses, tomato pomace, and antibiotic feed supplement. In general, there was no one best formula.

Several experiments under the leadership of Harrison demonstrated the value of good-quality hay in rations for growing dairy heifers. Heifers fed low-grade alfalfa hay with 6 pounds of concentrates per head daily did not gain as rapidly as others fed only 3 pounds of concentrates with U.S. No. 1 alfalfa hay. In another experiment, heifers would eat only about a pound of ripe bluegrass hay while they consumed over 4 pounds of No. 1 mixed legume-grass hay. These tests were interpreted as an indication of the difficulties in making up for the deficiencies in hay quality by feeding more concentrates.

Five experiments with lactating cows, under the leadership of Morrison and Salisbury, in cooperation with Savage and Harrison, demonstrated that quality of protein in the concentrate mixtures is of little importance, compared with its importance to the nonruminants, swine and poultry. When fed with corn silage and mixed hay low in legumes for roughage, a concentrate mixture having low-quality protein gave as good results as a mixture having high-quality protein and also more variety. It was common practice at that time for feed manufacturers to make claims for advantages of higher-quality protein mixtures with many ingredients over more-simple concentrate mixtures. This work on protein quality was carried out during World War II when there was a shortage of protein supplements supplying high-quality protein urgently needed for swine and poultry; therefore, it was particularly pertinent.

In another series of experiments by Savage, Harrison, and Norton, concentrate mixtures composed of ground whole grains, including soybeans and some linseed meal as the only by-product, gave just as good results as a mixture of excellent by-products, plus some ground corn and oats. Different combinations of ingredients were used in mixtures that were equally palatable. These results showed that abrupt changes in the concentrate mixtures that are similar in protein and total digestible nutrients can be made without harmful effects. No differences were observed between mixtures on the incidence of mastitis or health disturbance.

Investigations were conducted for several years by Savage and Harrison on the use of phosphoric acid and cane molasses as preservatives in making silage from grasses and legume-grass mixtures and on the nutritive value of these silages compared with corn silage. The grass silages were of good quality, and no differences were observed in palatability and feed intake compared with corn silage. Milk yields were slightly higher on the corn silage rations. When the grass silages were fed as the only roughage, it was necessary to feed more concentrates in order to maintain production and body condition.

In 1944 the department initiated another series of studies on the nutritive value of forages for dairy cattle, which involved J. K. Loosli, L. A. Maynard, K. L. Turk, and C. L. Norton and several faculty members in agronomy. This work was partially supported by a grant from the Aviation Corporation in 1943 of \$15,000 annually for 5 years. The results of these and other experiments that followed will be discussed in Phase IV.

### **Mt. Pleasant Farm**

In 1940 Cornell University acquired the use of 3,812 acres of federal-owned land by license agreement between the United States Government and the university. The university assigned 1,212 acres of land on Mt. Pleasant, about 10 miles east of the campus, to the College of Agriculture for use largely by the Departments of Animal Husbandry and Agronomy for research on pasture and forage crops and forest-soils problems. A barn specifically designed for dairy heifers and calves, with hay, bedding, and feed storage; a caretaker's house; and fences and water facilities for several pastures were constructed. A research project was drawn up by a committee comprising E. S. Savage, chairman, and E. S. Harrison; Richard Bradfield and H. B. Hartwig, agronomy; and C. E. F. Guterman, director of the experiment station. This project was designed to study and demonstrate the potentials of systems of grassland farming (crops and livestock) adapted to the hill lands of southern New York. That portion of the farm assigned to animal husbandry was used for grazing, barn feeding experiments with dairy heifers, and pasture tests with growing, fattening steers. Staff in agronomy used a portion of the tract for field research on crops suitable for the acid soils of the area.

### **Death of E.S. Savage**

With the death of Professor E. S. Savage on November 22, 1943, the dairy industry lost one of its outstanding leaders, one who had exerted a wide influence in New York and the nation. He was truly a pioneer in the field of dairy husbandry.

Some of the contributions of Professor Savage in research with dairy cattle have already been discussed. Most notable were the protein experiments that proved it was entirely unnecessary to feed concentrate mixtures as rich in protein as those that had commonly been fed throughout the northeastern states. He and his associates conducted many experiments to develop more-economical methods of raising dairy calves, which resulted in the widely used Cornell dry calf starter. His last important experiments with lactating cows showed that considerable changes could be made in feed formulas without lowering production, provided the mixtures were made up of suitable feeds that supplied the proper amounts of protein, fat, and total digestible nutrients.

Few people realize that Professor Savage was the man who had first visualized the farm cooperative that became the Cooperative G.L.F. Exchange and whose advice and counsel had been the foundation for much of its program of service. When the charter for the G.L.F. was developed in 1920, it was really a memorial to Professor Savage whose dream of a great farm cooperative was brought one step closer to reality. As the cooperative grew and developed into one of the nation's largest feed-manufacturing and farm-supply organizations, much of its early success could be attributed to Professor Savage and the blueprint he laid out. Savage was the leader of a college feed conference board for the northeastern colleges of agriculture that provided advice on feed formulation to all feed cooperatives in the region. After about 1922, Professor Savage traveled on the Lehigh Valley Train to Buffalo one day every week to consult on formula revisions of the G.L.F. feeds. Much earlier he had pioneered as the father of the "open formula" feeds marketed by G.L.F. and other cooperatives.



In addition to his many bulletins and scientific articles on dairying, Professor Savage wrote a regular column, "Savage Feed Service," for the *Dairy-men's League News* for over 18 years. This included a timely article on dairying and a list of concentrate feeds with their prices and the cost of 100 pounds of total digestible nutrients in each. Thousands of dairy farmers read this column every week. Later, the *News* was published biweekly. This was one of the most-effective extension educational projects of the department at that time. Savage authored a book, *Feeding Dairy Cattle*, and was coauthor of *Feeds and Feeding Manual* and *Better Dairy Farming*.

Exhibitors at the New York State Fair got to know Professor Savage as the genial and respected superintendent of the dairy cattle department from about 1925 through 1936. Through his leadership, the cattle show at Syracuse attained high rank in the country.

In 1911 Professor Savage was one of the leaders in organizing the live-stock breeders of Tompkins County into a County Breeders' Association with the object of promoting the breeding and improvement of high grade and purebred livestock. Some time later, he operated a dairy farm for many years, just north of Ithaca, where he developed a purebred Guernsey herd to a high level. He always took an active part in the activities of farmers in his home county and maintained continuous membership in the Farm Bureau and Grange.

Professor Savage traveled extensively to study agricultural and dairy conditions in various parts of this country and abroad. For one of his early sabbatics, he worked with Professor Morrison at the University of Wisconsin. In 1931 he was a representative of the United States Government at the World's Dairy Congress in Copenhagen, Denmark, and at that time he traveled to several countries to visit universities to study new techniques.

Savage was active in the American Dairy Science Association and the American Society of Animal Production, serving terms as secretary and vice-president of the latter organization. He was a fellow of the American Association for the Advancement of Science. His alma mater, the University of New Hampshire, awarded him the honorary degree of doctor of science in 1933.

Professor Savage was a good teacher, always warm, friendly, and responsive to the needs of his students and advisees. He gained the respect and admiration of us all by his kindness and helpfulness. He had an immeasurable influence on the lives of his students and friends alike.

It was quite fitting that in 1947, when the new building was dedicated to house the School of Nutrition, it was named Savage Hall, an appropriate memorial for a great leader in the field of animal feeding and nutrition.

## Work in Dairying Continued at Geneva until 1943

Under the direction of Dr. A. C. Dahlberg, beginning in 1921, the Jersey herd at the station in Geneva served as a good demonstration to dairy farmers of what could be accomplished with desirable breeding, feeding, and management practices. There was a gradual, consistent increase in milk production due to selecting dams for breeding purposes, elimination of low producers, more-advanced methods of selecting bull calves for future herd sires, and greater use of the best sires after their value was known. Some of the increase also was due to improved feeding and management.

With a trend to an increasing proportion of Holsteins among the state's dairy herds, it is interesting to record that a small herd of this breed was

added to the Geneva station in 1940. During that year, this group of eight cows averaged 14,042 pounds of milk and almost 500 pounds of butterfat. This was considerably higher than for the station's Jersey herd.

Further research was initiated on the influence of the milking machine upon milk production. Slightly more milk was given by the cows milked by hand, but the difference was evident only after the third month of lactation. When cows were milked by machine in 4 to 5 minutes, using a timer to determine the milking period, milk production was maintained as uniformly throughout the lactation as by hand milking. These results clearly demonstrated that milking machines should be removed from cows promptly after the cow has been milked and that cows can be trained to milk out rapidly without excessive hand stripping (N.Y.S. Agr. Exp. Sta. Bul. 654, 1934, and Bul. 697, 1941). This pioneering work had a profound effect in providing the basis for modern milking practices.

Calf-feeding experiments gave no positive results from feeding of supplemental vitamins A and D (cod liver oil), kelp, and complex mineral mixtures. Feeding of mangels and beet pulp to lactating cows had no effect on milk flavors.

Over a period of 3 years, beginning in 1938, the station at Geneva cooperated with nine other state experiment stations in a series of input-output investigations under the leadership of dairy scientists of the U.S. Department of Agriculture to measure the effects of different feeding intensities on milk production and other body functions (USDA Tech. Bul. 815, 1942).

Throughout the 1930s and the early 1940s, Dr. G. J. Hucker and his colleagues conducted extensive investigations on the causes, control, and prevention of mastitis in dairy herds. A great deal of knowledge was obtained, but the problem persisted in dairy herds. It appeared that the most significant factors for bringing mastitis under partial control were to use detection methods for infection of udder quarters at regular intervals, use proper milking methods, including stripping, and take sanitary precautions for the dairy herd.

But the program in dairying at Geneva came to an abrupt halt in 1942, the animals were sold, and Dr. Dahlberg was transferred to Ithaca on April 1, 1943. The decision to discontinue the dairy work was made by the college administration in accordance with the wishes of budget-making officials in Albany. Presumably, the change was made to avoid unnecessary and costly duplication of effort.

The staff member most affected by the decision was Dr. Dahlberg; for the bacteriologists remained at Geneva, and others were eligible for retirement. After his transfer, Dr. Dahlberg devoted his major efforts to manufactured dairy products. In recognition of his work, he received the Borden Award in dairy-manufacturing research from the American Dairy Science Association in 1944. He was president of this association in 1943-44, and later in 1961 he was honored by receiving its first Distinguished Service Award in recognition of a lifetime of work spent in the advancement of the dairy industry.

Dr. Dahlberg served as editor of the *Journal of Dairy Science*, 1928 to 1938, and was an official delegate of the United States to the World's Dairy Congress in Berlin in 1937.

## Animal Breeding and Artificial Insemination

A new Division of Animal Breeding and Artificial Insemination was established in the department in 1939 when Professor Morrison asked Professor G. W. Salisbury to undertake and develop this work. Courses in animal breeding and genetics had been taught over the years by Professors Wing, Allen, Harper, Hinman, and Asdell, but the teaching and research in animal breeding had not been separated into a formal division until this time.

Largely because of the efforts of Professor S. J. Brownell and the extension staff, artificial insemination was beginning to develop as an important tool in dairy cattle improvement; and the first artificial breeding association in the state was organized in 1938. It was evident to all concerned—farmers, professors, and extension workers in the counties—that much research would be needed for artificial insemination to realize its potential in dairy cattle and other livestock improvement.

In the summer of 1938 before starting his new work in animal breeding and artificial insemination, Salisbury visited agricultural colleges and experiment stations in Michigan, Wisconsin, Minnesota, Iowa, Nebraska, Arkansas, Mississippi, Kentucky, and Ohio to study research in progress with dairy cattle. Earlier in the summer of 1937, he visited universities and experiment stations in the British Isles to study research with dairy cattle and methods of breeding and management of dairy cattle on Jersey and Guernsey Islands.

Professor Salisbury initiated research on artificial insemination in October 1939 and assumed responsibility for teaching and research in animal breeding and genetics on July 1, 1940. He took over the teaching of the course in animal breeding that fall and also taught course 120, Advanced Animal Breeding, in alternate years.

The research program initiated by Salisbury and his graduate students was primarily directed towards the solving of field problems encountered in the New York State artificial breeding units. First of all, an artificial vagina was developed which made it possible to control the temperature of the semen during collection. It soon found wide acceptance by dairy cattle breeding units in the state especially for collection of semen during the winter.

The next problem studied was that of determining the proper methods of handling semen after collection for optimum duration of fertility. It was found that a storage temperature of 5° C or lower must be used for control of bacterial growth and livability of spermatozoa. Conditions for semen collection and storage, including temperature control and the use of aseptic methods for collection, for handling of semen after collection, and for preparation of the diluters used, were developed. In much of the research on semen at this time, Dr. I. C. Gunsalus, bacteriologist in the Department of Dairy Industry, cooperated closely with Salisbury.

Through the leadership of Professor Brownell, several artificial breeding units in the state were combined to form the New York Artificial Breeders' Cooperative (NYABC) in 1940, with central location of bulls. By this time research had solved most of the important problems in handling semen, but others remained. It was necessary to develop cheap, effective containers for shipping semen that would hold satisfactory temperatures. Such containers were developed and tested, and semen was shipped 200 miles or more with field insemination rates as satisfactory as when it had been used locally after collection.

Salisbury and associates developed the yolk-citrate diluter, which had advantages over those previously used. It was soon being widely adopted in New York State and elsewhere.

The methylene blue reduction test was developed as a rapid method for counting the spermatozoa in each semen ejaculation and determining the quality of semen, without recourse to complicated biochemical procedures.

As a result of these early investigations, the NYABC was able to expand its operations more than two-fold without using a great number of bulls.

After adequate tests for quality of semen and of fertility were established, the effects of certain feed ingredients on semen production were studied. It was found that there was no advantage in adding wheat germ oil to supply additional vitamin E to ordinary rations, even for bulls used heavily in artificial insemination. In other experiments, there was no advantage in adding a supplement supplying large additional amounts of vitamin A to the rations.

Further studies showed that semen of satisfactory quality could be diluted as much as 1 part of semen to 50 parts of diluter with results as good as when a dilution rate of 1:4 was used. It was also found that spermatozoa produced acids in their metabolism by the buffer of the diluter. The addition of glucose to the diluter improved livability of spermatozoa. The B vitamins, which are concerned in glucose metabolism, were not a factor limiting fertility of bull semen.

Laboratory facilities and equipment were developed on the second floor of one wing of the horse barn. But greatly improved laboratories were provided for research in the new Ithaca headquarters for the NYABC after the cooperative moved from Syracuse to Ithaca in December 1944.

The location of the NYABC, with its stable of more than 35 bulls at that time, on the Cornell campus made possible expanded activities in research and extension and closer working relationships, not only in artificial insemination, but in the entire field of dairy cattle breeding. Professor Salisbury served as the coordinator of relationships between the NYABC and the Department of Animal Husbandry and Cornell University. The research program under the leadership of Professor Salisbury, coupled with an effective extension educational program led by Professor Brownell, put Cornell University and New York State out in the forefront of dairy improvement programs. In recognition of his excellent research in artificial insemination, Professor Salisbury was selected for the Borden Award in dairy production in 1945 by the American Dairy Science Association.

## Beef Cattle and Meats Divisions

Professor R. B. Hinman was given responsibility for the beef cattle and meats divisions when the department was reorganized in 1928. Hinman had served on the faculty since 1920 and devoted much of his time to teaching several production courses—sheep, beef cattle, and swine. Part of the time he collaborated with Professors Harper and Allen in offering a course in practical livestock management. Hinman took a leave of absence the year 1924–25 for graduate study in animal breeding at the University of Wisconsin and earned the Ph.D. there in 1926. After returning to Cornell, he taught the general course in animal breeding for several years. In addition, he continued to teach the course in beef cattle until his retirement in 1943.

Beef cattle had never been favored in the early work of animal husbandry at Cornell. A small herd of grade Angus had been purchased in 1905, and it was not until 1915 that the first purebred Herefords arrived on the scene.

In his reflections on animal husbandry at Cornell, Mr. Albert K. Mitchell, prominent cattleman in New Mexico and Cornell alumnus and trustee, made these interesting comments in 1961: "I came to Cornell in the fall of 1915 as a junior to major in animal husbandry, with special emphasis on beef cattle so that I could better carry on with our New Mexico ranching interests. My faculty adviser expressed some concern that I would not find just what I was looking for in beef cattle work at Cornell. He suggested a conference with Professor Wing, head of the Department. Professor Wing, with his beetling eyebrows and bristling mustachio, was not inclined to reassure the new student unless he planned to major in dairying. When I expressed regret that more beef cattle study was not available at Cornell, Professor Wing informed me with certainty that there was no place in the agricultural economy of New York State for the beef cattle industry.

"This was a disappointing introduction to a school where I had expected to complete my technical education. But in the person of K. J. Seulke, instructor in beef cattle and meats, I found a sympathetic and cooperative ally. The beef cattle herd consisted mainly of some fair-quality Angus and Hereford steers used in the feeding and meats courses, and several head of milking Shorthorn and Angus cows of inferior conformation and dubious ancestry. I still count my greatest accomplishment as an undergraduate at Cornell, the fact that through our combined efforts, Professor Seulke and I succeeded in getting Professor Wing to accept a gift of two good registered Hereford cows with heifer calves at side that were the foundation animals of the creditable Hereford herd now (1961) grazing on the Cornell pastures" ("Reflections on Animal Husbandry at Cornell," Proc. of Dedication Ceremony of Frank B. Morrison Hall, Sept. 12, 1961).

But when Hinman took charge in 1928, the beef cattle herd, composed of Herefords and Angus, was only fair in quality. They were housed in one of the outlying barns with no facilities for steer-feeding trials. Little had been done to improve the pastures. With Morrison's development program, however, new foundation animals were purchased in 1931 and soon were housed in the new beef barn.

Special attention was given to the selection of sires and in the breeding program to improve both the Angus and Hereford herds. Professor Hinman devoted special attention to the development of superior animals based on records of performance, including economy of gains and quality of meat produced. He worked hard to focus attention of faculty, students, and farmers on the proper place of beef cattle and other meat animals in the agriculture of New York and the Northeast.

### **Beef Cattle Research**

Under the leadership of Hinman and Morrison, several feeding trials were initiated in the early 1930s to determine the protein requirements of fattening yearling steers. Steers receiving high-protein supplement (equal parts of linseed meal and cottonseed meal), added to basal rations of ground corn and mixed clover-grass hay, consistently produced higher gains and better-finished steers than those receiving smaller amounts of protein

supplement. John I. Miller, graduate assistant, participated in some of these experiments.

Professor Hinman was very active in promoting improved pastures for beef cattle. Because the large amount of hill lands in New York was not suitable for growing cultivated crops, he felt that a better use would be for producing beef cattle. Beginning in 1933, with the cooperation of Professor Johnstone-Wallace in agronomy, Hinman conducted trials for several years to measure liveweight gains on permanent pastures, improved with applications of superphosphate and better pasture management, including rotational grazing and clipping of uneaten grass and weeds. Slightly over 200 pounds of liveweight gains were obtained from each acre of improved pasture, and the steers were of sufficient finish at the end of the pasture season to be graded as medium. The steers were in high enough condition after 60 days of full feeding in dry lot for them to be graded choice. These improved pastures provided a good demonstration to hundreds of farmers on tours of the college.

After Dr. John I. Miller came on board in 1936, he taught the course in livestock feeding one semester each year for the next several years. He was active, in cooperation with Professors Hinman and Morrison and C. S. Hobbs, graduate assistant, in initiating a series of feeding trials to compare different protein supplements for fattening yearling steers and calves. The protein supplements studied were linseed meal, corn-gluten meal, expeller-process soybean oil meal, and ground soybeans. The daily gains consistently favored linseed meal, with slightly lowered gains on corn-gluten meal, but none of the differences were significant. Although corn-gluten meal supplied poor-quality protein for nonruminants, these tests showed it was satisfactory for yearling steers when fed with corn and good-quality hay and corn silage.

Building on Hinman's work on improved pastures for beef cattle, Professors Miller and Morrison initiated experiments in 1942-43 to determine the best methods of growing and fattening yearling steers with a maximum use of pasture and minimum of grain. It was felt these studies would provide information for more-efficient beef production in the Northeast, especially important during the war and postwar periods. The results showed that good New York pastures alone will grow and fatten yearling steers to an acceptable market condition; however, the data also demonstrated that limited amounts of grain feeding may be profitable.

### **Instruction and Research in Meats**

Nearly all of the instruction in meats during the early part of this period was given by C. D. Schutt, instructor. He gave the lectures, taught the slaughter and meat-cutting laboratories, and conducted laboratory instruction on curing of hams and bacon and the preparation of sausages and other meat products. In addition to these instructional duties, Schutt was responsible for the routine slaughtering of experimental animals and cutting of carcasses into wholesale and retail cuts. He was not trained as a scientist, but he knew meats and was a good teacher, always liked and respected by students.

When not occupied with his teaching and routine jobs, Schutt helped in the retail meat salesroom in the basement of Wing Hall. The salesroom provided a good outlet for the meat products available from the classroom and from the slaughter studies of experimental animals. One of the dependable helpers over the years was A. I. Manning. He was especially popular with customers. After several years of using a horse-drawn vehicle for home meat

deliveries, "A. I." graduated to a Model T and later to a modern V-8, which was used until about 1940. After that time, no home deliveries were made. Later, "A. I." completed his 40 years of service to the department as caretaker of the livestock pavilion, which always was clean and shiny under his stewardship.

In addition to his heavy teaching load and the responsibility for supervision of beef cattle, Professor Hinman carried out a modest research program on meats. Some studies, partly in cooperation with Dr. McCay, did not provide a satisfactory answer to the cause of the wide variation in the color of beef, which ranged from extremely dark-cutting carcasses to the so-called pink-cutting carcasses.

Successful methods were developed for using smoked salt in curing hams and other pork products and in keeping farm-cured hams and other meats without refrigeration, particularly during the summer.

Studies on quality and palatability of beef produced by yearling steers fattened on good pasture alone, in comparison with beef produced by grain feeding, with and without pasture, were conducted by Miller and Morrison, assisted by J. J. Wanderstock, graduate assistant. Each year the steers receiving no grain or other supplements had significantly lower final grades on foot, dressing percentages, and carcass grades than did those of any of the other lots. Under the conditions of these trials, all of the beef was acceptable; however, beef produced by feeding some grain on pasture, after pasture, or in dry lot was higher in quality and palatability, largely due to a difference in fatness, than beef produced on pasture alone. Dr. Faith Fenton, College of Home Economics, cooperated with the cooking and palatability studies. These experiments demonstrated that beef produced on New York pastures should be able to meet the demand for acceptable beef, and under the economic conditions at that time, good pasture could be substituted economically for grain. In succeeding years, there was a trend in consumer demands for leaner beef.

Professor R. B. Hinman retired on June 30, 1943, and died on November 22 that same year. He was an excellent livestockman and an expert in all practices in feeding, breeding, and management of beef cattle. In addition to his teaching and research, Professor Hinman did notable work in promoting and achieving a renewal of interest in beef cattle production in New York State.

Professor John I. Miller was appointed head of the beef cattle and meats divisions July 1, 1943, to succeed Professor Hinman. Miller had been involved with much of the beef cattle and meats research since he started graduate work.

When he joined the staff, Miller started teaching two courses in livestock selection and judging (beef cattle, sheep, swine, and horses), which were quite popular with students. In fact, the establishment of his position had resulted from student requests over a period of years for these judging courses. Further, the students wanted a livestock-judging team to represent Cornell at national and regional intercollegiate contests. Under Professor Miller's excellent teaching and leadership, Cornell teams compiled distinguished records in national competition for many years. His first team in 1936 ranked second in the international contest in Chicago, and one member was high individual in the contest. This was quite an accomplishment in competition with leading universities in the Midwest.

Professor Miller also taught the beef cattle course, after Professor Hinman died, and the beef cattle portion of the elementary course in livestock production. These courses, plus the judging classes, gave him one of the heaviest teaching loads of any faculty member in the department.

Professor Miller worked actively with producers and breeders to continue the promotion of the beef cattle industry in New York and the Northeast. He served as secretary of the New York Angus Association beginning in 1943. He organized the first training school for beef cattle herdsman in cooperation with a breed association; this activity later became the Beef Cattlemen's Short Course held annually at Cornell. He was elected president, North Atlantic Section, American Society of Animal Science in 1940-41.

During the summer of 1944, state Senator Fred Bontecou, an Angus breeder in eastern New York, convinced the director of the budget in Albany that an additional staff member was needed for teaching and research in beef cattle and meats. Professor Miller had been able to carry the heavy load, plus his other teaching and research, only because of reduced numbers of students during the war. Budget director John Burton instructed Dean Myers to incur expenditures of \$5,000, in addition to the previous budget provision for 1944-45. It was assumed by Professor Morrison that an additional item for this amount would be inserted in the budget; but this was not done, and it was necessary for the expenditures to be made from previous allocations. Through a series of negotiations between Professor Morrison and R. H. Wheeler, director of finance for the statutory colleges, funds were made available for a new instructor position, and Dr. J. J. Wanderstock was appointed on October 1, 1945.

### **Beef Cattle Herdsmen**

George Taylor was the beef cattle herdsman until he resigned in 1934 and was succeeded by Harold P. Hamilton. He made considerable improvement in the management of the Angus and Hereford herds, and his position was upgraded to the title of beef cattle manager. Hamilton left the department in 1939 to assume a position as manager of the purebred Angus herd owned by John D. Rockefeller 3d.

William Slaight was the next manager of beef cattle and served effectively for several years as the herds were improved and steer-feeding experiments expanded. Also, some of the better animals were exhibited successfully at the New York State Fair.

### **Sheep and Swine Divisions**

J. P. Willman was in charge of teaching and research with sheep and swine. He taught the sheep and swine production courses and also those portions of the elementary course dealing with these species. With his earlier experience in extension, Willman continued to work closely with sheep and swine producers in the state and kept himself available to them and to county agricultural agents. He believed in direct communication and liked speaking to groups of farmers about his research. He made regular contributions to the breed journals and to the press, and felt that these were as important and influential as his long list of scientific publications.



### **Sheep Breeding Flock**

The purebred sheep flock was improved greatly in the early 1930s with purchases of new foundation animals. From 8 to 14 ewes of each of the Dorset, Hampshire, Merino (C type), Shropshire, and Southdown breeds were purchased, along with rams of each of the breeds. Breeders in New York and several other states and Canada cooperated in the selling of foundation breeding animals to Cornell.

After a few years, the Merinos and Shropshires were gradually eliminated from the flock. The Southdown flock was sold to the University of Maryland in 1941, and Corriedales were purchased in 1942-43 to replace them.

These foundation animals were housed in the new sheep barn that had been constructed in 1931 and in the old original Waite farm barn, which stood nearby. This latter unit burned in 1938 and the legislature responded quickly with an appropriation to build a new barn. This was accomplished in 1939, and the two barns provided adequate housing for the breeding flocks and experimental sheep.

### **Sheep Research**

During the years that Willman served as the 4-H livestock extension specialist, he became aware of important losses to sheep producers, especially in western New York, caused by the stiff-lamb disease, or white muscle disease. This was a strange disease of suckling lambs that became apparent at 1 to 5 weeks of age. Lambs that were affected became characteristically stiff in their legs. Some would gradually improve after a few days, but others would become so stiff they were unable to walk or to nurse their mothers without assistance. Death was probably not due to the disease itself, but to starvation, with the lambs becoming so thin and weak they would die.

Postmortem examinations of stiff lambs by veterinarians showed that certain muscles had undergone degeneration, becoming whitish in color. In most cases, the disease affected the same muscles on both sides of the body. This condition was apparently due to the feed supplied to the ewes and not to any infection.

To study the relationship of feeding and management to the stiff-lamb disease, Willman and Morrison initiated a long-term research project in 1930. It was conducted in cooperation with members of the staff of the New York State Veterinary College.

In experiments conducted in succeeding years, stiff lambs were produced when ewes were wintered on a ration of cull beans, oats, barley, and alfalfa hay of good quality. In contrast, ewes did not produce stiff lambs when fed a ration of wheat bran, oats, corn silage, and mixed clover-timothy hay. Also, farmers who had experienced severe losses from the disease reported much better results after changing to this latter ration.

The occurrence of stiff lambs was greatly lessened when considerable wheat bran was added to a ration that otherwise produced the disease, and it was prevented by the feeding of wheat germ meal to the ewes and lambs. Because wheat germ meal and wheat bran are rich in vitamin E, the effect of this vitamin was then tested. It was found that the disease could be prevented or cured by feeding rations containing liberal amounts of vitamin E or alpha-tocopherols.

These investigations on the stiff-lamb disease illustrate the tenacity and thoroughness with which Professor Willman attacked problems. He worked continuously on the stiff-lamb problem for over 17 years before the answer became known. As a result of his research, farmers in the region were able to minimize the losses in their ewe flocks. (Results of continuing research on this subject are discussed in Phase IV.)

Lamb feeding was quite important to many farmers in the western region of New York as a supplement to other farm enterprises. Feeder lambs provided a means of utilization of bean pods and other crop residues during the winter. They also utilized off-season labor and provided a valuable manure pack for use on soils for growing of cash crops. Some farmers kept feeder lambs in the basement of their barns each winter in order to keep their potatoes, cabbages, or other vegetables from freezing while in storage.

An annual lamb feeders' banquet became a popular event in Batavia, with several hundred in attendance. At these affairs Professors Morrison and Willman and other staff members presented results of lamb-feeding experiments and other sheep research.

Investigations were initiated in 1932 to evaluate methods of fattening western lambs under New York conditions. Some of the earlier studies with feeder lambs compared limited feeding, full-feeding, and self-feeding of the grain-protein-supplement mixtures when fed with clover-timothy hay. There were no differences in rate of gain, but feed costs per 100 pounds of gain were somewhat higher for the self-fed lambs.

Other experiments with western feeder lambs showed that corn silage may be fed successfully as the only roughage for fattening when it is properly supplemented with calcium and protein-rich concentrates. Corn silage had a higher value when fed with alfalfa hay than when fed as the sole roughage (Cornell Univ. Agr. Exp. Sta. Bul. 691, 1938).

Several years of feeding experiments demonstrated that linseed meal, soybean-oil meal, whole soybeans, and corn-gluten meal were about equal in value when fed as protein supplements to feeder lambs. In other tests, lambs fed urea nitrogen as a substitute for all of the linseed-meal nitrogen were difficult to keep on feed and gave unsatisfactory feed-lot performance. Satisfactory growth and fattening of feeder lambs were obtained when enough linseed meal was fed to provide a ration having a total protein content of 10 to 10.5 percent (air-dry basis) (Cornell Univ. Agr. Exp. Sta. Bul. 834, 1946).

Of great importance in all of the sheep investigations and in the development of the sheep flock were the shepherds. Walter Thomson was the shepherd during this period until November 1, 1934, when Larry Hunt took over this responsibility. Larry had started as assistant shepherd on July 1, 1934, after graduation from Cornell. He worked quietly and effectively, and was always cooperative with faculty and graduate students. He was excellent with undergraduate students, teaching them fundamental sheep-husbandry practices. It was a delight to see him work the flock with his border collie dog not only in the pastures, but also in the livestock pavilion for audiences at Farmers' Week.

### **Kenwood Sheep Farm**

An experimental sheep operation, called the Kenwood Sheep Farm, was established in 1938 to determine the opportunities for profitable sheep production on typical hill lands of New York State. This 600-acre farm, in Ontario and Livingston counties, was owned and financed by F. C. Huyck and

Sons, Kenwood Mills, Albany, New York. The experiment was supervised by an operating committee consisting of one representative of Kenwood Mills, three members of the College of Agriculture (two from animal husbandry and one from agronomy), the county agricultural agents of Ontario and Livingston counties, and the farm operator.

It was planned to operate the farm for a period of 10 years. The farm was at an elevation of 2,000 feet and, when acquired, was in a state of low fertility, not having been farmed for several years. But with the use of sheep manure, applications of limestone and superphosphate, soil fertility was improved, and satisfactory crop and pasture yields were obtained.

The original flock consisted of 300 head of yearling white-face western ewes that were purchased. Additions were made later to bring the maximum size up to 700 head. Cotswold rams were used chiefly for production of ewe lambs for replacements. Some Corriedale rams also were used. Ewes that were not selected for special matings were bred to purebred Shropshire, Hampshire, and Suffolk rams for production of market lambs.

Satisfactory methods of parasite control were developed. During the first 5 years good results were obtained in both wool and lamb production. Problems due to unfavorable weather during the lambing season in some years were encountered. From 1942 to 1945, when the project was terminated, bad weather contributed to the production of low-quality hay, and other difficulties arose because of wartime conditions and the scarcity of adequate and efficient farm labor.

Even with these difficulties, it was concluded that it is possible to produce excellent pastures and to grow satisfactory hay crops on submarginal land similar to that used in the experiment. The hay produced was satisfactory for sheep when it was harvested before it got too mature.

To make large-scale sheep production profitable under these conditions, it is necessary to wean annually at least 90 lambs for each 100 ewes bred and to produce from each breeding sheep at least 8 pounds of wool. The lamb crop is important, and one test in 1944-45 indicated that the performance of native lambs was improved by the addition of cobalt to their ration.

Under the conditions of this experiment, it was concluded that the scarcity and high cost of experienced farm labor or labor for handling sheep are unfavorable factors to large-scale sheep production; also, an absentee-landlord type of farming is unsatisfactory for such an operation (Cornell Misc. Bul. 6, 1948).

### **Swine Breeding Herd**

As with the other classes of livestock, substantial improvement in the swine herd was made in the early 1930s with new foundation breeding animals of the Berkshire, Chester White, and Duroc breeds.

Over a period of years several people served as herdsman or assistant herdsman of swine, including Wayne Brown, John Cunkleman, Thomas Hillier, L. A. Newman, F. L. Carnes, and Clarence Preston. Two of them (Newman and Carnes) served in dual capacity with both sheep and swine. John A. Dunn became the swine herdsman in 1945 and continued in this capacity for a number of years.

## Swine Research

Investigations with swine expanded rapidly under the leadership of Willman and Morrison. Several experiments to determine satisfactory methods of preventing anemia in suckling pigs enabled swine producers in the eastern states to reduce the enormous annual losses that had been due to this disease. The disease occurred when suckling pigs were confined indoors or to enclosures with concrete floors with no access to soil. Under these conditions, it was found that anemia was prevented by drenching the pigs once a week until they were 6 weeks of age or by swabbing or spraying the udder of the sow with a saturated solution of ferrous sulfate until the pigs were 4 to 6 weeks of age. Also, it was desirable to allow the young pigs access to a palatable concentrate mixture containing a small amount of iron salt.

Earlier work by Morrison and his associates at the Wisconsin Experiment Station demonstrated the superiority of the trio-mixture, a combination, by weight, of two parts digester tankage and one part each of linseed meal and ground or chopped alfalfa hay as a supplement to yellow corn for pigs fed in dry lot. A mixture without the ground alfalfa was an efficient supplement to corn when the pigs had access to pasture. With the availability of new protein, vitamin, and mineral supplements and by-product feeds, a series of experiments was initiated by Morrison and Willman to determine if the standard trio-mixture could be improved upon for growing and fattening pigs. Numerous modifications were made in the trio-mixture with good results. For example, soybean-oil meal and cottonseed meal were substituted for linseed meal, and meat scraps were substituted for tankage (Cornell Univ. Agr. Exp. Sta. Bul. 730, 1940).

In succeeding years several hundred pigs were used in experiments to determine whether standard rations could be improved by making substitutions or additions of several different ingredients. In all experiments the results emphasized the practical and economical importance of good quality, sun-cured alfalfa hay as vitamins A and D insurance. There was no benefit from the addition of cod-liver oil or fortified cod-liver oil to a ration of ground corn and trio-mixture when fed to fall pigs in dry lot. The addition of liver meal increased the daily consumption, but did not affect the amount of feed required per unit of gain (Cornell Univ. Agr. Exp. Sta. Bul. 836, 1947).

Professor Willman also conducted experiments for several years to determine the value of adding various supplements to the winter rations for brood sows on the pigs produced. For example, there was an advantage from the addition of cod-liver oil concentrate. In other tests the number of pigs born weak or dead was reduced by using iodized salt instead of common salt, although there had been few cases of newborn pigs showing symptoms of goiter.

## Horse Division

Professor M. W. Harper was placed in charge of the horse division when the department was reorganized. He had been involved in teaching and research with horses since he first came to Cornell. Much of the farm work was done by horses at that time, but the animals were also used for teaching and research work. In addition to the course on horses, Harper continued to teach the course on problems in animal genetics and a portion of the elementary course in animal husbandry.

Samuel Kunz was the horseman responsible for the daily management of horses. He resigned during the 1932-33 academic year and was succeeded by Robert M. Watt, a Scotsman with a good background of experience with livestock and keen knowledge and the ability to work with draft horses. Bob Watt was an excellent addition to the department's programs. He quickly gained the confidence of students and all others who worked with him and was greatly respected by horsemen everywhere.

As a part of the department's program to improve the herds and flocks for instruction, research, and demonstration purposes, new foundation purebred Belgian and Percheron mares and stallions were carefully selected and purchased in 1931-32. With the addition of fillies born into the herd, by the mid-1930s the Belgian herd totaled about 18 head. There was a similar number of Percherons. Selected animals were exhibited each year at the New York State Fair, winning many blue ribbons and grand champion awards in both breeds from 1934 on.

The most-extensive research in this division during the 1930s was a series of feeding trials with mature workhorses to determine protein requirements. The reason for the repetition of these experiments for several years was the widespread belief that rations containing extra protein excel carbonaceous rations for all classes of horses. Although this was probably true for some classes, these trials showed it to be questionable for the mature horse for which energy to perform work is the end product.

A limited amount of work was conducted in cooperation with the Veterinary College to study effects of certain minerals, such as iodine, and vitamins, when fed to pregnant mares as a possible preventative of common foal ailments, including weak joints and navel infection. There was little advantage from adding these supplements to good rations.

The horse barn was destroyed by fire on the afternoon of January 21, 1938. The loss also included feed and some equipment stored in the barn. The 1938 legislature acted promptly and appropriated \$45,000 to replace the barn and an additional \$4,615 to cover the feed and equipment destroyed by the fire.

### **Death of Professor M. W. Harper**

Professor M. W. Harper died in Ithaca on May 9, 1938, after 33 years of faithful, productive work. He was born and brought up in Ohio and graduated from Ohio State University in 1901. He received the master's degree at the University of Illinois in 1902 and then taught at the University of Missouri for 3 years before he came to Cornell as an assistant in animal husbandry in 1905. He was promoted to instructor in 1906, assistant professor in 1907, and full professor in 1913.

Professor Harper was concerned mainly with the care, feeding, training, breeding, and judging of horses. In addition to his teaching and research in the college, he published five books in the period from 1911 to 1924. Professor Harper was highly regarded by the students not only because of his classroom instruction, but also because of his unfailing interest in them and his readiness to talk with those who came to him for counsel. He was one of the pioneer horsemen in American universities.

After the death of Professor Harper, leadership of the horse division was transferred to Dr. G. W. Salisbury who had been on the faculty since 1934. He taught the horse course for the next several years.

A new horse barn was constructed on the same site as the previous one and was occupied in the fall of 1939. The second floor of one wing contained space for the small animal laboratory and for a new laboratory for artificial insemination research.

Only a limited amount of farm work was still being done with horses by this time. The herd was used mostly for instructional purposes and a limited amount of research. Selected animals were exhibited successfully at the New York State Fair for the next few years.

A research project on the control of strongyles in horses was conducted for about 4 years, in cooperation with Dr. D. W. Baker and Dr. J. W. Britton, parasitologists in the Veterinary College. Parasitism was a problem with horses when they were closely confined in small exercise lots and pastured on limited areas. A system of rotational grazing of mares and foals in which the pastures were allowed a periodic rest of 3 weeks proved effective in reducing the rate of pickup of infection and the number of parasites that finally became established as an active infection in the foals.

As luck would have it, about two-thirds of the new horse barn was destroyed by fire in 1943. One wing, which contained the small animal and animal breeding laboratories on the second floor, was left standing. A couple of years later, the ground floor was renovated for laboratories for dairy cattle nutrition and physiology of lactation.

## Rapid Growth of Extension

Extension educational programs in animal husbandry grew at a rapid rate during the Morrison era in accord with the philosophy that had been established much earlier of "service to the people." From the very outset, the New York State Extension Service had proceeded on two fundamental concepts, namely, that research shall precede extension and that teaching shall be based on facts, not on personal opinions. The key function was to take research results and interpret them for the use of farmers throughout the state to help improve the efficiency of the dairy and livestock enterprises and promote the welfare of farm families. The Extension Service never deviated from its program of education.

By the early 1930s, county agents had become established in all agricultural counties of the state, and the number of 4-H club agents was increasing. Farm and Home Bureau Associations and 4-H Club Associations were functioning and were the legalized extension agencies for each of the counties.

In addition to his other duties, Professor Morrison served as project leader of animal husbandry extension programs until 1934 when Professor S. J. Brownell, with the approval of the director of extension, was asked to take on this responsibility. This turned out to be a wise decision, for Stanley, as we all learned to know him, gave outstanding, aggressive leadership to dairy cattle and livestock extension over the next 28 years. He was especially noted for his work in training new extension specialists in the department, developing leadership through personal example, and organizing extension educational programs. In simple terms, Brownell was a super leader and promoter of programs to improve dairy cattle and other livestock and to develop leaders among breeders and producers.

After the reorganization of the staff, there were six extension specialists, with four of them (Brownell, Hopper, Crandall, and Tailby) concentrating on

dairy cattle programs, one (Grams) on sheep production, and one (H. A. Willman) on 4-H club livestock programs. Over the succeeding years, a number of additions and changes in specialists were made and will be described in sections that follow on extension activities. Along with the work of the specialists, a great deal of extension education was carried out by the resident teaching and research faculty, especially those in the livestock production areas, including Morrison, Harper, Hinman, Savage, Harrison, and J. P. Willman.

Extension work in animal husbandry was conducted in three project areas: (1) dairy cattle, (2) other livestock, and (3) 4-H club livestock.

Major programs in dairy cattle production were concentrated in four areas: (1) dairy records-dairy herd improvement associations and dairy record clubs; (2) dairy cattle breeding, (3) dairy cattle feeding, and (4) herd health.

## Extension Programs in Dairy Production

### Dairy Records—Dairy Herd Improvement Associations and Dairy Record Clubs

The number of dairy herd improvement associations (DHIA) continued to grow slowly, reflecting the interest of some dairy farmers in using the records as a basis for increasing milk production and profit per cow. By the year 1929–30, however, supervised records were being kept on only 25,000 cows in 49 associations, or about 1.5 percent of the dairy cow population in New York. There were 2,500 cows on test in the dairy record clubs.

Professor W. T. Crandall had the responsibility for supervision of the dairy records programs, including official testing programs conducted by the dairy cattle breed associations. The Advanced Registry (A.R.) system had been in existence for many years, but an important development came in 1925 when the Ayrshire Breeders Association started the Herd Improvement Registry (HIR). It was patterned after DHIA in that all cows in the herd were tested, rather than selected cows, as was the case in Advanced Registry. Soon the other Breed Registry Societies adopted the herd improvement registry type of testing. In many cases, it was carried out on the same herds as the DHIA program, and the same test-day data of milk weights and fat percentage were used for both programs.

Walter Tailby worked closely with Crandall on all of the field activities of the DHIA program, especially the selection, training, and general administration of the supervisors. As the number of associations and supervisors increased, Mr. Tailby had to spend more and more time in the field. He was very conscientious and did a thorough job in the program at all times.

Special efforts were made by the extension specialists to emphasize the value of keeping milk records to provide information necessary for culling inferior animals and to use as guides for better individual feeding and as measures of inherent ability for profitable production. One method used to get this message across was Mr. Tailby's regular WHCU radio program, "Test and Know Your Cows, It Pays."

To give dairy farmers full value from their record work, Professor Crandall made a special analysis of results at the end of each testing year, correlating the milk production and grain fed in such a way as to show whether low production resulted from underfeeding or from a lack of inherent ability. He

spent hundreds of hours with a hand calculator (one cranked by hand) working out these summaries for use as demonstration teaching materials at the annual dinner meetings of the dairy herd improvement associations. These summary discussions, with analysis of the dairy farmers' records, proved to be of great value in holding the interest of association members and guiding them in the improvement of their herds.

The DHIA supervisors were key figures in the development of the dairy records program. Their work was difficult from the standpoint of travel, hours involved, and varied living conditions, especially in the earlier years when the supervisors were required to stay at each farm overnight. The pay was generally low, compared with other jobs, and there was little opportunity for advancement. It is not surprising that the recruitment of DHIA supervisors was always a difficult problem. During the depression years of the early thirties, a large number of the supervisors came from the 2-year Cornell program or from the state agricultural and technical institutes. Their initial training and experience were supplemented by periodic visits by Mr. Tailby. He visited each supervisor several times each year, checked the procedures and techniques used, and offered suggestions for improvement as needed.

Following the example of two or three other states during the late 1920s, an owner-sampler or mail-order type of testing was initiated in New York. The County Farm Bureau Associations and the county agricultural agents were active in this development, and they financed and built regional milk testing laboratories in Middletown, Ithaca, and Gowanda. Later, there were county laboratories in Plattsburg, Westport, Oswego, Elmira, Cortland, and Owego.

In 1930 Clarence G. Bradt, county agent in Delaware County, was brought into the Department of Animal Husbandry to give leadership to the Dairy Record Club program. As a result of his promotional and "sales" campaign, the work grew at a fairly rapid rate until a peak was reached at about 850 members and 10,000 cows on test under this program. With this more simple system, dairy farmers were signed up by the county agricultural agents, and milk sample boxes and recording sheets were provided. Milk samples and record sheets were mailed to the respective laboratories each month, the milk was tested, and the records and feeding recommendations were returned by mail. This system provided low-cost milk-testing service, about 12 cents per cow, to those dairy farmers interested in using the records for improvement of their herds.

The degree of success of the dairy record clubs in each county depended largely on the interest, follow-up, and counsel of the county agricultural agent. And there were a number of problems that affected the program. Difficulties were encountered in proper preservation of the milk samples during mail shipment. There was often a tendency for some dairy farmers to forget about taking samples during the busy farm-work season or when other phases of the farm enterprise became more important. Business gradually dropped off, and the dairy record clubs became a victim of the depression in the mid-1930s. All the field laboratories eventually closed except the ones in Ithaca and Middletown.

Professor Bradt was transferred to other responsibilities, mainly herd health programs, and what was left of owner-sampler testing was supervised by G. W. Tailby until his retirement. Eventually, the Ithaca laboratory was closed about 1949, and the Middletown laboratory continued on a small scale until about 1960. Looking back on this type of dairy records service, it may be said that one of its greatest attributes was that it encouraged a great many



dairy farmers to start keeping records and led them eventually to change to the more complete and satisfactory DHIA program. At the beginning of World War II, there were 130 dairy herd improvement associations with 3,200 members and over 80,000 cows enrolled.

The DHIA program continued during the war period under great handicaps. In 1942 about 40 percent of the supervisors left for other work or military service. Because of this shortage, conscientious objectors to military service were made available; they helped to keep the program going. Many women also were employed as supervisors, and their excellent work was an important factor in the survival of the program. By 1944 about 60 percent of the DHIA supervisors were women or conscientious objectors.

At the end of the war years, there were 64,276 cows in 2,671 herds being tested in the several types of record-keeping services supervised by the extension services of animal husbandry. Even though fewer cows were tested, average production per cow continued to increase. By 1944 the average cow in DHIA in New York produced over 8,300 pounds of milk. The advantages of production records and the results of good feeding, breeding, and management practices were widely publicized through educational meetings, service letters, and other media—*Dairy Herd Improver*, *Farm Bureau News*, the daily and weekly press, and the radio (Fifty-eighth Annual Report, 1945).

### **Dairy Cattle Breeding**

Much greater emphasis was given to dairy cattle breeding extension after Professor S. J. Brownell joined the faculty in 1929. He believed that the purpose of a dairy cattle breeding program is to achieve greater and more-efficient milk production. The ability of dairy cows to produce is determined largely by inheritance; therefore, the most satisfactory way of improving the inherent milk-producing capacity in dairy cattle is through the use of better sires.

Surveys taken in 20 counties in the state in 1929 showed that 54 percent of all the bulls were grade or scrub. Only 46 percent were purebreds, and of this number, only 20 percent were registered. Only 3 out of every 100 bulls were from cows of known production.

As a result of these surveys, Professor Brownell felt that the 54 percent of dairy farmers who had grade and scrub bulls could bring about a decided improvement in their herds by using purebred sires. The farmers with better herds, such as those in DHIA and dairy record clubs, could improve their herds 25 percent or more with the use of bulls of known ancestry. And the outstanding dairy farmers, whose herds produced 350 pounds of milkfat or more, could improve or maintain their production with certainty only by the use of proved sires. With this situation and outlook, Professor Brownell established "better bull" and "proved sire" campaigns. More areas within the state were becoming free from tuberculosis, thus making it safe to urge the purchase of better sires and females.

The first bull association to be established by Brownell in New York was organized in 1930 by 17 cooperating dairy farmers in Schuyler County. Bull associations grew in number until 1939 when there were 40 associations in the state involving nearly 200 dairy farmers and nearly as many herd sires. Bulls in each association were rotated among the farmer members, and this provided a mechanism for keeping bulls alive until they were proved.

In 1930 2-day breeding schools for dairy farmers were conducted in six counties. During the following winter, there were 23 breeding schools conducted in as many counties. These schools proved to be popular, attracting large numbers of dairy farmers, and were effective in creating interest in better sires and better breeding programs. During the year 1931-32, the better-sires project was instrumental in replacing more than 1,300 grade and scrub bulls with purebred bulls. One technique used that proved effective was a bull sales list that was distributed to the counties. The only bulls listed were those whose mothers had produced 400 pounds of milk fat or more in a year.

Even when purebred bulls were carefully selected on the basis of ancestry, it was recognized that there was still considerable uncertainty as to how prepotent they would be for transmitting high production to their daughters. A bull could not be proved until he was old enough (5 to 6 years of age) to have daughters with at least one record of production. One difficulty encountered in obtaining more-extensive use of proved sires was that farmers did not like to keep an old bull. Because of this, an intensive campaign was conducted to convince farmers of the great value of desirably proved sires and to show that, with properly constructed bull pens, paddocks, and breeding racks, bulls could be kept in service until their breeding value could be determined. Cooperation of extension specialists in agricultural engineering was enlisted for this project. Through these cooperative efforts, many farm demonstrations were held to show the construction of model bull pens and paddocks.

As a result of the intensive dairy cattle breeding and proved sire educational programs, the number of breeders participating increased quite rapidly during the early 1930s. By 1934 intensive sire campaigns were being conducted in 17 counties with more than 5,000 dairy farmers enrolled as cooperators. A veritable bombardment of materials was mailed to them. The dairy farmers who used grade or scrub bulls received monthly service letters giving information and advice on the selection, use, and value of a better bull. Those dairy farmers who had been using purebred bulls received each month another type of letter discussing the value of continuous testing, the proving of sires, sire indexes, bull associations, and better breeding practices in general. This was supplemented by a printed sheet or leaflet giving more technical and detailed information than was usually put in a letter. Other techniques included lists of proved sires and accompanying news articles sent monthly to the county agents in each campaign county. Also, a monthly checkup and summary of the progress of the work in each county were made, with publicity, meetings held, bulls proved, bull pens completed and other pertinent information included.

Professor Brownell long recognized that one basic weakness of the dairy cattle breeding program was the inability of farmers to fully utilize desirably proven sires through natural service. In his schools with breeders, he continually emphasized the potential in artificial insemination for utilizing valuable sires more widely. He was so enthusiastic about artificial insemination that I saw him in 1934 personally give a demonstration, in the department's livestock pavilion, to a group of several hundred dairy scientists, at the annual meeting of the American Dairy Science Association held at Cornell University. This was fully 4 years before the first artificial breeding association was formed in New York State.

When I joined the extension staff in animal husbandry on July 1, 1934, my major assignment was to assist Brownell in the dairy cattle breeding programs. This position was made available by an arrangement worked out by Professor Morrison to transfer W. T. Grams, the extension sheep production specialist,

over to a federal program under the Agricultural Adjustment Act. Recognizing that my primary livestock interests were with dairy cattle, Professor Morrison arranged for H. A. Willman to take over the adult extension work with sheep, and in return I was to spend time during the summer with the 4-H club program. So I had a full summer schedule with 4-H club meetings, shows, fitting and showing contests and a winter schedule with dairy cattle breeding meetings and activities of the proved sire campaign.

Leland W. Lamb joined the extension staff on October 1, 1935, as instructor and was promoted to assistant professor in 1938. He assisted with the 4-H club dairy programs, but his major attention was given to dairy cattle breeding. Professor Lamb resigned December 31, 1939, to accept a position with the American Dairy Cattle Club.

James D. Burke started as an extension assistant on November 1, 1936, to work on several extension projects including dairy records, dairy cattle feeding and management, and later he handled the extension work with meats and horses. After he graduated from Pennsylvania State College, Burke worked as a DHIA supervisor for 1 year, as a herdsman for 2 years, and operated a dairy farm for a year. These experiences gave him practical preparation for work with dairy farmers in New York. While serving as an instructor, he enrolled in the graduate school at Cornell, earning the master's degree in 1946.

Professor Brownell continued as extension project leader in the department and also served as secretary of the New York Holstein Association, on a part-time basis, with part of his salary paid by the association. He played a significant role in making the New York Holstein Association one of the strongest dairy cattle breed associations in the United States.

Earl H. Hanson, one of the graduate students in the department, was appointed extension instructor on April 1, 1936, to assist with ongoing programs and to succeed Professor Brownell as secretary of the Holstein Association. Mr. Hanson remained in this position for only a short time and resigned on August 31, 1937, to take a position in private industry.

Beginning in August 1937, Burke served for 1 year as secretary of the New York State Holstein-Friesian Association. He was succeeded by W. D. Brown, prominent Holstein breeder from West Winfield, who came to Ithaca and handled this work for the next two decades.

### **Herd Analysis Studies**

The extension program in breeding moved into an entirely new and advanced phase of its development in 1936 with the inauguration of a genetic analysis of herds in DHIA. Approximately 100 of the leading herds were analyzed during the first year, and in succeeding years the number increased to more than 600 herds.

Under this program those dairy farmers whose herds had been enrolled in DHIA for a period of at least 5 years were invited to cooperate by furnishing their yearly herdbooks, breeding data, and other records for analysis. Permanent herdbooks were compiled with complete breeding, production, and health data being given for every cow that had been in the herd during the time it had been on test. The cows were grouped into families (descendants from each foundation cow) and into groups of daughters of each sire that had been used in the herd. The transmitting history of each sire and of each family or strain of cows was effectively portrayed by means of charts typed in three colors. From these charts on each herd, the superior strains of cows were easily identi-

fiable. This analysis provided data and information for the dairy farmers to use in selection of heifers for their future herds.

In many of these herds, outstanding sires were identified, based on their transmitting ability, along with superior cow families. Bull calves that were produced from mating these sires to good transmitting cows in superior cow families were logical choices by dairy farmers for their herd sires. Herd analyses provided a means of showing the ability to transmit high production on the female side as well as on the male side of the pedigree.

New York definitely moved out into the lead in this work, and within a year similar analysis charts were being used in at least a dozen other states. At the same time, New York continued to be in the forefront in cooperative bull associations and in proving of sires. County agents sponsoring better bull campaigns were given intensive training each year. All these activities resulted in a larger proportion of dairy farmers using purebred bulls; they became more selective in bulls chosen to head their herds; and the breeding of dairy cattle gradually became established on the basis of animal genetic facts rather than selected records and popular names and families.

### **Artificial Breeding Program Initiated**

With these evolutionary changes in dairy cattle breeding and the development of leaders among dairy farmers, it was logical for them to recognize the potentials of artificial insemination as a more-certain means for further genetic improvement of dairy herds. As a result and through the leadership of Professor Brownell and the cooperation of dairy farmers around Ithaca, the first experimental and demonstrational artificial insemination association in New York was formed in October 1938 with headquarters at Dryden. It was named the Pioneer Artificial Breeding Association. This was the second association in the United States since the first one had been established in New Jersey earlier that same year. One of the leaders in the organization of the Pioneer Association was Raymond Albrechtsen, dairy farmer, living near Ithaca. During that year, he worked for 3 months as extension instructor, and in 1939 he was appointed on a full-time basis. Earlier, Ray had been a graduate student in animal breeding in the department and received the M.S. degree in 1931.

The first project was established with the idea of gaining experience in organizing and carrying on the artificial breeding program before it was offered as a regular project throughout the state. But as soon as the first association was established, dairy groups throughout the state saw the future value of similar programs in their area. It was impossible to hold down the demand for assistance from the extension specialists in forming new associations. The rapidity with which the program developed was without parallel in the history of dairy cattle breeding. Within 5 years after the original association, there were 33 associations, employing 37 inseminators, serving 41 counties in the state.

In the spring of 1940, plans were developed to form a central state organization to bring the bulls together from several local associations in order to provide semen more economically and under more scientific control. Also, a center would provide a means for greatly extending the services of outstanding bulls. Syracuse was selected as the headquarters, and operations of the New York Artificial Breeders' Cooperative (NYABC) were started on June 1, 1940.

Maurice W. Johnson, a DHIA supervisor in Chenango County, was employed as manager, a position he held for 20 years. The NYABC took over the barns of the Onondaga County Association and purchased their four bulls—two Holsteins and two Guernseys. More pens were constructed to house the bulls from the Pioneer Association, and other bulls were obtained later.

Much assistance was given to this fledgling organization by Jim Sears, dairyman and secretary-treasurer, and by Jim Foster, Onondaga County agricultural agent. Several of the existing local associations affiliated with the central organization, and newly formed locals affiliated as they were organized. During the first year of operation, the NYABC inseminated 3,500 cows. By 1944 forty units were served with about 35 bulls of the Holstein and Guernsey breeds.

The first DHIA production records on cows resulting from service by the NYABC were reported during the summer of 1942, and the first complete proved sire report on an association bull came in August 1942.

During these years, the program of artificial insemination in dairy cattle developed almost entirely as a project of the extension and research staff in animal husbandry. This program created new demands upon the extension specialists. It became clear to Brownell and Albrechtsen that additional extension specialists were needed to assist in organizing and supervising artificial breeding associations as educational demonstration projects. The first school for training of technicians to serve as inseminators was conducted in March 1941, but this needed to be continued on a regular basis to meet the needs of additional associations and the normal turnover of technicians. There was some pressure from the veterinary profession to use only veterinarians as inseminators, but the decision was made to use trained laymen. Over the years this proved to be a wise decision.

Because the success of dairy cattle improvement through artificial breeding was dependent upon the use of sires with the greatest ability to transmit high milk production, it was necessary for the extension specialists to aid in locating those sires that could be used with a minimum risk to the dairy farmers' breeding program. The New York State Bankers' Association recognized the importance of this work and the need for additional staff. As a result, the association provided funds for an extension instructor, F. I. Elliott, to assist in the educational aspects of artificial insemination and herd improvement. It was not reasonable, however, to expect this source of funds to continue indefinitely.

Professor Morrison and the Administration of the College of Agriculture made budgetary requests for a special appropriation to provide additional staff and operational support for the program. The State Legislature of 1944 responded with an appropriation of \$46,000 for extension and research in artificial insemination and dairy herd improvement. This provided five new staff positions in extension, one in research, and three graduate assistantships, along with additional funds for travel, equipment, statistical and secretarial services, and other operational costs.

In October 1944 these new positions for extension instructors were filled by the appointment of Joseph S. Taylor, George W. Trimmerger, Delmar J. Young, William R. Walker, and Dr. Graydon W. Brandt. They worked under the general direction of Professor Brownell and complemented his efforts and those of Raymond Albrechtsen. Dr. C. B. Knodt was appointed instructor to assist Professor G. W. Salisbury in his research program in artificial insemination.

The NYABC grew rapidly, and in 1944 the decision was made to move its headquarters to Ithaca on land furnished by Cornell University. This significant development was an outgrowth of the splendid cooperative work that had been carried on by the NYABC and the Department of Animal Husbandry. Construction of the new facilities was financed by Cornell University, and payment to the university was amortized over a 25-year period by the cooperative and the State of New York on an equal basis. The buildings were constructed on Judd Falls Road, about one-half mile from Wing Hall, and included a large barn for hay and bedding, two fireproof barns, each to house 30 bulls, a semen collection building, and an office and laboratory building.

The office and laboratory building provided space for the management staff of the cooperative and for the department's expanded program in research. The cooperative agreed to make available to the department its continuous collection of records in dairy cattle breeding for analysis and research. The barns housed the bulls owned by the cooperative and other bulls that were to be used for research purposes only.

This unusual arrangement and the information obtained through this cooperative effort between animal husbandry and the NYABC were of major importance to later developments in the dairy industry of New York State.

### **Extension Program in Dairy Cattle Feeding**

Feeding dairy cattle for economical returns was a third area for emphasis in the expanding extension program during the Morrison era. This was of major importance because of the volume of purchased feeds and the need for farmers to adjust seasonable production to market demands. Increased emphasis was placed on better summer feeding and management in order to meet the shortage of milk during the fall months.

Professor W. T. Crandall was the leader of the dairy cattle feeding program, and along with him worked H. A. Hopper, the senior member of the extension staff. During the late twenties, Professor Hopper developed tuberculosis, which restricted his travels out over the state. As a result, his activities were confined to office work for the remainder of his career. His major role was to handle the general correspondence that came to the department. With a large volume of letters requesting information on a wide variety of subjects, this was a very time-consuming task. To aid in responding to these requests, Professor Hopper developed a series of one- or two-page mimeographs to use as supplements to short letters on specific subjects, such as the use of cane molasses, value of dried brewer's grains, ground soybeans, mineral and vitamin supplements.

With his long background of experience and knowledge, Professor Hopper also was extremely helpful in teaching young extension specialists effective ways to work with farmers.

By the death of Professor H. A. Hopper in November 1937, Cornell lost one of the pioneers in agricultural extension work in New York State and in the nation. He had served the university for 27 years, having been the first extension specialist in the Department of Animal Husbandry. He served as project leader in extension in the department until poor health forced a change in his duties. In spite of ill health, Professor Hopper continued in his work with indomitable courage until only a few days before his death. He exerted an exceedingly important influence in the development of the dairy industry of this state. Possessed with a keen mind and sound judgment, his

advice was valued highly by dairy farmers throughout the state and by his colleagues in the university. I shall always be grateful for the counsel and advice that I received during the 3 years I was privileged to work with Professor Hopper as one of his young colleagues.

Professor Crandall launched a new dairy cattle feeding program in the fall of 1935. This program was built around the fundamental fact that dairy farm profits depend largely on high yields of good-quality feeds and the marketing of these farm-grown feeds through good cows. I was given the responsibility of working with Professor Crandall on this program. This gave me an opportunity to work in dairy feeding and nutrition, an area in which my advanced training had been centered.

The "new" feature of this program lay in the teaching methods—a concentrated drive, or campaign, with persistent step-by-step follow-up, furnishing the dairy farmer specific timely information throughout all seasons. The program started with a 2-day training school for county agents and then was launched in 10 counties in 1935 and expanded to 23 counties the next year and to 40 counties later. Farmers were given an opportunity to enroll, or sign up, and agreed to follow instructions and keep a record of results of improved feeding practices. More than 16,000 dairy farmers enrolled the first 2 years and received a monthly series of educational letters, prepared by the dairy specialists and distributed by the county agents. Two-day dairy cattle feeding schools were held in all the important dairy counties, and dozens of regional and community meetings were held. Dairy tours, demonstration farms, DHIA summary meetings, and a nutritional school for feed manufacturers were all part of the broad program. Among many educational materials used were two Cornell Extension Bulletins, *Raising Dairy Calves and Heifers* (Bulletin 361) by K. L. Turk and *Feeding the Dairy Cow Efficiently* (Bulletin 363) by W. T. Crandall and K. L. Turk, both published in 1936. They were widely distributed and served as "textbooks" for feeding schools and other meetings. Over the succeeding years, these bulletins went through many editions and revisions.

Through all the various teaching methods, several practices were stressed continuously: (1) feed cows all the high-quality roughage they will clean up readily; (2) grow all the high-quality roughage that the farm can produce economically; (3) adjust the size of herds to normal roughage supplies; (4) feed grain to each cow according to roughage consumption and to milk and fat production; (5) raise calves and young stock to develop large capacity for roughage; and (6) feed cows to condition them properly for the next lactation.

To carry out a successful educational program emphasizing fuller use of forages in supplying nutrients for milk production, it was important for the Agronomy and Animal Husbandry departments to cooperate closely. Specialists of the two departments jointly held meetings and 2-day schools covering both feeding and feed production.

The results from this feeding and feed production program over the next several years were very satisfactory. Increasing numbers of dairy farmers applied the recommended feeding practices and developed the resources of their farms for more economical production of nutrients. Forage crops were cut earlier to increase nutritive quality. Studies of DHIA records showed increased yields of milk with a decrease in pounds of grain fed and an increase in hay equivalent consumed, thus achieving a higher production at less cost.

After I left Cornell in 1938 to accept a position at the University of Maryland, J. D. Burke continued the work in the dairy cattle feeding program. Burke had a thorough grounding in practical dairy farming, the ability to talk

"farmer language" and to use new teaching techniques and visual aids. He proved to be thorough in his work, stimulating and original in his ideas, and worked constantly to improve the extension programs.

In addition to his contributions to the ongoing feeding and feed production program, Burke developed in 1939 the production and feeding analysis for DHIA herds that was used continuously after that time. The feeding program was analyzed for dairy farms on a yearly basis, pointing out the weak spots that needed to be corrected for greater efficiency.

### **World War II Brings Adjustments**

Beginning in 1942, the entire dairy feeding extension program was adjusted to the needs of World War II for more milk production. Secretary Wickard of the United States Department of Agriculture asked New York dairy farmers for a 5 percent increase in milk production in 1942 over 1941. To help dairy farmers meet this demand, many additional feeding and feed production schools were held as well as other special meetings for farmers; more than 270,000 war-emergency, dairy-feeding service letters and circulars were sent to New York dairy farmers; and there were 36 one-day Food for Victory meetings. Dairy farmers responded, and milk production per cow was up about 7 percent in 1942 over 1941.

Over the next couple of years, travel restrictions made necessary greater use of the radio, service letters, news articles, and press releases. A four-page leaflet *Food for Victory* giving suggestions for producing more milk was distributed to every dairy farm in the state in a farm-to-farm canvass. A dairy commodity committee report on a "Dairy Feed Mobilization Program" was widely circulated through the press and by mail.

In adapting the program to the war demands, some changes in farm practices were necessary. There was a tremendous increase in the use of wheat for feeding of livestock, and more than the usual amounts of oats and barley were fed to offset the drastic reduction of the corn supplies. In fact, in many dairy rations, the percentage of corn used was less than 10 percent. Dairy farmers were urged to feed concentrates liberally enough to good cows to ensure full, efficient production because there was a favorable relationship between feed costs and milk prices.

### **Cornell Feed Service**

In late 1941 Governor Thomas E. Dewey appointed a New York State Emergency Feed Committee of Cornell faculty to summarize feeding recommendations, publish war-emergency bulletins, and provide information for agricultural extension meetings. Discussions with this committee led to the idea of bringing together feeding recommendations and distributing this information direct to feed manufacturers, dealers, and distributors. Professor Morrison suggested that a feed service bulletin should provide information from all departments. This plan was followed, and with E. I. Robertson in poultry husbandry, serving as the editor, the first issue of the *Cornell Feed Service* was printed and distributed in August 1942. This first issue included "up-to-the-minute" articles from widely recognized authorities: "The Poultry Feed Situation," G. F. Heuser, L. C. Norris, and E. I. Robertson; "Formulas for Dairy Feeds," E. S. Savage; "Unnecessary to Add Vitamins to the Concentrate



Mixture for Milking Cows," J. K. Loosli; "Wheat for Livestock Feeding," F. B. Morrison; and "Summer Feeding of Dairy Cows," W. T. Crandall.

The *Cornell Feed Service* was issued as a printed leaflet three to four times each year and received wide acceptance. It became an official organ of the college and continued to provide timely, valuable feeding information under the leadership of several faculty members in both departments until the 1970s. It contributed greatly to working relationships between the college and the feed industries and became a link in getting adoption of new practices by farmers in milk, meat, and egg production during the war and postwar periods.

### **Herd Health Extension Programs**

After the extension veterinarian, Dr. H. J. Metzger, resigned from the staff in 1930, there was no one directly responsible for the work in herd health and animal-disease prevention for the next 5 years. Various activities were handled by several of the staff from animal husbandry, working in cooperation with the Veterinary College and with practicing veterinarians in the field. In cooperative educational meetings with farmers, all subject matter pertaining to disease was handled by veterinarians, whereas problems dealing with sanitation and herd management were handled by animal husbandry specialists.

Beginning in 1935, all herd health activities in animal husbandry extension were assigned to Professor C. G. Bradt. Under Bradt's leadership, the extension cattle health program, in cooperation with the State Veterinary College and the Federal Bureau of Animal Industry, was developed to acquaint dairy farmers with the importance of keeping herds healthy and free of disease. Dairy farmers learned to appreciate that without healthy animals milk production was reduced, desirable breeding bloodlines were broken, and animals failed to achieve a normal life of productiveness. Definite rules and guidelines for the maintenance of sound health, based upon good methods of herd management and proper stable sanitation, were established. These rules were constantly emphasized at educational meetings and through the use of other media. The keynote of the program was prevention of disease rather than cure.

After a long, slow process of education, by 1937 New York State became a modified accredited area for bovine tuberculosis with an infection rate of less than 0.5 percent. Twenty-five years earlier, dairy farmers had been highly antagonistic to the plan of cattle testing and slaughter.

After the eradication of tuberculosis from dairy herds, major emphasis was given to elimination of brucellosis in cattle (Bang's disease). Losses from breeding troubles, dead and weak calves, and decreased milk production due to brucellosis had been quite heavy for many years. About 15 percent of all cattle were believed to be affected.

A state program for control and elimination of brucellosis through the use of blood testing and calfhood vaccination was activated. Professor Bradt stepped up his efforts to make this work effective. A 12-point cattle-health defense program for 1941 was prepared and given wide publicity throughout the dairy counties of the state. It was emphasized that healthy dairy herds, like healthy people, are national assets, which must be defended and strengthened during the war period.

By 1945 about 26,000 herds, with approximately 465,000 cows, were enrolled in the state control programs for brucellosis. In that year about one-

third of all calves were vaccinated against Bang's disease. Under the programs of education, testing, and vaccination, it was evident that marked progress was being made toward what it was hoped would be the eventual elimination of this costly disease from New York dairy herds.

The incidence of mastitis was another health concern. Each year more than a hundred meetings were held to give dairy farmers information on the cause, prevention, and control of this disease. A war emergency bulletin, *Healthy Udders for Dairy Cows*, was widely distributed. Research work about this time at the New York State Experiment Station at Geneva indicated that the incidence appeared to be less when cows were milked rapidly. The report of this work was disseminated widely in the extension educational program.

## Extension with Livestock Other than Dairy Cattle

During the early part of Professor Morrison's administration, 1928 to 1934, there was only one extension specialist for livestock other than dairy cattle. This was W. T. Grams, sheep production specialist.

The sheep extension work led by Grams was conducted in three general phases: lamb feeding, flock management and disease control, and better sires. The work in lamb feeding was confined largely to four counties in western New York where this farm enterprise had been important for many years.

Extension work was conducted mainly through barn meetings, with discussions on such subjects as improvement in breeding, flushing the ewes, culling the flock, barn ventilation and equipment, use of temporary forage crops, shearing practices, wool marketing, and control of external and internal parasites. Sheep tours were arranged to familiarize farmers with successful methods.

The result of extension work in adoption of improved methods of flock management and the use of better rams is measurable only over a period of years. One indication of progress was the report by commission men in the Buffalo stockyards that buyers no longer discriminated against New York lambs, but accepted them on the same basis as lambs from other states.

During the early thirties, there was an increased interest in home butchering and in the curing of meat. Beginning in 1932, Mr. Grams gave demonstrations in several counties each year on cutting and processing beef, pork, and lamb. Before this time, a limited amount of extension work with meats had been handled by R. B. Hinman and C. D. Schutt. Many farmers were using cull dairy animals for home consumption; they had low market value, but furnished good edible meat. It was quite evident, however, that many farm men and women were having difficulty in cutting the carcasses in a satisfactory way to avoid waste and spoilage and in using the various cuts to best advantage.

An example of an effective program was one conducted in cooperation with the National Livestock and Meat Board and local packing companies and stores in the fall of 1933. Twenty-eight meat cutting demonstrations were held in 12 cities with a total attendance of over 12,000. Special demonstrations were given for homemakers, meat retailers, and high school students.

After Grams was transferred to a federal salary item under the Agricultural Adjustment Administration on July 1, 1934, responsibility for the meats extension work was given to me for the next 4 years. The program was very modest with five or six demonstration meetings each winter arranged by farm

and home agents. Interest and attendance at these cutting demonstrations were exceptionally good, and the questions and discussions indicated there was a need for this type of work. Carcasses were brought to the meeting place by farmers who owned the meat. Sometimes it was quite a challenge, in subzero weather in the North Country, to tackle a quarter of frozen beef. Another challenge occasionally encountered was when a frozen pork carcass that had been skinned was brought in for the cutting demonstration. As the exterior of the carcass thawed in a warm room, you can imagine the "fun" I had trying to cut it with a handsaw and knife as it skidded on a smooth table! Soon I learned to arrange for nonfrozen carcasses.

After H. A. Willman took over the extension activities with sheep farmers in 1934, emphasis continued to be given to improvement in quality of market lambs. A close relationship developed between the 4-H club program and the work with sheep producers. Parents and their sons and daughters together attended many of the demonstrations on drenching, docking, castrating, and shearing and meetings on feeding and management. They were equally interested in local lamb shows and ram sales.

In 1938 H. A. Willman designed and built a portable sheep dipper and developed a dipping service, which resulted in the control of external parasites on over 250,000 sheep. This work attracted the interest and attention of Dr. Herbert Schwardt in entomology and Dr. Donald Baker in the Veterinary College. A new program in livestock entomology with state funding to support it was formed as a result.

Throughout this entire period, only a limited amount of attention in extension was given to beef cattle and swine. Service to farmers with these classes of livestock was given through a state beef cattle day each year, the beef cattlemen's short course, bulletins, news articles, and radio.

Groups of farmers interested in draft horses requested information and guidance in these subject areas: (1) how to select animals for purchase and to identify unsoundness, (2) how to stimulate greater interest in horsemanship, and (3) the breeding and raising of horses. Mr. J. D. Burke held a series of barn meetings and demonstrations each year arranged by Farm Bureau agents in response to these requests. In addition, horse-pulling contests continued to increase in popularity. In some years, up to 30 separate contests were held with a total of over 150 teams.

During the latter part of the thirties and the early forties, the economic situation encouraged some New York farmers to diversify their farm business with livestock other than dairy cattle. This brought about an increasing demand for more information on beef cattle, sheep, swine, and horses. To help fill this gap, Professors Brownell and Morrison worked out arrangements to obtain the services of Professor Joseph M. Vial, an extension livestock specialist from the University of Maryland, for 1 month in 1940 and for a similar period in 1941. Professor Vial's meetings were very popular and met with enthusiastic responses.

### **New Positions for Livestock Extension**

It became clear that it was necessary to have two full-time positions for livestock extension, and livestock producers strongly supported this need. A committee representing the livestock industry worked very effectively with legislative leaders and with Professor Morrison and the college administra-

tion, and were successful in getting a new state appropriation of \$10,000 in the 1943-44 budget for the College of Agriculture that provided these positions.

Dr. Charles S. Hobbs, Oklahoma State University, was invited to head this program, and he joined the faculty as extension associate professor on June 10, 1943. He had been a graduate assistant in the department at Cornell during the period, August 1938 to June 1941, so was well known to the faculty and many livestockmen in the state.

The second position was filled by George R. Johnson, as extension instructor, on July 1, 1943. Johnson had grown up on a livestock farm in western New York and was a graduate of Cornell in 1939. After graduation, he taught vocational agriculture for 2 years. This experience and a year as assistant county agent, plus his practical farm background, provided him with a full understanding of extension teaching and organization methods.

Within a short time, Hobbs and Johnson established very active extension programs. Hobbs gave leadership to beef cattle and swine programs, and Johnson had responsibility for sheep. Johnson organized and developed the New York State Purebred Sheep Improvement Project and lamb grading and marketing educational programs. Also, he conducted the meats work, including slaughtering, cutting, and curing. Freezer lockers were a novelty and were coming into use; therefore, much assistance was given on handling meat to be stored in them.

The addition of these two new livestock specialists brought into balance for the first time educational services to all segments of the livestock industry. Livestock breeders and producers gave their strong support and assistance in obtaining these new positions because of their confidence in the department. It was a reflection of the reputation that had been built by dairy specialists.

During the year 1944-45, meat and milk continued to be the most urgently needed of all food products produced in the United States for the war effort. Severe weather conditions brought about an unusually poor and short hay crop in New York State. During the winter, severe storms disrupted traffic so that many communities were without livestock feed and facilities for marketing farm products for days at a time. The critical meat situation became more severe during the year, and unprecedented demands were made for assistance on all types of meat animals.

In addition to the many war-emergency problems, the livestock extension program was faced on a long-term basis with an increasing number of farmers who were starting a new livestock enterprise. They requested information on producing livestock as a source of supplementary income and establishing a complete livestock-farming system.

To meet these requests, programs were worked out by the specialists (Hobbs and Johnson) with county agents for beef cattle, sheep, and swine. Long-time programs for each class of livestock included breeding, feeding, health, management, and marketing.

## Livestock Extension for Rural Youth

Extension work in livestock production with rural youth expanded rapidly under the leadership of H. A. Willman beginning in 1929. The extension services gradually organized 4-H departments with 4-H club agents in the counties. The name "4-H"—a term standing for head, hands, heart, and health—

was applied to the rural youth program from its beginning in 1916 in the College of Agriculture.

Total 4-H enrollments in dairy and livestock projects in 1930 were 2,213. By 1945 these enrollments had increased by more than 200 percent to a total of 7,211. Harold Willman recognized early the difficulties of one specialist carrying the load with these increasing enrollments. He organized subject-matter training schools for county 4-H club agents so that they would be more effective and his time-schedule in the counties would be reduced.

Throughout all the 4-H livestock activities, the objective was the development of future farm leaders, along with the development of herds and flocks. It was essential that farm girls and boys understand the basic principles of livestock management, breeding, feeding, and marketing. The 4-H livestock program was designed to teach these principles by furnishing a "hands on" experience and to foster a love of livestock of good type and production. The educational programs were carried on to a large extent under five phases: (1) records and record keeping, (2) judging, (3) demonstrations of desirable husbandry practices, (4) fitting and showmanship, and (5) exhibiting of animals at local, state, and national shows. Many of the successes in 4-H club work stimulated parents to improve their herds and flocks.

By the mid-1930s, the severe depression caused reductions in budgets and salaries. With shortages of funds, it was necessary for Willman to contact private industry for support of achievement awards, for educational trips of judging teams, and for some teaching materials.

An example of a special need was a barn for 4-H animals at the New York State Fair to replace a small dilapidated tent. This problem was handled quickly and effectively by Professor Willman with the splendid help and support of two cattle breeders and a committee of 4-H members who went to Albany to advise Governor Herbert Lehman of their needs. He was sympathetic and understanding, and soon a new 4-H livestock barn was constructed. Out of this experience came a suggestion that such matters involving fund raising, legislation, or policy making should rest officially with an organization to take on this role. No doubt the approach and effort for the new barn at Syracuse helped to encourage the establishment of the New York 4-H Federation in 1935.

When the call came for more meat and milk during World War II, over 6,000 4-H club livestock projects were being handled by boys and girls in the state. Some of these young folks had to assume much of the responsibility of running the home farm when their parents were recruited for defense industries.

A land army of workers was recruited under an expanded 4-H club livestock program. This gave all girls and boys a chance to contribute to the war effort by volunteering to do some regular work such as milking cows, washing milk utensils, making hay, cultivating corn, fattening pigs for home use, feeding young stock on the farm, or any one of many other jobs that needed to be done to ensure greater food supplies.

In 1942 members of New York 4-H livestock clubs produced more than 500,000 pounds of beef, lamb, and pork and more than 15 million pounds of milk from their own livestock. These amounts were even larger the following year.

Over the years, many outstanding herds were developed through 4-H club work as a result of the herd-building practices that were followed. A report in 1942 covering a period of 6 years of 4-H dairy club work in 39 counties in the state showed that the program had influenced the foundation of 300 registered purebred herds, the selection of 400 registered bulls of merit, the

replacement of 500 grade and scrub bulls, the enrollment of more than 350 herds in dairy herd improvement associations, and the construction of at least 75 safety bull pens.

Thousands of rural youth got a head start in careers as a result of their early experiences in 4-H livestock programs.

## Important Role Of College Administration

Any appraisal of the early growth and development of animal husbandry at Cornell must give due credit and recognition to the significant role of the university and college administration. It is clear that Professor Morrison and the faculty in animal husbandry had the support and confidence of the presidents and their staff, and the deans and directors of the College of Agriculture. So it is appropriate at this point to recognize those in administration during this phase of the history.

Dr. Livingston Farrand was the president of Cornell at the beginning of the Morrison era. President Farrand had served since 1921 and was succeeded by Dr. Edmund Ezra Day in 1937. Good cooperation and working relationships existed between the college administration and the president's office.

Dr. A. R. Mann was dean of the College of Agriculture from 1916 to 1931, when he resigned to become provost of the university. After Morrison became head of animal husbandry, Dr. Mann also served jointly as dean and director of experiment stations.

Dr. Cornelius Betten, who was director of resident instruction, succeeded Dean Mann and served as acting dean and director of experiment stations until June 30, 1932, when Dr. Carl E. Ladd assumed the position. Dr. Ladd had served as director of extension since 1924.

Lloyd R. Simons was appointed director of extension to succeed Dr. Ladd on October 1, 1932. He had served as county agent leader since 1928.

On January 1, 1936, Dr. Carl E. F. Guterman, professor of plant pathology, was appointed assistant director of the Cornell University Agricultural Experiment Station. At the same time, Dr. A. J. Heinicke, professor and head of pomology, was appointed director of the New York State Agricultural Experiment Station at Geneva.

Dr. Betten resigned as director of resident instruction on June 30, 1940, to become dean of the university faculty. Anson W. Gibson succeeded him as director of resident instruction on July 1, 1940. He had been on the staff of resident instruction since 1928 and, before that, was in the Office of Farm Practice.

The untimely death of Dean Carl E. Ladd on July 23, 1943, was a serious loss to the college and Cornell and to the agricultural interests of the state and nation. On August 1, 1943, Dr. William I. Myers, professor of farm finance and head of the Department of Agricultural Economics, was appointed acting dean of the college; a little later on October 16, 1943, his title was changed to dean. Dean Myers was the popular choice of the faculty.

All these administrators in the College of Agriculture had grown up in the Cornell tradition and gave outstanding leadership and played significant roles in the continuing development of the university.

## Morrison Retires from Position as Department Head

After serving as head of the Department of Animal Husbandry from 1928 to 1945, Professor Morrison asked to be relieved of administrative responsibilities on October 1, 1945. He requested this arrangement in order to devote more time to research and writing, especially on his book, *Feeds and Feeding*, and for extensive travel to study livestock production around the world.

Professor Morrison requested and was granted a sabbatic leave for the first term of the school year, 1945-46, during which time a revision of *Feeds and Feeding* was completed. He also asked that in the legislative estimates for 1946-47 the college administration place him on a half-time basis and the remainder of his salary be made available for a professorship in the department's budget. This professor was to teach the course in livestock feeding, conduct research, and direct the work of graduate students.

These arrangements were all worked out, and Morrison continued after his sabbatic on a half-time basis as professor of animal husbandry and animal nutrition. He initiated a new graduate level course in livestock feeding and applied animal nutrition, which was offered in the spring term each year for the next 9 years.

Great strides were made in animal husbandry at Cornell and in New York State during Professor Morrison's tenure as head of the department. When he first assumed this position, Professor Morrison formulated a program expansion that was endorsed and supported by farm organizations, by prominent livestock breeders and breeders' associations, and by the governor and State Legislature. Within a year, the appropriations for work of the department were increased 60 percent, and later appropriations were made to provide for the erection of new barns, remodeling of existing barns, the purchase of a large farm for research and instruction, and the purchase of new foundation livestock of the various breeds and classes.

Animal research was expanded, graduate training programs were strengthened, keen young scientists were added to the staff, undergraduate courses were revitalized, and extension programs were made more informative and valuable.

Any professor takes pride in the accomplishments of his or her students. This was especially true with Morrison. College presidents, deans, department heads, teachers, scientists, leaders in industry and government, and successful breeders and farmers are all numbered among his former students.

Professor Morrison gave generously of his time to speak at various livestock meetings and for instruction in short courses. He provided scientific information freely to scientists in feed industries, to livestock farmers, and to colleagues in other universities and research centers.

An indication of the growth and development of the faculty during Professor Morrison's administration may be observed by comparing the list of the faculty in September 1945 illustrated in table 3 with the staff in 1929-30 (p. 53). What was most important was the personal influence of Morrison in shaping programs and people that had a lasting effect on the department, the College of Agriculture, and the agriculture of New York State and the nation.

**Table 3. Faculty in the Department of Animal Husbandry, September 1945**

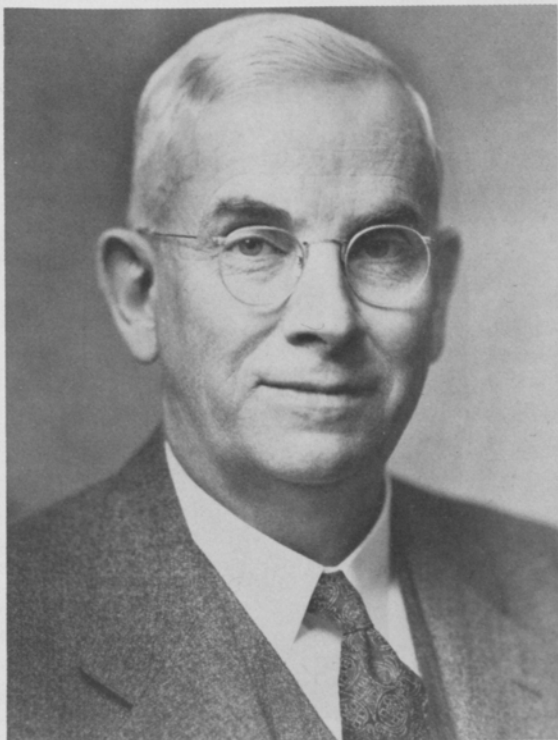
<b>Head of Department</b> Professor F. B. Morrison	
<b>Animal Nutrition and Physiology</b>	<b>Extension</b>
Professor L. A. Maynard	Professor S. J. Brownell, project leader, dairy cattle breeding
Professor C. M. McCay (on leave for military service)	Professor W. T. Crandall, dairy records, dairy cattle feeding
Acting Professor W. H. Adolph	Professor C. S. Hobbs, beef cattle and swine
Professor S. A. Asdell	Associate Professor H. A. Willman, junior livestock programs
Associate Professor J. K. Loosli	Associate Professor C. G. Bradt, herd health
Associate Professor L. L. Barnes (part-time)	Assistant Professor Raymond Albrectsen, dairy cattle breeding
Acting Assistant Professor L. E. Harris	Instructor G. W. Tailby, dairy herd improvement associations
<b>Animal Breeding and Artificial Insemination</b>	Instructor G. R. Johnson, sheep and meats
Professor G. W. Salisbury	Instructor J. D. Burke, dairy cattle feeding, dairy records
Assistant Professor C. B. Knodt	Assistant Professor G. W. Trimmerger, artificial insemination and dairy herd improvement
<b>Dairy Cattle</b>	Instructor G. W. Brandt, artificial insemination and dairy herd improvement
Professor K. L. Turk	Instructor J. S. Taylor, artificial insemination and dairy herd improvement
Assistant Professor A. A. Spielman	Instructor D. J. Young, artificial insemination and dairy herd improvement
Assistant Professor C. L. Norton	Instructor W. R. Walker, artificial insemination and dairy herd improvement
<b>Beef Cattle and Meats</b>	
Professor J. I. Miller	
Instructor C. D. Schutt	
Instructor J. J. Wanderstock	
<b>Sheep and Swine</b>	
Professor J. P. Willman	
<b>Horses</b>	
Professor G. W. Salisbury	
During the previous 2 years, additional faculty had been part of the department's budget as follows:	
<b>Biochemistry</b>	<b>Federal Laboratory of Nutrition</b>
Professor J. B. Sumner	Assistant Professor G. H. Ellis
Assistant Professor W. A. Gortner	Assistant Professor S. E. Smith
Assistant Professor G. F. Somers, Jr.	

## Turk Succeeds Morrison

Late in July 1945, Dean Myers explained to me the usual procedures in the selection of a new department head. He conferred with each professor in the department, asking for a list of five possible candidates, ranked in order of preference, either from other universities or within the department. In addition, he consulted with leading livestock farmers in the state. Dean Myers stated the faculty vote showed a majority in my favor, and he then assured me of his support and that of the directors and livestock leaders.

With this indication of strong support and confidence, I accepted the invitation to serve as the third head of the department, beginning on October 1, 1945, and the challenge of following two distinguished predecessors in the position—H. H. Wing for 25 years (1903–28) and F. B. Morrison for 17 years (1928–45).





Frank B. Morrison, second  
head of the department,  
1928-1945.



Departmental picnic at the Morrisons' summer home near Sheldrake, June 14, 1932.



Participants in animal nutrition seminar, 1930-31. *Back:* Vawter, Caskey, Schaible, Smith, Rottensten, Sehgal, Williams, Madsen. *Center:* Stiles, Harper, ? , Crowell, Morgan, Schneider, McCay. *Front:* Crawford, Work, Turk, Solis, Maynard, Ringrose, Metzger.



Clive M. McCay with white rats used in classic studies on effects of early nutrition levels on aging processes.



L. L. Madsen, graduate student, with lamb raised on purified diet.



New beef cattle barn (*foreground*) constructed early in the 1930s. *In background* is barn constructed in 1949 for joint use by beef cattle and horses.



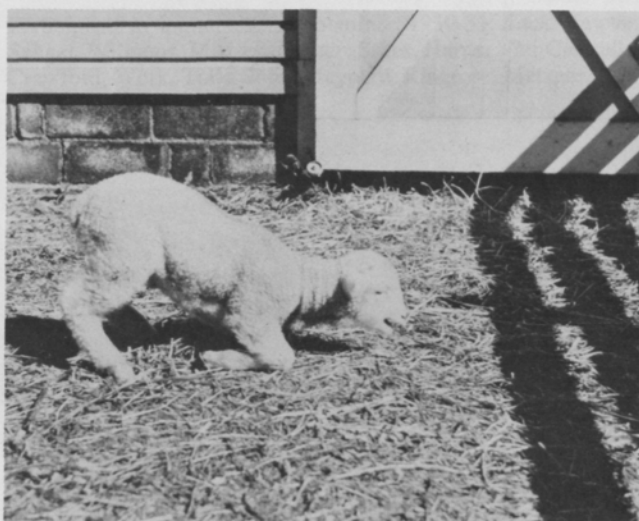
New sheep barn occupied in 1931 is shown *in foreground*. Note hay being unloaded. Experimental barn *in back* was constructed later.



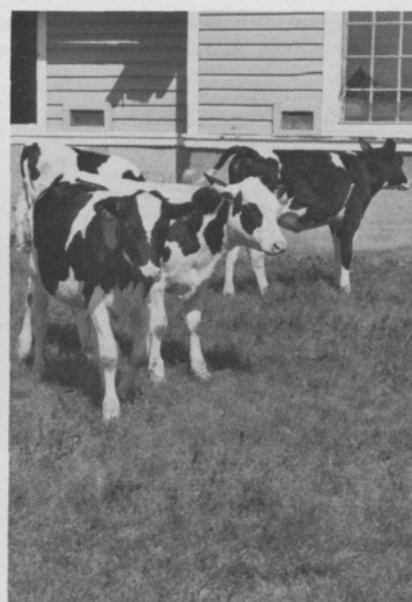
Aerial view of new barn for swine completed in 1931.



Pigs on one of many feeding experiments during the 1930s and 1940s.



Many years of research solved this stiff lamb disease problem.



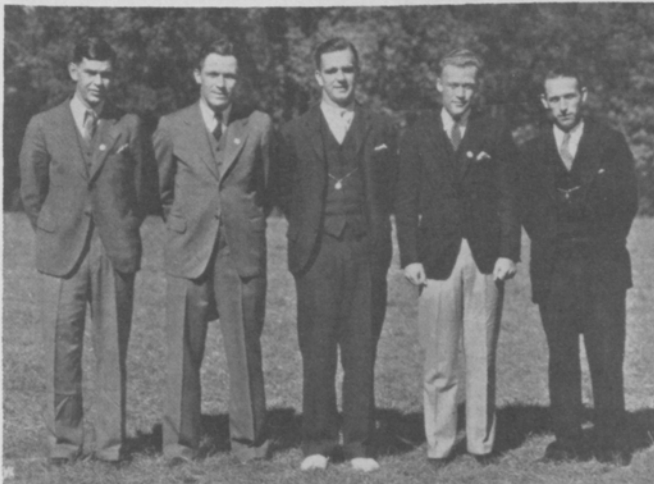
Holstein calves raised on limited whole-milk, dry calf-starter method.



Cornell Ollie Catherine, a star of the Cornell dairy herd during the 1930s. Outstanding in both production and type. She was National Grand Champion and the All American Aged Cow in 1938, and top producer that year with 1,156.6 lb of butterfat. In peak condition, she weighed about a ton.



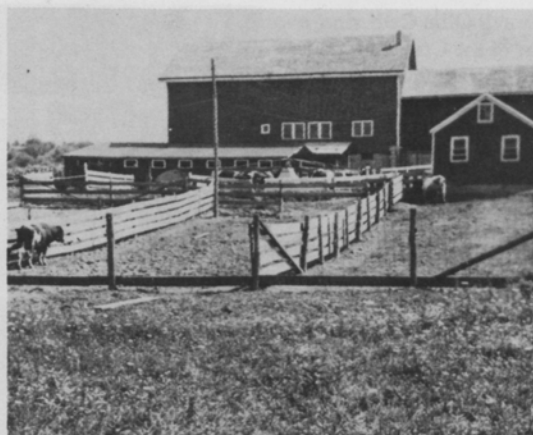
Students on 1933 livestock judging team. *Left to right:* Merle Cunningham, Morton Adams, William Moore, and Ronald Wilson pictured here at informal competition at Briarcliff Farm. This team was coached by R. B. Hinman.



Cornell's 1934 dairy cattle judging team. This team won intercollegiate judging contests at the Eastern States Exposition and the Waterloo Dairy Cattle Congress. *Left to right:* William Stewart, Joseph P. King, Ronald Wilson, Richard G. Price, E. S. Harrison (coach.)



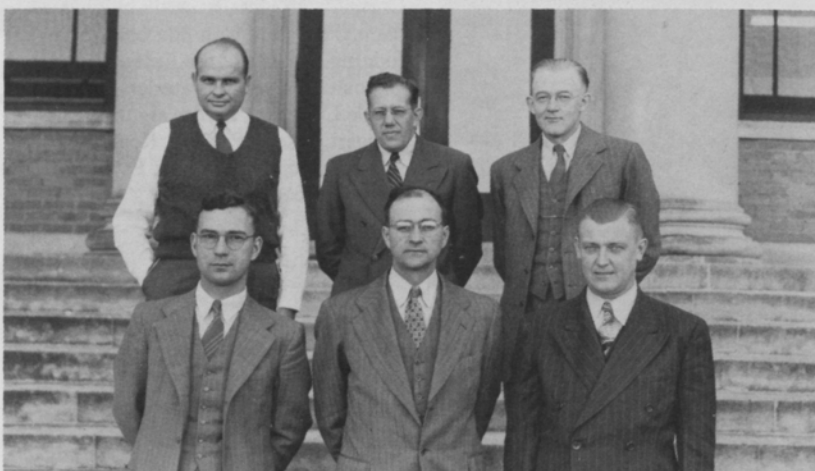
Paul Dean, herdsman, weighing hay for one of the many feeding experiments with dairy cows.



First headquarters for New York Artificial Breeders' Cooperative near Syracuse in 1940.



Professor Brownell (3d from left), M. W. Johnson (4th from left), and group of breeders that went to New Jersey to observe bull barn and laboratories for artificial breeding.



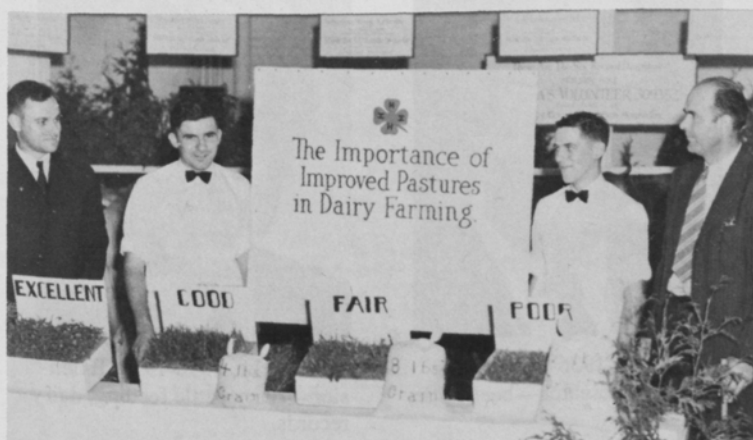
Animal husbandry specialists for extension in artificial breeding and dairy herd improvement in 1944. Left to right: top row—J. S. Taylor, G. W. Trimberger, R. Albrechtsen; bottom row—G. W. Brandt, W. R. Walker, D. J. Young.



New headquarters for the NYABC on the Cornell campus in 1944. This office and laboratory building provided space for the staff of the cooperative and its operations, plus laboratories for research by animal husbandry staff. Barns in the rear housed bulls for the cooperative and for research and were used also for feed and bedding storage.



Professor Brownell conducting training school for AI technicians in 1944.

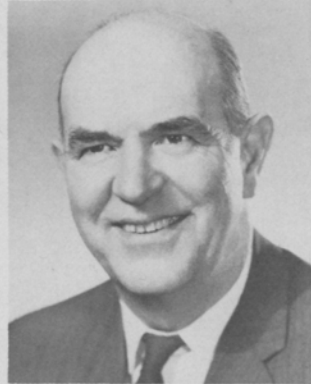


4-H demonstration team at the 1941 National Dairy Show. Center (left to right): Edward and Donald Benson, Oneida County; extreme left: G. William Niles, 4-H agent; at right: Harold A. Willman, animal husbandry 4-H specialist.

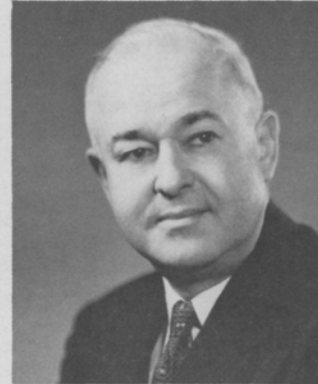
New Faculty in Animal Husbandry, 1928-1944  
(those who attained rank of professor or associate professor)



S. J. Brownell, 1929-1959.  
Extension—dairy cattle  
breeding.



H. A. Willman, 1929-1964.  
Extension—4-H livestock.



C. G. Bradt, 1930-1959.  
Extension—dairy records, herd  
health.



S. A. Asdell, 1930-1965.  
Teaching, research—animal  
physiology.



E. S. Harrison,\* 1931-1943.  
Teaching, research—dairy  
cattle.



K. L. Turk, 1934-1938;  
1944-1974. Teaching, research—  
dairy cattle. Administration.



G. W. Salisbury, 1934-1946.  
Teaching, research—animal  
breeding.



J. I. Miller, 1936-1976.  
Teaching, research—beef cattle,  
meats.



J. D. Burke, 1936-1971. Extension—  
dairy cattle feeding, dairy  
records.



PHASE IV

Growth and Development of Animal Husbandry



J. K. Loosli, 1938-1974.  
Teaching, research—animal  
nutrition.



R. Albrechtsen, 1938-1969.  
Extension—dairy cattle  
breeding.



C. S. Hobbs, 1943-1945.  
Extension—livestock, beef  
cattle.



G. R. Johnson, 1943-1955.  
Extension—sheep production.



G. W. Trimberger,  
1944-1974. Extension, research,  
teaching—dairy cattle.



A. A. Spielman, 1944-1947.  
Teaching, research—dairy  
cattle.



## *PHASE IV*

### **Growth and Development of Animal Husbandry under Administration of Kenneth L. Turk, 1945-1963**

In assuming the office and duties as head of the department on October 1, 1945, it seemed clear that first I should make every effort to continue the sound growth and development in instruction, research, and extension that had evolved over the previous 41 years. My main responsibility was to keep everything moving on "an even keel," strengthen some areas, and stimulate new programs to meet changing conditions.

#### **Plans for the Future**

The organization of the faculty in animal husbandry into several divisions, as established by Professor Morrison, had functioned successfully, so there was no need for any major changes. This arrangement with allocation of funds and responsibilities to the divisions developed leadership among the faculty and flexibility in their operations. We did feel, however, that we should set up a plan for the future with these targets in mind:

1. Greater emphasis on the quality of undergraduate instruction, especially in the elementary courses, and of undergraduate student advising
2. Regular staff meetings to provide better communication among the faculty and with college and university administration
3. Increased participation of faculty and graduate students in the departmental seminar
4. Additional faculty positions to strengthen weak areas and to provide better overall balance in programs
5. More-attractive salaries at all levels, especially for the academic staff, to build and maintain morale and to make the salary scales competitive with other universities
6. Adequate, modern facilities and equipment for all functions of the department
7. Additional support staff, especially in research, to increase faculty efficiency
8. Greater emphasis on teaching as a part of the training programs of graduate students
9. Good working relationships with leaders of livestock organizations and farmers and also enlisting their support for improvement of the department's programs

### Implementing the Plans

Regular staff meetings were initiated early in October 1945. At the first meeting our plans were presented and discussed. The faculty responded favorably and requested that a committee be designated to study student advising and to make recommendations for improvements in working with both undergraduate and graduate students. This committee on student advising functioned effectively over the next few years. Other faculty committees gave special attention to faculty-student relations, orientation of new students, evaluation of course offerings, new courses needed, and curricula for students majoring in different areas (i.e., dairy production, livestock production, meats, and scientific course of study in animal science). Another committee was concerned with the department library.

Plans for the conduct of the department seminar to include active participation by the faculty and graduate students were discussed. It was agreed that, during the first few periods of each semester, active research by different individuals and also extension projects would be presented. For the balance of the semester, different staff members would serve as leader for each seminar, with two or three graduate students making short reports each time. This system was activated and worked very satisfactorily. Graduate students got experience reviewing the literature and in making short, concise presentations for appraisal and analysis by their peers. It gave the faculty an opportunity to get acquainted with the students in the several disciplines and provided for increased participation by the faculty and graduate students.

We also recognized the need for new, modern facilities for teaching and research, and much effort was exerted on this over the next several years. Detailed planning for a new building actually had started in 1942 as a part of the Postwar Building Program. Professor G. W. Salisbury represented the department in all discussions with college and university officials and with those in the Budget Bureau in Albany. His excellent presentations on the need for new facilities resulted in a high priority being given to animal husbandry over several other departments.

In addition to a new building to provide teaching and research facilities for the faculty, we emphasized the need for a large animal research laboratory to replace the old, inefficient units being used for animal experiments in the Blair barn and other outlying barns. But as will be pointed out later, a new large animal research laboratory was not realized during my administration. These things take time to accomplish. For example, it was not until 1957-58, some 15 years after planning was started, that an appropriation was obtained for the construction of a new building to replace Wing Hall.

Some of the problems confronting the department and the college during the mid-1940s were those of converting from wartime to peacetime programs. An example of a small adjustment in animal husbandry came as a request from the university provost Arthur S. Adams to release approximately 20 acres of pasture lands adjacent to the dairy barns to be used as a "temporary" site for the construction of emergency housing for returning veteran students. This left us with only dry lots for the dairy herd. The temporary arrangement, as we anticipated, eventually became permanent. Wooden barracks from vacated military bases were brought in and reconstructed for housing for married students. When the barracks were removed several years later, the area was used as the site for the construction of new buildings for the College of Veterinary Medicine. On another occasion the department lost some of its beef cattle pastures.

After the loss of the pasture lands, we began discussions that continued for many years on the need for removing all the livestock units from the campus to a centralized location on a new teaching and experimental farm.

Another example of loss of land by the department came in 1952. Dean Myers called one day to advise us that the university needed some of the Warren farm for an expansion of the golf course. Even though I voiced some objections (that was before my golfing days), he emphasized that students take priority over dairy cows in the operation of a university. We ended up losing 35 acres that had been improved through the use of farm manures, fertilizers, and good soils and crops management. Since the Warren farm is owned by the state, the university worked out a swap so that we obtained an equivalent acreage from the Lamkin farm on Freese Road near Varna. Part of this farm was occupied by the university's animal behavior laboratory. This land was low in fertility, but adjoined the east side of the Warren farm, so it could be used for feed production.

## Increases in Salaries

The Salary Classification Act relating to salaries of members of the faculty, the administration staff, and other employees of the College of Agriculture and experiment stations became effective March 28, 1945. Under this act Cornell University was empowered to classify all positions with the services and grades provided by the act and to recommend increases in salaries once a year to persons meriting them. The minimum and maximum salary for each grade within a service, with amount of increment allowed when recommended, was set up in the act, as were provisions for promotions through grades, or to other services, and for reclassification. A significant provision was one that permitted an appointment of a new person in the professional service above the minimum salary and with the approval of the state budget director. In future recruiting efforts, this policy permitted the university to offer a salary more commensurate with the ability of the person being sought.

The Salary Classification Act brought about considerable increases in the 1944-45 budget. This budget also included a revised schedule of emergency compensation that was recommended by the governor and adopted by the legislature. The revision provided salary increases ranging from 14 percent to 30 percent, depending upon the level of base salary.

The state appropriations for 1948-49 provided additional increases due primarily to the incorporation of an emergency compensation bonus into all base salaries. Further salary adjustments were made in succeeding years with cost-of-living bonuses that were eventually incorporated into the regular budget. Gradually, the salary scale of the College of Agriculture at Cornell became more competitive with salaries in comparable universities in the United States.

## Sources of Operational Funds

The department was always faced with the problem of adequate funds for all of its functions, especially for costs of operation and maintenance, including items for technicians and research associates. But with the support of

dairy and livestock farmers and the college administration, we were able to obtain several new state appropriations for research and extension. They made possible not only several new faculty positions, but also operational support for them.

We were dependent upon income funds from sales of milk, animals, and meat for much of our operating costs. These income funds varied from year to year, depending upon economic conditions—prices of products sold and costs of feeds, supplies, chemicals, and equipment.

In addition to income, state and federal Hatch funds, some new federal funds were provided to the experiment station as a result of the Research and Marketing Act of 1946 and the Bankhead-Jones Act of Congress. Later, the Federal Regional Research Fund became available for a number of cooperative projects involving New York and the other northeastern states. Animal husbandry faculty were involved in several of these research and marketing and regional projects.

Another significant source of funds during these years was a rapid increase in the number of grants and contracts in all areas of the department for research on specific problems. Many of these were short-term, for 1 to 3 years, but others, notably from the Cooperative G.L.F. Exchange, Inc., and the New York Artificial Breeders' Cooperative, provided renewals over relatively long periods of time. From about 1959-60, several members of the staff were awarded substantial competitive grants each year from the U.S. Public Health Service and the National Science Foundation for basic research on a variety of subjects. A complete list of all grants and gifts to the department from 1926-27 through 1962-63 is summarized in appendix 3. The number increased from only a few grants each year up to more than 30 during the year 1962-63.

## State University Established

Various developments in state relationships that affected programs in the College of Agriculture and the Department of Animal Husbandry took place in the 1940s and 1950s. The most significant was the establishment of the State University of New York in 1948. Under the legislation that established this new university, the general supervision of the state colleges at Cornell was transferred from the board of regents to the Board of Trustees of the State University. Some of us felt that Cornell and the College of Agriculture had little to gain and much to lose under this new arrangement. The immediate problem was the loss of good, direct relationships that existed between the dean and Cornell administrative officials with the board of regents in presenting budget requests. Before 1948 the regents had agreed to submit the college budget as presented. The State University provided one more administrative level through which the college budget must pass before reaching the legislature and the governor. Further, under the new arrangement, officials of the State University could use their power to remove and reduce items in the budget without due appreciation for the special needs of the College of Agriculture. Most of the other units of the decentralized State University are primarily teaching institutions in contrast to the College of Agriculture with its three-fold functions of instruction, research, and extension. In later years the degree of intensity of this issue varied somewhat with the leadership of the State University.

## New Library for the College

Another important development was the construction of a new building to house the combined libraries of the Colleges of Agriculture and Home Economics. This was a badly needed facility to replace the very crowded conditions in Stone Hall. An initial appropriation was made in 1945, but it was not until 1949 that construction was started. It was completed in 1952 and named in memory of Albert R. Mann, former dean of the college and director of the experiment station. This marked the first time in its history that the College of Agriculture had adequate library facilities. It was constructed at the east end of the agricultural quadrangle between the Plant Science building and Warren Hall, with a wing connecting to the latter to provide accommodations for the Department of Rural Sociology.

## Livestock Advisory Council Organized

In March 1953 we invited about 40 livestock farmers and breeders to meet with staff members and review the work in the Department of Animal Husbandry at Cornell. We also invited representatives of agricultural industries, cooperatives, and breed societies. Our purpose was to obtain their advice and suggestions on how to improve our programs in teaching, research, and extension. They inspected the research laboratories and the livestock units and expressed amazement at the inadequacies of the facilities for research and teaching and the lack of satisfactory office space for the faculty. In taking this step, we were following the example set by Professor Morrison to gain support of animal industry leaders.

In their discussions, members of the group felt that improvement in the physical facilities must be made promptly if the department was to maintain its leadership among the agricultural colleges in the country. They decided the Livestock Advisory Council should be established on a permanent basis and elected a chairman, Mr. Eugene P. Forrestel, a prominent Hereford breeder from Medina, N.Y. Several members of the council expressed the need for regular and fairly frequent meetings, if their work with the department was to be effective. But they wanted some time to "digest" the information we gave them on the programs of the department and the pressing needs to enable the staff to improve their service to the livestock industry. Members of the council, therefore, requested another meeting in about 2 months and directed the chairman to appoint an Executive Committee to coordinate the activities of the council as a whole. This smaller group met in April and developed some recommendations that were presented to the council at its next meeting. The committee met with Dean Myers to acquaint him with their work and to point up their role as an advisory group.

A second meeting of the council was held on May 29, 1953, for a more-detailed review of the courses of instruction in the department and some of the major research and extension projects. They asked the chairman to appoint subcommittees from the membership to make further studies and give advice and recommendations on policies relating to (a) extension programs, (b) teaching and research in dairy husbandry, (c) teaching and research in livestock production (beef cattle, sheep, and swine), (d) current operating and physical needs, and (e) long-time capital-construction needs.

These subcommittees all held meetings in the spring of 1954 with faculty members and made careful studies and reports that were summarized and presented personally to Dean Myers. In June of that year, members of the Executive Committee and chairmen of the other committees went to see President Carlson of the State University to express strong support for the work of the department. They made specific recommendations, particularly the need for a new building and related research and teaching facilities, and increased funds for operating and maintenance.

After careful and thorough studies of all the department's programs, recommendations made by the Advisory Council to the dean of the College of Agriculture in 1954 included the following:

1. A strong livestock marketing course should be added to the curriculum in agricultural economics and more research should be conducted on the economics of livestock farming.
2. The county agent leaders in the Extension Service and the committees in the counties should give greater consideration to the selection of county agricultural agents with training and qualifications for work in animal husbandry.
3. Greater service to livestock producers, especially in swine and meats, should be provided; there should also be continued and expanded work on herd health and diseases, especially in prevention, sanitation, management, and nutrition.
4. Relative to the curricula and courses offered, the council recommended that
  - (a) strong emphasis be continued on laboratory instruction;
  - (b) emphasis be given to practical, as well as fundamental, aspects in courses of livestock instruction;
  - (c) efforts should constantly be made to have the best teachers possible in the elementary courses;
  - (d) the college and the department should give serious consideration to the development of better procedures for placement of the graduates of the college, particularly those with majors in animal husbandry.
5. After reviewing and evaluating the current research projects and those planned for the future, the council gave general approval to the research in progress and made these suggestions for future research on
  - (a) maximum utilization of forages;
  - (b) input-output relationships in milk production;
  - (c) feed-lot testing of prospective beef sires and progeny testing of young stock and more work with swine on larger litters and hybrid vigor;
  - (d) effects on long-time production, reproduction, longevity, and economy from feeding high and low levels of grain and roughage alone during the entire life span of dairy cows.
6. The council endorsed and approved the steps being taken to establish cooperative working relations with the State Institution Farms for use of these farms for research and education demonstrations.
7. In regard to long-time plans, the council recognized that the dairy and livestock units of the department could not be operated efficiently without



more pasture lands and recommended that a survey of possible future locations for dairy and livestock units be explored.<sup>1</sup>

In 1956 the chairman of the council named a committee of six members to work with members of the New York State Conference Board of Farm Organizations in communication with the State University and the director of the budget in Albany. This committee met with President Carlson, State University, and Mr. Paul H. Appleby, director of the budget, and presented the need for immediate provision of improved facilities for the Department of Animal Husbandry at Cornell. Members of the committee also made contacts and held discussions with the chairmen of the senate Finance Committee and the Ways and Means Committee of the assembly and the agricultural committees in the senate and assembly. Later, President Carlson and Mr. Appleby visited Cornell, went over the proposed space analysis for a new building, and eventually approved the plans.

Mr. E. P. Forrestel served effectively and efficiently as chairman of the council until he resigned in 1962. At the meeting of the council on May 1, 1962, he was succeeded by Mr. J. Stanley Earle, a prominent dairy farmer from Unadilla, N.Y.

Members of the council continually gave the department the benefit of their suggestions and recommendations for improvement. They gave support for our budgetary requests for increased appropriations for maintenance and operations and new positions for both professional and nonprofessional personnel. This two-way flow of communication and discussion between the faculty and members of the council was of great benefit both to our programs and to livestock producers.

## Study for Projected Five-Year Program

In January 1959 Arthur H. Peterson, university controller, sent a letter to Dean W. I. Myers and the directors that sparked a collegewide study to project a 5-year program of priorities useful as a basis for sound financial requests to be made to the State Legislature. He wrote: "In my opinion, 1959 may prove to be one of the most important years in the history of Cornell. It will be recorded either as the year in which we took advantage of the situation and made great progress toward new goals, or the year in which we missed our golden opportunity...."

"There is a new administration in Albany. A number of Cornellians are in key positions, and while they are not likely to show any preference, there is reason to hope that they would be sympathetic to our proposals if they are sound.... And at Cornell, we have the most unusual circumstances in that three of the four deans of the statutory colleges will be new. [Charles E. Palm had been designated as the successor to Dean Myers on July 1, 1959.]

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<sup>1</sup> It was not until 1969 that a block of 2,500 acres of land south of Dryden, near Harford, about 15 miles from the campus, was purchased by the state of New York as the site for a new animal science teaching and research farm. The new units for dairy cattle were completed and occupied during 1973-74. New facilities for beef cattle and sheep were occupied about 2 years later.

"Under these conditions, the time appears to be opportune for Cornell to make a real effort to improve relations with the State....

"Past experiences have shown that a new dean has an advantage for one or possibly two years in competing for the State dollar. I am suggesting that the entire college get behind a project to exploit this advantage to the maximum."

Two weeks later (January 26, 1959), Dean Myers sent a letter to the department heads stating that Controller Peterson's proposals had been discussed with the directors, and they planned to carry them out in connection with the budget requests for the year 1960-61. He asked each department head, after consultation and careful consideration with members of the faculty, to prepare a 5-year program of priorities and desirable changes in emphasis needed to meet changing conditions. Dean Myers stated further, "The outlook for more adequate support of research and education by New York State is favorable and we should make full use of this opportunity."

All faculty members in animal husbandry worked for several weeks to make a critical analysis of the needs in facilities, operations, and programs in teaching, research, and extension. After these evaluations staff members listed priorities and recommended changes for the future. This 5-year program for animal husbandry was sent to the dean and directors to be included along with those of other departments. Most of these priorities were gradually implemented.

## New Home for Animal Husbandry

Soon after W. I. Myers became dean of the College of Agriculture in 1943, he gave attention to the need for more and better space for animal husbandry. He enlisted the services of the University Architectural Advisory Board to determine if an addition could be made to Wing Hall. This group felt that, in spite of its name, it was impossible to design a functional wing for Wing Hall.

So as a part of the postwar building program, the decision was made to construct an annex to Wing Hall to ease the critical need for additional office, laboratory, and teaching space for the department. Accordingly, an architect was assigned, and preliminary plans were developed for a separate structure to be located on the west side of Judd Falls Road just east of Stocking Hall. The building was to extend across the area where the livestock pavilion is located. The pavilion was to be demolished, and a new one relocated elsewhere. Although not connected with Wing Hall, the proposed annex would be relatively close, and the department would occupy both buildings.

Time passed by, and little was done to alleviate the overcrowded and unsatisfactory facilities. Eventually, after much work and effort on the part of many livestock organizations and leaders, especially the Livestock Advisory Council, and the college and university administration, plus the Administration of the State University in Albany, the decision was made that a new building should be planned and designed to house the entire department. The old plans for an annex were scrapped, and a new architect was assigned. New plans were developed, and an appropriation was obtained in 1957-58 for construction of a new building.

One of the highlights in the history of animal husbandry at Cornell was the completion of Frank B. Morrison Hall (named after his death). This new building, completed in 1961, was designed to provide office and laboratory space for all personnel in the department. At that time, this included 38 pro-

fessional staff, about 50 graduate students, and more than 100 technicians, chemical analysts, stenographers, and clerks.

In addition to the offices for the faculty and staff, the new building provided 6 lecture rooms, 5 teaching laboratories, 20 research laboratories, 6 animal laboratories, and special rooms for x-ray studies, large and small animal surgery, chromatography, microbiological assays, electronic data processing, and others. Also, a seminar room, reading room, and departmental library provided for an improved environment for students and faculty. And for the first time, adequate facilities for teaching and research in meats were provided with a modern abattoir, carbon dioxide hog immobilizer, complete processing equipment, meat storage and curing rooms, and research laboratories. All told, the building contains over 300 rooms.

Morrison Hall was planned by the faculty of the department under the leadership of a committee of professors: S. E. Smith, chairman, S. J. Brownell, William Hansel, C. R. Henderson, J. K. Loosli, and J. I. Miller.

Formal dedication exercises were held on September 12, 1961, presided over by President Deane W. Malott, with Governor Nelson A. Rockefeller giving the principal dedicatory address. Others participating in the ceremonies included Thomas H. Hamilton, president, State University of New York; Eugene P. Forrestel, chairman, Livestock Advisory Council; Don J. Wickham, commissioner, New York State Department of Agriculture and Markets; Albert K. Mitchell, trustee of Cornell University and prominent Hereford breeder in New Mexico; Kenneth L. Turk, head of the department; and Charles E. Palm, dean, New York State College of Agriculture.

An evening program and dinner were held in Statler Hall with W. I. Myers, emeritus professor and former dean of the college, presiding and presenting a brief history of animal husbandry at Cornell. The main speaker of the evening was James H. Hilton, president, Iowa State University, on the subject, "Animal Industry in a Period of Change."

A dedication symposium was held the following day in recognition of the contributions of Professor F. B. Morrison on the theme, "Animal Nutrition's Contributions to Modern Animal Agriculture." Professor John I. Miller presided over the program of distinguished speakers, which included Professors Leonard A. Maynard, J. Thomas Reid, and John K. Loosli of the Cornell staff, and Professor Frederick N. Andrews, head, Department of Dairy Husbandry, Purdue University, and Dr. Lane A. Moore, leader of nutrition investigations, Dairy Cattle Research Branch, U.S.D.A. (*Dedication Ceremony of Frank B. Morrison Hall and Symposium Papers on Animal Nutrition's Contributions to Modern Animal Agriculture*, Special Publication, Cornell Univ. Agr. Exp. Sta., N.Y.S. Coll. Agr., 1962.)

Mrs. F. B. Morrison and sons, Roger and Spencer, were guests of honor at the dedication ceremonies. Several hundred livestock breeders, other leaders in the animal industries, and several members of the Cornell Board of Trustees attended. In a personal discussion with Mrs. Morrison at that time, she laid down a challenge, saying she hoped the future work produced in the building would be commensurate with the fine new facilities.

The new building was constructed at the former sites of the farm practice shops and machinery sheds and the horse barn, on the corner of Judd Falls Road and Tower Road. Some of the department's laboratory facilities had to be moved from the horse barn to other temporary quarters, pending completion of the new building.

We were not successful in getting everything we needed in the new building. For example, we were not permitted to include some extra offices

and laboratories to provide for future growth. We requested air conditioning throughout the building, but it was provided only for some animal rooms and the dairy records processing laboratories. At one stage in the development of detailed plans and drawings, the state construction fund officials reported that the estimated cost would exceed the available funds. The architect was asked to reduce all dimensions by 6 inches. After the building was finally completed, the balance of funds would have more than covered the cost of the things we had requested—an ironic miscalculation.

Wing Hall was renovated for use by the Department of Biochemistry. Later, a new three-story wing was attached to the rear of Wing Hall to provide additional laboratory and office space. (Defying earlier judgment!)

## Relationships with University and College Administration

We were always fortunate to have the cooperation and support of outstanding administrators while I was head of the department.

### In the University

At the beginning of my administration, Dr. Edmund Ezra Day was serving as president of Cornell University. He retired in 1949 and was succeeded by Provost Cornelius W. de Kiewiet who was acting president for about 2 years, when Dr. Theodore P. Wright was named acting president for an interim period. In 1951 Deane W. Malott was appointed president and he served until 1965. All these presidents recognized the significant role of the College of Agriculture in the university.

### In the College

Dean W. I. Myers served with distinction until his retirement on June 30, 1959. He had been associated with Cornell continuously since he entered as a freshman in 1910, some 49 years earlier. As dean of the college, Dr. Myers was a strong supporter of the principle of freedom with responsibility in his dealings with the faculty. He appreciated the wide interests and points of view that are normal in a large and diverse university and the need to follow policies that would permit each member to develop his or her resources to the maximum. He recognized the importance of livestock industries in the agricultural interests in the state and gave consistent support to the basic needs of the Department of Animal Husbandry.

Dr. Charles E. Palm succeeded Dr. Myers as dean of the College of Agriculture on July 1, 1959. He was an entomologist and a member of the faculty since 1934. He served as head of the Department of Entomology from 1938 to 1957. On June 1, 1957, he was appointed director of research and director of the Cornell University Agricultural Experiment Station.

One of the notable features of Dr. Palm's tenure as dean of the college was his unusual ability to forge outstanding personal and public relationships with the governor and other officials in Albany and with agricultural leaders in the state. These relationships were always developed in the interests of the College of Agriculture and its functions in teaching, research, and extension

and later in the international dimension of service to world agriculture. He was very appreciative of the needs of animal husbandry and gave prominent leadership in obtaining state appropriations for a new farm with adequate facilities for teaching and research.<sup>2</sup>

Dr. Carl E. F. Guterman was director of research and director of the Cornell University Agricultural Experiment Station during the early years of the Turk era in animal husbandry. Dr. Guterman died on March 27, 1957, at a relatively young age of 53, after serving as director for 15 years. Early in his career as a plant pathologist, Dr. Guterman showed marked aptitude in both research and administration. He had unusually quick, keen perception coupled with ability and a great drive to get things done. More than 500 research projects in agriculture and home economics came under his scrutiny and were his to coordinate. They involved contacts and relationships with many people, who found him easy to work with because of his outstanding ability and fine human qualities. Dr. Guterman was widely known and respected.

As indicated above, Dr. Charles E. Palm succeeded Dr. Guterman as director of research in 1957. He in turn was succeeded by Dr. W. Keith Kennedy on July 1, 1959. Dr. Kennedy was professor of agronomy and had served for several years as assistant director of research. His broad interests, capabilities, and personal qualities enabled Keith to work effectively in this important post as director.

Professor A. W. Gibson retired as director of resident instruction on June 30, 1960, after 20 years and following a total period of 45 years of service after his first appointment in the College of Agriculture. Those of us who worked closely with Director Gibson respected his efforts to improve teaching in the college and to recognize good teaching through promotions and salary increases. He worked constantly for a strong advisory system, with broad flexible requirements for graduation to permit each student to obtain a good education in agriculture, tailored to the individual's needs and objectives.

Director Gibson was succeeded by Professor Thomas C. Watkins on July 1, 1960. He was professor of economic entomology with an outstanding record as a teacher in this discipline.

After 40 years of leadership in extension, Lloyd R. Simons retired as director of extension on June 30, 1954. He had served as director since 1932. Director Simons was widely recognized as an able organizer and administrator, who was intensely interested in, and worked tirelessly for, the betterment of farming and homemaking.

Professor Maurice C. Bond, professor of marketing, succeeded as director of extension on July 1, 1954. Some timely and far-reaching changes for extension work in New York took place during his term of office. Most significant of these was a change in the relationship of the Farm Bureau and the Extension Service. The County Farm and Home Bureau and 4-H Club Associations were

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<sup>2</sup> During Dean Palm's administration, the name of the college was changed on July 1, 1971, when three words were added to make it the College of Agriculture and Life Sciences. This change expressed a new sense of direction for several of the college's programs, especially the basic biological sciences, which have been an essential part of the college's efforts since its inception.

separated from the State Farm and Home Bureau Federation and became known as County Extension Service Associations. After this change, Director Bond spearheaded the organization of the State Extension Service Advisory Council, consisting of some 400 representatives of the 56 County Extension Service Associations.

Director Bond retired on June 30, 1962, and was succeeded by Alvin A. Johnson, professor of plant breeding, on July 1 of that year.

## Some Policy Changes on Staff Employment

The new Social Security program became an inherent part of the State Retirement System in 1957. After October 1 that year, new staff members were not permitted to have cooperative state-federal appointments with eligibility for retirement salaries from both, as had been possible in the past. Those previously employed could exercise a choice between two options: (1) they could drop their federal appointment and enroll in Social Security; or (2) they could forego Social Security and retain both federal and state retirement. This policy affected several staff members in animal husbandry extension.

Some changes in policies on new staff appointments were established by the college administration in 1960. A letter from Dean Palm to department heads, dated March 3, 1960, outlined this policy: "All salaries are assigned to departments by the college administration for particular individuals. When an individual leaves, retires, or changes positions within the college, the department is assured of a starting salary of assistant professor at the P-18 grade of \$6,990. The position vacated becomes college property again to use anywhere within the college that the dean and directors feel it is most needed." Previously, the salary items were assigned to departments, and they had the flexibility, when a senior staff member retired or left the faculty, to bring in a new professor above the minimum that was established. The reassignment of positions made it possible for the administration to make essential adjustments within the framework of the collegewide budget and enabled the dean to care for urgent requests during the year. Therefore, the administration needed to be alerted in event of a special request as early as possible. This was the responsibility of each department head.

A majority of the faculty members of the department and the college were paid their yearly salary in ninths until late in the 1950s. This nine-payment plan was initiated several years earlier so that the method of salary payment in the statutory colleges would conform to the policy of the endowed colleges of the university. The general policy in the college was that each member of the faculty was expected to work on the job for 11 months each year, with 1 month for vacation. An individual had the opportunity from time to time, however, to use the off-salary months for professional improvement. We took advantage of this policy to help upgrade the training and qualifications of some of our staff, especially those in extension. Six staff members in animal husbandry were able to meet the requirements for Ph.D.'s under this policy. It was not intended that the off-salary months would be used regularly for outside consulting. But the nine-payment policy was changed by the administration, and the faculty had the option of staying on ninths or changing to twelfths. A majority of the faculty chose to transfer to a 12-payment basis, and salaries were adjusted upward as rapidly as possible by approximately

two-ninths. By the early 1970s, the college ranked at the top salary scale in comparison with other state land-grant institutions.

## Student Enrollment Increases in Postwar Period

With large numbers of students returning from military service, student enrollment in the College of Agriculture almost doubled for the 1945-46 academic year over the previous years. About 60 percent of the applications for admission made by men were from veterans of World War II. These increases in students naturally resulted in heavier teaching loads in nearly all courses, especially the elementary animal production courses.

Numbers of undergraduate students continued to increase almost every year, except in the early 1950s when some decreases up to about 10 percent occurred. During much of the time, Cornell ranked second in the nation to Iowa State College in undergraduate enrollment. But in 1962-63 Cornell led the nation with 1,818 undergraduates in the College of Agriculture. About 25 to 30 percent of the students in the college had faculty advisers in the Department of Animal Husbandry.

The number of graduate students also increased gradually, but was controlled by the university administration with the establishment of quotas for each of the colleges and departments. Applications for graduate study in the several fields of animal husbandry were very heavy throughout the period 1945 to 1963, so we could be quite selective each year, admitting only those with outstanding qualifications. Most of the graduate students needed financial support, and the number we could admit was restricted to funds available for assistantships on state, federal, or grant funds. There were some who provided their own funds, and many foreign students were supported by their governments or international agencies. By the early 1950s, we had about 50 graduate students majoring in the department. About one-fourth of the graduate students came from other countries.

With increasing numbers of students enrolled in animal husbandry courses and corresponding heavy teaching loads, it was necessary to offer some of the elementary courses, such as dairy cattle, livestock feeding, and meats, both semesters each year.

## Special Emphasis to Teaching

We gave much attention to teaching throughout my tenure. Ever since my days as a graduate assistant in the early 1930s, I had felt that generally the faculty did a better job of teaching graduate students than they did of teaching undergraduates. So we wanted to improve undergraduate instruction, if possible, and, at the same time, maintain the high quality of graduate education. In addition to training our undergraduate students to meet the needs of New York State agriculture, we hoped that increasing numbers would be well prepared for advanced study.

It was quite evident over a number of years that the beginning course taught by four or five individual faculty members was not popular with the students. The students were not being stimulated to take other courses and to major in animal husbandry. The course covered all classes of farm animals (dairy cattle, beef cattle, sheep, swine, and horses), with students getting only a smattering of knowledge of each species. Many of the students would follow

the introductory course with the courses in dairy cattle, livestock feeding, and animal breeding, but only a few would take other courses dealing with beef cattle, sheep, swine, and horses or the advanced subjects in nutrition, physiology, and animal breeding. So it was decided to remove the dairy cattle portion from the elementary course. This would allow more time for the other classes of livestock, thus making it a better introductory course in livestock production (other than dairy cattle). Credits for the dairy cattle course were increased from three to four. This change helped to improve both courses, but did not solve the problem of having several different teachers in the elementary course.

It was not until 1951 that money was available for a new staff member for this spot. Dr. Ben E. Sheffy joined the faculty and devoted his major attention to teaching the course Introductory Livestock Production. This proved to be a satisfactory way to handle the course, but it was short-lived because Sheffy transferred out of the department after 4 years. The course was then taught in alternate years by Professors D. E. Hogue and W. G. Pond until J. M. Elliot joined the faculty in 1960. The title was changed to Introductory Animal Science. Professor Elliot was appointed assistant professor with the definite understanding that his promotions in rank and salary would depend primarily on his performance in teaching the elementary course. He would be free to conduct research in areas of interest in animal nutrition in accordance with resources available or that might be obtained. Dr. Elliot had completed his doctorate here at Cornell a few years earlier, so his capabilities were known to our faculty.<sup>3</sup>

Professor Sedgwick E. Smith accepted the responsibilities for teaching the undergraduate course in livestock feeding after he joined the faculty in 1946. The course was then offered both semesters and continued to be one of the best in the department. Beginning in 1951, Professor Richard G. Warner gave the course one semester each year.<sup>4</sup>

In all appointments for resident staff positions, we gave equal weight to the individual's interests and capabilities for teaching as well as for research. Over the years the success of instruction programs in the department, along with research, gave support to this policy. We felt that teachers become better teachers if they do research, and researchers become better researchers if they also teach.

One of the most popular courses in the department was Animal Breeding. It was taught earlier by Professors Hinman and Asdell and then was offered by Professor Salisbury, beginning in 1940. After Salisbury resigned in 1947, Professor Robert W. Bratton succeeded him in teaching Animal Breeding, assisted by Robert H. Foote. Then Professor Foote was given full respon-

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<sup>3</sup> Professor Elliot was the recipient of the 1982 teaching award in dairy production from the American Dairy Science Association. He was appointed chairman of the Department of Animal Science in 1983 to succeed Professor R. J. Young, who followed Professor Reid in 1976.

<sup>4</sup> Professor Warner taught the course in livestock feeding 24 times in succeeding years. His innovative teaching techniques and personal qualities in dealing with students earned him the Professor of Merit Award in 1985 of the College of Agriculture and Life Sciences.



sibility for teaching the course. It was reorganized, and new materials on quantitative genetics and reproductive physiology were added. Foote introduced many innovative techniques and visual aids in his teaching and soon became a well-known and well-liked teacher. For laboratory problems on livestock selection, he used computer-simulated models so that the students could see the results of one additional year's selection each week. Later, he introduced audiotutorial models and videotapes that were effective teaching tools.<sup>5</sup> Professor Bratton initiated a new course, Livestock Improvement through Artificial Breeding. Professor Charles R. Henderson taught Problems in Animal Breeding for graduate students and advanced undergraduates.

I continued to teach Elementary Dairy Cattle one semester each year, with the assistance of graduate students and other staff for the laboratory instruction. Beginning in 1948-49, the course was offered both terms. Professor Lorin H. Schultz taught it one term each year and then was followed by Professor Glen H. Schmidt during the 1958-59 academic year. In addition, Schmidt started a new course, Physiology and Biochemistry of Lactation. Actually, this replaced an earlier one-credit course that had been given at various times by Maynard, Asdell, and Loosli.

I was requested by Dean Myers to serve on the Philippines project during the 1954-55 year. During this period some of my teaching responsibilities were handled by Dr. Kenneth E. Harshbarger, who served as acting assistant professor, September 16, 1954, to June 30, 1955. He was on leave from the University of Illinois. Professor S. E. Smith was acting head of the department during my absence from September 1954 through November 1955.

Advanced dairy production was taught by Professor G. W. Trimberger, along with the courses in dairy judging and selection, after he transferred from extension to resident teaching and research.

Professor J. P. Willman continued to teach swine and sheep production until he retired in 1957. After that time Professor Douglas E. Hogue taught the sheep course, and Professor Wilson G. Pond taught swine production. Professor J. I. Miller taught beef cattle and livestock judging and selection.

When Professor Maynard became head of biochemistry in 1945, he continued to teach animal nutrition for a while, but about 1950 Professor J. K. Loosli assumed responsibility for this important course. It was always well taught and attracted graduate students from many other departments.

Professor McCay continued to offer his laboratory course in nutrition until 1959, when it was turned over to R. G. Warner. Also, McCay was the first to teach a course, History of Nutrition, beginning in 1938-39 and continuing until 1959 (except for the period 1943-46 when he served in the U.S. Navy). Through this course and seminars in which McCay was one of the leaders, graduate students learned "it is hopeless to understand the present without knowing the past." Dr. McCay's approach encouraged a vast majority of

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<sup>5</sup> The high quality of Professor Foote's teaching has been recognized with the Professor of Merit Award in 1968 of the College of Agriculture and Life Sciences and the State University Chancellor's Award for Excellence in Teaching in 1977; and he was the first recipient of the Edgerton Career Teaching Award in 1980.

students to become interested in history. His enthusiasm and tenacity rubbed off on the students and made "believers" out of them in recognition and appreciation of the value of studying history.

Some changes were made in course offerings in endocrinology and physiology of reproduction during the early 1950s after Dr. William Hansel joined the faculty. Professor Asdell continued to offer Physiology of Reproduction and Applied Animal Physiology, and Hansel taught Fundamentals of Endocrinology.

Courses in meat and meat products, which were taught successively by Mr. Schutt and Professors Wanderstock, Wellington, Nauman, and Stouffer, continued to attract good enrollments. Hugh Holley assisted with teaching the classes in slaughtering, cutting and processing of meats. A new course in meat technology was initiated in 1961-62 and offered by Professor Wellington in alternate years.

Of the total student body of the College of Agriculture, there were approximately 1,400 to 1,500 enrollments each year in the 25 courses offered in animal husbandry.

Courses offered for selected years, 1949-50 to 1963-64, are listed in appendix 1.

### **Graduate Assistants Contribute to Instruction**

Graduate assistants contributed to instruction as a part of their educational programs. Most of them were on stipends (either state, federal, or income funds) and were required to spend 20 hours a week as instructors in laboratory classes or in research. Sometimes graduate assistants were given full responsibility for one or two laboratory sections, or they worked together with the professor in the lab instruction. The graduate assistants often were asked to assist in a course outside their major discipline; this gave them an opportunity to learn other teaching techniques. These experiences provided opportunities to develop teaching skills and (according to an old adage) to learn by teaching, and they did! Therefore, even those on special grant funds (not required to contribute time) were advised to work as teaching assistants.

It was important for graduate students to learn teaching techniques and skills, for it was anticipated that a majority of them would find future employment in both teaching and research in universities.

In regard to graduate students in the department, I would like to add a personal note. My wife (Bernice) and I wanted to extend the hospitality of our home to all the department's graduate students and their spouses. In the earlier years, before the group was large, this usually took the form of several small Sunday brunches each year. But as the numbers increased, we moved to our patio for fall and spring parties. We liked to have foreign students in our home soon after their arrival to get acquainted with them and to offer assistance with any orientation problems. We remembered the pleasant "at homes" of earlier professors like Walter King Stone and Bristow Adams and hoped to carry on this Cornell tradition of warmth and friendliness.

### **Cornell Judging Teams—An Important Part of Education**

Throughout my career I have always been a strong supporter of the courses in dairy and livestock judging and selection and have recognized the value of

judging team experiences to students. Perhaps this goes back to my own college days when I was a member of three teams—dairy, livestock, and meats—that competed in national intercollegiate contests.

Many years ago I started collecting definitions of education. One of them I remember is this: "The great end of education is to discipline rather than to furnish the mind; to train it to the use of its own powers, rather than to fill it with the accumulation of others." It seems to me that is essentially what training in judging and selection of livestock has been doing. Students learn the importance of self-discipline, concentration, and decision making and the art of verbal skills. They learn from their experiences, from their teachers and fellow students, from the livestock breeders and farm managers.

Cornell was fortunate to have outstanding teachers and coaches of judging teams during the period 1945-63. Professor J. I. Miller's livestock judging teams compiled a record of accomplishments over a period of 20 years that was unequaled among teams from other eastern universities. Each team comprised five contestants, plus an alternate, and competed in three contests: Eastern States, Springfield, Massachusetts; Eastern National, Baltimore and Timonium, Maryland; and the International Livestock Exposition, Chicago, Illinois. There were no teams during the war years (1942-45), and part of the time the livestock teams alternated with meat judging teams. Cornell had 11 winning livestock teams in this period: 6 at Eastern States, 4 at the Eastern National, and 1 at the International (1952).

Professor George W. Trimberger had a very impressive record with the dairy cattle judging teams. George had taught judging courses at Nebraska and was a natural for this work at Cornell. His first team in 1947 won top honors in the intercollegiate contest at the Eastern States Exposition and also at the national intercollegiate judging contest at Waterloo, Iowa. Members of this team were Germain Marion, Bernard Stanton, and John Dewey. In that year these three fellows also were members of the livestock team that won first at Eastern States and the Eastern National and second place at the International Livestock Exposition in Chicago.

During this period of time (1947-63), Trimberger's teams compiled the best cumulative record of their era with eight winners of the Eastern States contest (50 percent) and five winners at the National contest (30 percent). The dairy judging courses attracted large numbers of students, both men and women, who were anxious to study with Professor Trimberger. In 1955 he wrote a book, *Dairy Cattle Judging Techniques*, which has continued in extensive use over 30 years.<sup>6</sup>

The first intercollegiate meat judging team at Cornell was trained in 1953 and was followed by eight others. These teams, taught by Professor G. H. Wellington, competed at the Eastern National Contest in Baltimore and the International Livestock Exposition. Students in the judging course and on the judging teams learned to grade meat accurately and developed an appreciation of the many factors that influence meat quality. However, with

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<sup>6</sup> By the time he retired on December 31, 1974, Professor Trimberger had coached 24 Cornell dairy cattle judging teams. Twelve of them were winners at the Eastern States Exposition, 7 won national contests, and 12 placed among the top 3 in intercollegiate contests.

decreasing student interest, the meat judging course was discontinued in the early 1960s and was replaced by a course on livestock and meat evaluation.

The selected groups of students on the dairy-, livestock-, and meat-judging teams and the several hundred additional students who took judging and selection courses have had a high degree of success in the dairy and livestock worlds.

## Proposal for Change in Name of Department

Over the years the trend in teaching and research shifted gradually from the art of animal husbandry to include the sciences involved in animal functions. Beginning in the mid-1940s, our faculty discussed this many times, raising the question of a new name for the department that would reflect this change in emphasis. Finally, at a departmental staff meeting on January 5, 1963, it was voted to recommend to the administration that the name be changed to the Department of Animal Science. This request was approved by college and university administrations and became effective in January 1966.

## Administrative Assistance in the Department

As the department's programs expanded, it became obvious that the department head needed some assistance in the handling of increasing administrative details. After presenting this need to the dean and directors several times, we finally had an item approved in the 1953-54 departmental budget. Barth E. Mapes, a Cornell graduate in agriculture with considerable farm experience, was appointed administrative assistant on November 1, 1953. In a few years all the larger departments in the college had similar positions in their budgets. Barth provided good liaison between the department head's office and the faculty and other staff, the livestock units, and all operations of the department. He continued in this position throughout my administration.

Mrs. Madeline Bower, administrative aide, was responsible for the department's business office until her retirement in August 1963. She handled requisitions, payrolls, and other financial and business details with loyal dedication for 27 years.

An expression of appreciation to all the secretarial staff and other nonacademic staff is in order. We were fortunate to have a capable group who had a high degree of devotion and sense of responsibility to their duties in widely varying areas. We cannot name them all, but special appreciation is given to Mrs. Ruth Teeter who was promoted to the position of secretary to the department head in 1960 after many years of effective secretarial work in the department.<sup>7</sup>

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<sup>7</sup> Mrs. Ruth Teeter was promoted in 1964 to the position of administrative aide. She continues in 1986 to have responsibility for the department's business office with the title of administrative manager.



Kenneth L. Turk, third head of the department, 1945-1963, in his office in Morrison Hall in 1962. Note the photograph of Professor Morrison on the wall.



Members of livestock advisory council inspect site of new building for animal husbandry, 1959.



Laying cornerstone for Morrison Hall, *Left to right:* Professors S. E. Smith, J. I. Miller, Wm. Hansel, and K. L. Turk.

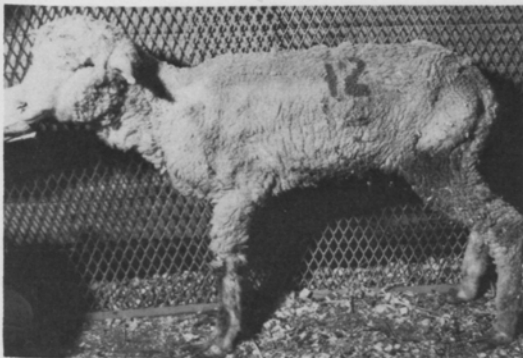


Morrison Hall, new home for Department of Animal Husbandry, completed in 1961.

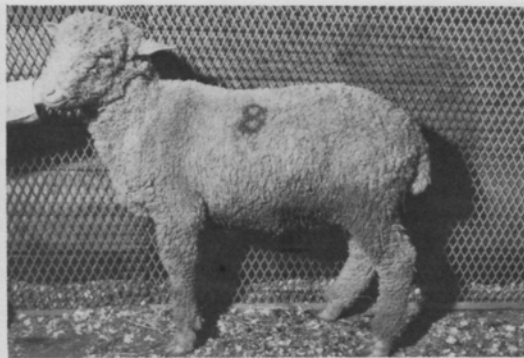


At the dedication of Morrison Hall in 1961, Mrs. F.B. Morrison poses with sons, Roger and Spencer, in front of Morrison portrait.





- cobalt

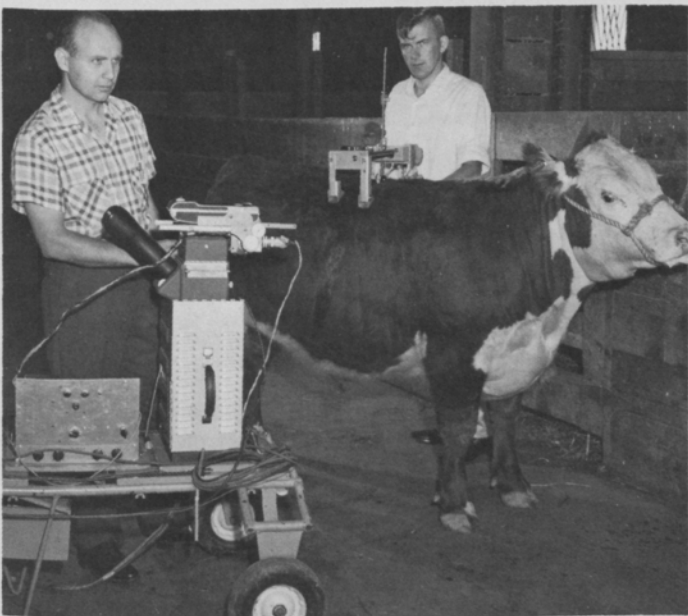


+ cobalt

Research by Professor S. E. Smith with lambs demonstrated relationships between cobalt and vitamin B<sub>12</sub> in ruminants.



Cow meets computer in Dairy Records Processing Laboratory.



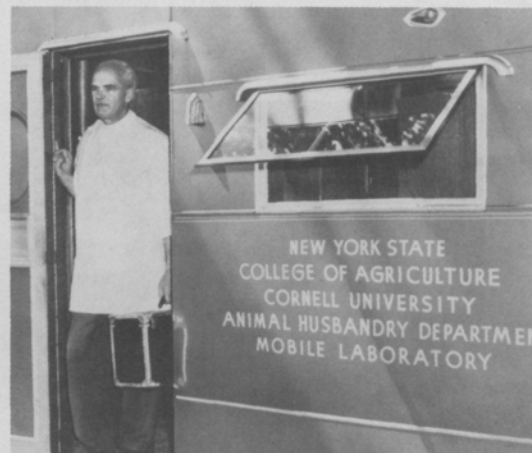
Development and application of ultrasonic methods for live animal evaluation and carcass composition were pioneered by Professor J. R. Stouffer.



Group of dairy cattle breeders evaluate some Holstein cows in Cornell herd. Dairy barns *in background*.

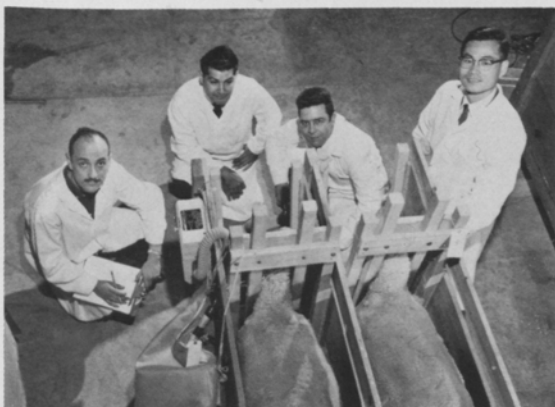


Many years of investigations at Mt. Pleasant farm under leadership of Professor J. I. Miller demonstrated the value of pastures and other forages for economical beef production. Shown here are steers receiving varying amounts of grain supplement.



Professor Asdell and mobile laboratory equipped to sample feed, blood, semen, and reproductive organs in field studies of reproductive failures of dairy cattle.





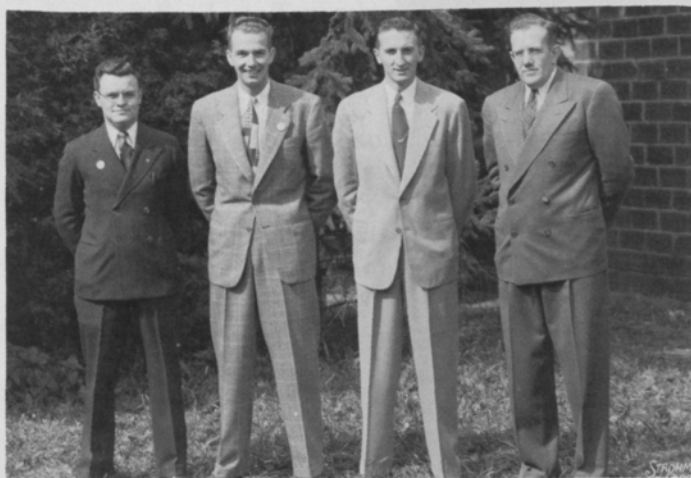
Graduate students from many nations study animal sciences at Cornell. Shown here are three with their professor in animal nutrition. *Left to right:* Osvaldo Paladines (Ecuador), Andre Bensadoun (France), Professor J. T. Reid, and In K. Han (S. Korea).



Professor Robert H. Foote and student in audiotutorial carrels used in reproductive physiology course.



1947 livestock judging team was first at Eastern States and Eastern National Expositions and second at International Livestock Show in Chicago. *Left to right:* J. Dewey, G. B. Marion, B. F. Stanton, David Morrow, Stewart Fish, M. Gannon, Joseph Fairbank, J. I. Miller (coach).



1947 Cornell dairy cattle judging team won the intercollegiate contests at the Eastern States Exposition and the National Dairy Show. *Left to right:* G. B. Marion, B. F. Stanton, J. Dewey, G. W. Trimmer (coach).



Students' livestock show attracted a large audience during Farm and Home Week each year.



Ezra Taft Benson, United States secretary of agriculture, visits the university in March 1954 and looks over the dairy herd. Shown are (left to right) K. L. Turk, Dean W. I. Myers, Secretary Benson, Paul Dean, and G. W. Trimberger.



Dairy heifers on feeding experiments at Mt. Pleasant farm, 1957-58.

## Morrison Grants and Fellowships

Not too long after I was named head of the department, Professor Morrison talked with me and several other members of the staff about an idea he had for the establishment of an award to be given by the American Society of Animal Production. He was grateful for the excellent cooperation he had received for many years from scientists who sent him research information, mimeographs, *Feeders' Day* reports, reprints, and bulletins for his use in revised editions of *Feeds and Feeding*. Professor Morrison felt that an award by the society would be a recognition and a small token of his appreciation. We applauded this idea as being most generous, and as it turned out, it became a fitting living memorial. In 1946 Professor Morrison and his wife, Elsie B. Morrison, established a trust fund for an award to be presented each year to a member of the American Society of Animal Production (later Animal Science) for outstanding research in livestock production. It is now known as the American Society of Animal Science Morrison Award. It is administered by the society with an annual award of a watch, another suitable memento, and \$3,000 or a greater amount as approved by the board of directors. In the beginning the amount was \$1,000, but increased value of the stock portfolio in the trust fund made the larger amount possible.

In 1950 Professor and Mrs. Morrison established an endowed fellowship at Cornell University to foster the training of graduate students, especially those from foreign countries, in the field of livestock feeding. Unfortunately, the amount of this endowment was not large enough for the income to provide an annual fellowship of sufficient amount to meet inflationary costs. In later years it has been necessary for the department to supplement the funds. Mrs. Morrison also provided funds for scholarships to be awarded to undergraduate students in animal husbandry.

In November 1949 Professor Morrison made a gift of money to the department for suitably framed photographs of livestock and farm scenes for decorating the classrooms and corridors of Wing Hall. He had long felt the need for such pictures, but there were always other needs for any loose funds. At that particular time, Professor Morrison felt the photographs would help "dress up" Wing Hall before the annual meeting of the American Dairy Science Association scheduled to be held at Cornell in June 1950. From time to time during those years Professor Morrison made other gifts to the department for specific purposes.

On a later occasion, in the summer of 1956, after Professor Morrison retired, staff members in the department reluctantly decided not to accept a proposal made by the Morrison Publishing Company. The proposal was to set up a grant to Cornell University to establish a half-time professorship for his son Dr. Spencer H. Morrison. Professor Morrison felt that a university connection was desirable for Spencer to have for future revisions of *Feeds and Feeding*. After considering this proposal carefully and thoroughly, the faculty voted against the plan. So it was my responsibility to advise Professor Morrison that the staff of the department felt that it would be unwise for him, his son, the department, and the college to enter into the arrangement. This was one of the most difficult tasks of my career.

## American Dairy Science Association Annual Meeting at Cornell

The 45th annual meeting of the American Dairy Science Association (ADSA) was held at Cornell on June 20–22, 1950. This department and the Department of Dairy Industry jointly hosted this very successful meeting. This marked the third time the association met at Cornell. Still in its infancy, the association held its 3d annual meeting here in 1908. And in 1934 the 29th meeting was held jointly in Ithaca and at the State Agricultural Experiment Station at Geneva. Two Cornell faculty members were charter members of this association when it was organized at the University of Illinois in 1906—Professor H. A. Hopper, animal husbandry, and Professor E. S. Guthrie, dairy industry.

It is no easy job to sponsor one of these meetings, but all the committees from both departments handled their responsibilities in a very satisfactory manner. The attendance of 1,529 was the largest ever for an annual meeting of the association held up to that time. (Later another meeting of ADSA was hosted by Cornell in 1967.)

Dean W. I. Myers gave the official welcome at the opening session and highlighted the economic situation, particularly in respect to the dairy industry. The featured guest speaker was Dr. Edmund Ezra Day, who just the week before had been named president emeritus of Cornell University. His talk on the subject, "Reflections on the Nature of Human Progress," was inspirational as so many of his talks were.

It was a happy coincidence that the president of the association during 1950 was Professor G. Malcolm Trout of Michigan State University, an alumnus of Cornell. He obtained his Ph.D. here in dairy chemistry in 1936.

## American Society of Animal Science Originated at Cornell

It is a little known fact that the American Society of Animal Science had its genesis on the Cornell campus. On July 18, 1908, a group of animal nutritionists representing 13 state agricultural experiment stations and the U.S. Department of Agriculture met during a summer school session and decided to form an organization of persons involved in animal nutrition investigations. A committee was appointed to draw up a plan to be presented in the fall during the International Livestock Exposition in Chicago. Henry P. Armsby of Pennsylvania State College was chairman, and Whitman H. Jordan of New York Agricultural Experiment Station at Geneva was a member.

The committee made its report on November 26, and the American Society of Animal Nutrition was formally organized with a slate of elected officers. A constitution was adopted, setting these objectives: (1) to improve the quality of investigation in animal nutrition, (2) to promote more-systematic and better-correlated study of feeding problems, and (3) to facilitate personal interaction between investigators in this field. The first-year membership reached 100, with 33 charter members.

The society went through two name changes, first in 1915 to the American Society of Animal Production and second in 1961 to the American Society of Animal Science.

Cornell has furnished several officers of the society over the years, with L. A. Maynard serving as president in 1943, J. I. Miller in 1955, and J. K. Loosli in 1960. It is significant that during the period 1951-80, 13 former graduate students in this department served as president.

## Morrison Retires from Active Service

Professor Frank B. Morrison retired from Cornell University on June 30, 1955, and was given emeritus rank, after almost 45 years of leadership in the fields of animal husbandry and livestock nutrition.

On June 1, 1955, friends and associates of Professor Morrison met to honor him at a testimonial dinner in Willard Straight Hall at Cornell University. One of the highlights of the occasion was the presentation to Cornell by Harold L. Creal, a dairy farmer from Cortland County, of an oil portrait of Morrison. This painting by Robert Childress was made possible through generous contributions from livestock farmers and breeders, former students, and other friends as a project of the Livestock Advisory Council. The portrait hung in Wing Hall until 1961 when it was transferred to Morrison Hall.

In addition to talks by Provost Forrest F. Hill and Dean W. I. Myers, the featured speaker of the evening was Professor Gustav Bohstedt, one of Professor Morrison's first graduate students and later head of the Department of Animal Husbandry at the University of Wisconsin. Based on their close personal friendship and relationships over many years, Professor Bohstedt described the qualities and characteristics that carried Morrison far in the esteem of his scientific colleagues and the public:

*"Integrity*—mental and moral honesty, a scientific conscience, nontolerance of sham and deception, courage to back up his convictions;

*Ambition*—a mainspring, a driving force, accounting for his prodigious industry and accomplishment; pride and the desire to excel;

*Generosity*—fairness, a sense of social obligation, public spiritedness, plain helpfulness, the human side of Morrison."

Professor Bohstedt further paid this tribute: "No one who knows the Morrisons will fail to recognize the very strong influence that Elsie B. Morrison has had upon Frank. This has truly been a closely knit family partnership. With a wife less inclined to identify herself with the work and ideals of her husband, the success would not have been so great."

It was during his undergraduate years at the University of Wisconsin that Morrison became associated with Dr. W. A. Henry, then dean emeritus of the College of Agriculture. Dean Henry had published the original editions of his book, *Feeds and Feeding* (first edition in 1898), which met with immediate success and soon became the outstanding textbook in its field. But in 1909 when a revision of the book was necessary, Dean Henry was in failing health. He requested several of the professors to help him obtain the services of a young graduate student or senior to help in the tedious work of compiling data. As a young sophomore, Morrison felt he could do anything that a senior or graduate student could, so he applied for the job before anyone else and he got it! And besides he needed the money.

To accumulate some funds so that he could go to college, Morrison had taught country school for 3 years after high school. He worked his way through the University of Wisconsin and graduated with honors in 1911. On many occasions he told me about the evenings he spent in a canoe on Lake

Mendota, on the University of Wisconsin campus, courting Elsie Bullard, a journalism major, by getting her assistance in editing and proofreading the manuscript for a new edition of *Feeds and Feeding*. She became Elsie B. Morrison on November 24, 1910, and was an active working partner on the book throughout Professor Morrison's career.

During the years that Morrison was advancing in the academic ranks at Wisconsin, he was working long hours at home on revisions of *Feeds and Feeding*, and *Feeds and Feeding*, abridged, the latter being published for use in high schools and vocational schools. Major responsibility for the books rested with Morrison ever since his second year in college because of the continuing poor health of Dean Henry. In 1915 the name of Morrison first appeared as coauthor, and upon Henry's death in 1932, Professor Morrison became the sole author.

Constant changes and discoveries in the fields of animal nutrition and animal husbandry required periodic revisions of these standard textbooks. In the last editions, the 22d edition of *Feeds and Feeding*, published in 1956, and the 9th edition of *Feeds and Feeding*, abridged, published in 1958, Professor Morrison had the able assistance of his wife and their two sons and their wives. At various times, the main book was translated into Portuguese, Spanish, and Russian.

Professor Morrison gave lectures in almost every state and also in Canada, the Philippines, England, and India. At one time or another he gave special advanced courses in animal nutrition and livestock feeding at Texas A&M College, Utah Agricultural College, and the University of California.

On several different occasions, Professor Morrison was called upon to study livestock production in other countries. These assignments included the following:

In 1929 he was a member of an American commission to study the livestock industry of Germany and made recommendations for its improvement.

At the request of the Philippine government in 1937, he conducted a survey of the livestock industry and made recommendations for its development and improvement.

In 1949 the Argentine Livestock Producers' Association invited him to make a study of the livestock industry of Argentina to provide the basis for the establishment of livestock experiment stations.

He conducted a survey of the livestock industry in Venezuela for the government in 1954 and also acted as adviser to the Venezuelan minister of agriculture on feed control.

In recognition of his outstanding accomplishments in education, research, and administration, two universities awarded Professor Morrison honorary degrees of doctor of science—the University of Vermont in 1947 and the University of Wisconsin in 1950.

Professor and Mrs. Morrison bought a house in Florida for their winter home, but continued to spend the summers at Upper Saranac Lake for a few years.

Frank B. Morrison's distinguished career ended abruptly on April 7, 1958. He and Mrs. Morrison had left their home in Sarasota, Florida, about a month earlier to travel by automobile to Oklahoma and Colorado for speaking engagements. They were en route to visit their son, Spencer, and his family in Clinton, Iowa, when Professor Morrison died of a heart attack in Atlantic,

Iowa. They had papers all ready to turn over the book and the Morrison Publishing Company to their son.

Many tributes were paid to Morrison, among them an editorial in the *Daily Jefferson County Union* newspaper in Fort Atkinson, Wisconsin, entitled "Distinguished Son Returns," highlighting his career. Professor Morrison was buried not far from the farm where he was born.

Dean W. I. Myers was quoted in the *Ithaca Journal*: "The death of Professor Emeritus Frank B. Morrison came as a shock to his countless friends in the College of Agriculture and the Cornell community. He rendered long and distinguished service to the livestock industry. Under his leadership, the Cornell Department of Animal Husbandry became one of the largest and best, attracting students from all over the world.

"Though he retired in 1955 after some 28 years of service as a faculty member, he has seemed to be ever present. His influence is always around. And thus I think it will always be, for through his publications and former students his work will live on and his influence will continue to be widely felt."

Unfortunately, there have been no new, revised editions of *Feeds and Feeding* since the 22d edition in 1956. Over the passing years several authors have tried to write a successor to the "farmers' bible", but none have really filled the void.

## Active Programs in All Areas in Animal Husbandry

Active programs in instruction, research, and extension in animal husbandry were in effect in 1945 when I succeeded Professor Morrison and were continued in the years ahead. In selecting new faculty, I spent much time and effort considering the needs of the department as a whole and in terms of maintaining a balance between the basic and applied disciplines. I always felt that my most important job was in the selection of the right kind of faculty for the department. In addition, my aim was to encourage a reciprocal understanding, by the animal production faculty of the basic sciences and by the basic scientists of the applied aspects of animal husbandry and the interaction of the two.

Some highlights of faculty contributions over the next 18 years are summarized here for each of the several divisions of the department.

## Animal Nutrition Division

Professor Maynard, cooperating in some of the research projects, continued to serve the department on a part-time basis until 1950, when he felt it necessary to devote full time to his duties as director of the School of Nutrition and head of the Department of Biochemistry.<sup>8</sup> Professor J. K. Loosli served as leader of the animal nutrition division, beginning in 1945.

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<sup>8</sup> After Dr. Maynard retired as director of the School of Nutrition, he was succeeded by Dr. R. H. Barnes. The name was changed to the Graduate School of Nutrition with Dr. Barnes as the dean. Later in 1974, after Dr. Barnes retired, this program became the Division of Nutritional Sciences with Dr. M. C. Nesheim as director. Many faculty members in animal science hold joint appointments in the division.



After spending 3 years as an officer in the United States Navy during World War II, Dr. C. M. McCay rejoined the faculty in 1946 to continue his teaching and research in nutrition. Dr. W. H. Adolph served as acting professor of nutrition and biochemistry for 2 years during part of the time McCay was in the Navy. He conducted research and taught the laboratory course in animal nutrition.

Facilities for animal nutrition research were improved in 1946 when an outlying farm and barn, at the north end of Sapsucker Woods Road near the airport, became available to expand studies with dogs and fur-bearing animals. Over the next several years, Professor McCay built up a colony of about 200 purebred, registered, parasite-free dogs (mostly beagles, but ranging to Great Danes) to possibly the largest and best colony for dog research in the United States. Enough surplus dogs were sold each year to pay for much of the cost of operating the farm. Dogs were used as experimental subjects, in addition to rats, hamsters, and other laboratory animals, for McCay and his associates to continue the significant studies on the chemistry, physiology, and pathology of aging.

McCay wrote the book *Nutrition of the Dog* in 1943, and the second edition, revised and expanded, was published in 1949. He felt there was probably more misinformation concerning the nutrition of the dog than of any other species; as a result, many fine animals had aged prematurely and died in early life. This excellent book, which was used by pet owners, scientists, and veterinarians, presented the evidence gained from experiments, many of them his own research, selected and evaluated from technical literature of the world. The book won the National Dog Week Award and Medal in 1948.

Later when construction was to be started on Morrison Hall and with demolition of the remaining wing of the horse barn, the colony of rats and other laboratory animals was moved to the barn at the dog farm. The small animal laboratory remained there until 1961, when the rat colony was transferred to Morrison Hall.

In 1949 the Cornell Agricultural Experiment Station entered into a memorandum of understanding with the Bureau of Animal Industry, Agricultural Research Administration, U. S. Department of Agriculture, which provided for an expansion of nutrition and physiology research with fur animals. This followed earlier cooperative work at the U.S. fur animal experiment station near Saratoga Springs. About 1952 both Charles F. Bassett and the research project were transferred to Ithaca and located at the dog farm for the next 10 years. Facilities were then constructed in 1962 for mink research at the Reed farm where the project remained until it was terminated in 1983. Professors Loosli, Smith, and Warner cooperated at various times in the mink research. Dr. Hugh F. Travis became director in 1962 and also served as an adjunct associate professor in animal husbandry.

When Professor McCay assumed his work at Cornell after his war service, he devoted a larger proportion of his energy to research on problems directly related to human nutrition and health than was the case earlier. He had been deeply impressed by the large quantities of coffee and acid beverages consumed by military personnel, so he carried out studies to measure their effect on health and longevity. It was found that, when coffee was provided as the sole fluid to experimental rats fed a well-balanced diet, there were no measurable harmful effects on the animals. On the other hand, acid beverages, such as cola beverages, as the sole fluid, caused severe teeth erosion in rats, dogs, and monkeys. The initial damage was detected after only a few days. After 6



months on acid beverages as the only fluid, the molar teeth of rats were dissolved down to the gum line even though the diet was fully adequate.

These studies were extended to include an evaluation of calcium and phosphorus utilization by experimental animals throughout the life span. Calcium absorption and utilization were found to decrease as animals became older, and larger intakes were needed to prevent depletion of the bones and loss of teeth. It became clear to McCay that many Americans, and especially the elderly, were consuming diets critically deficient in calcium as well as in other nutrients, but excessive in energy.

Throughout his studies on prolongation of productive life, McCay became impressed with the necessity for a multidisciplinary approach for progress in solving the problems relating to nutrition and human health. He felt that nutritionists must work side by side with physicists, biochemists, bacteriologists, pathologists, physiologists, histologists, and psychologists. When such cooperative attacks can be made upon the basic problem of age changes, he predicted it is likely the results will afford new methods of attacking many of the diseases of old age.

In his cooperative research with McCay, Dr. LeRoy L. Barnes, professor of physics at Cornell, conducted biophysical measurements on experimental animals. Teeth were shipped to dentists, and tissues were taken to pathologists in several hospitals. These cooperators made periodic visits to Cornell's laboratories to write up the results and plan further studies. Such cooperative studies involving anyone who might contribute to basic knowledge in his major areas of interest continued throughout McCay's active life. Several studies were made on fluoride metabolism and its effects on bones and teeth of experimental animals over their life span. As a result of these studies, McCay became concerned with fluoridation of public water supplies. Also, he maintained a lifelong interest in the enrichment of foods and the application of sound nutrition practices by homemakers as well as in institutions and public dining facilities.

In the late 1950s the United States Army Medical Research and Development Command provided support for studies by McCay and Asdell on the effects of ionized radiation, used as a preservation agent, on the nutritive value of foods. This was a forerunner of such processes today. Irradiated beef, pork, and vegetables were fed to dogs for a 3-year period and were found to be satisfactory for body maintenance, for reproduction, and for growth and development of pups.

Professor Loosli and his graduate students continued to utilize purified-diet methods to study nutritional requirements of herbivora. Work with sheep and goats provided the first direct evidence that the essential amino acids—arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine—could be synthesized in the rumen from urea fed as the only dietary source of nitrogen. These results explained why urea can serve as a replacement for a part of the protein in the rations of ruminants, as had been shown in earlier studies.

A long-term project dealing with amino acid nutrition of farm animals was started in 1947. This work was conducted by Loosli jointly with Professors Williams and Maynard of the Department of Biochemistry. Out of this collaboration came many important contributions: the development of methods for the quantitative analysis of 50 feeds for 10 amino acids; the determination of the comparative amino acid composition of the bodies of the rat, chick, and pig; the establishment of the quantitative requirements of pigs

for seven amino acids; and the production of a large body of data on nitrogenous metabolism in the rumen as affected by various dietary factors.

In addition to his research on fundamental problems of nutrition and metabolism, Loosli continually examined the need to solve problems of immediate concern to livestock farmers, such as information on new feeds and feed products. His research on vitamins and antibiotics for calves and tocopherols for milk production resulted in substantial savings to dairy and livestock farmers. He collaborated with colleagues in the elucidation of the role of vitamin E in the prevention of stiff-lamb disease, relationships of selenium and vitamin E (tocopherols) to muscular dystrophy in dairy calves, studies on the effect of different planes of early nutrition upon mature productive and reproductive performance in dairy cattle, and extensive investigations on the relation of the stage of maturity of forage at harvesting to its subsequent feeding value. Loosli also contributed to knowledge on the relationships of milk production efficiency to the relative proportion of the rumen volatile fatty acids and the effects of hay-to-concentrate ratios on digestibility of feeds and milk production.

In recognition of his outstanding research, Professor Loosli received the American Feed Manufacturers' Award in 1950 and the Morrison Award in 1958, both from the American Society of Animal Production, and the Borden Award in Dairy Production in 1951 from the American Dairy Science Association. In further recognition of his contributions to animal agriculture, Loosli was elected president of the American Society of Animal Production in 1959-60 and president of the American Dairy Science Association in 1970-71 and is the only scientist to be so honored by both societies.

Revised editions of Maynard's widely used book *Animal Nutrition* were published in 1947 and 1951. Subsequent revisions were made jointly with Professor J. K. Loosli; in 1979 the seventh edition was by Loosli, H. F. Hintz, and R. G. Warner, with Professor Maynard retained as the first author. In these editions, the general framework and character established by Maynard in the first edition were preserved, but were updated with new discoveries, facts, and knowledge. This book presents the principles of nutrition and their applications to feeding practice and is used as a textbook and reference by almost all the leading colleges and universities.<sup>9</sup>

During my sabbatical leave of 6 months (beginning on April 1, 1951) to study the birthplace of the breeds of livestock in the United Kingdom and Europe, Professor Loosli served as acting head of the department.

Loosli also spent the 1953-54 year in the Philippines as a faculty member on the Cornell-Los Baños program (see pp. 187-88). During his absence, Dr.

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<sup>9</sup> Professor Loosli served as head of the department from 1963 until 1971. He was visiting professor of animal science, University of Ibadan, Nigeria, during 1972-74. After 35 years of distinguished service at Cornell, he retired with the title of emeritus professor on July 1, 1974. Since that time he has served as a visiting professor in the Department of Animal Science, University of Florida. In 1975-76 he served as acting chairman of the department and in 1976-77 as acting assistant dean for research. He was associate editor, *Journal of Nutrition*, 1980-84. He was elected honorary fellow, American Society of Animal Science, in 1976 and to the American Institute of Nutrition in 1973 and received the Award of Honor from the American Dairy Science Association in 1983.

Richard F. Davis served as acting assistant professor to assist with the teaching and research program.

After Dr. Richard G. Warner joined the faculty in 1951, his research centered largely on dairy cattle nutrition, value of various feeds for milk production, factors affecting food intake in ruminants, and nutrient requirements of mink and the laboratory rat. Of particular significance were studies initiated in 1952 that described the dramatic changes that occur in the structure and function of the ruminant stomach from birth to maturity and showed specifically how the nature of the ration affects the rate and kind of development that occurs.

Warner and his graduate students continued work on the limited whole-milk, dry-starter method of raising calves. Satisfactory milk replacers were developed, and with high quality feeds and management satisfactory growth was obtained on less milk than had been used previously.

Several years of experiments demonstrated the value of antibiotics, especially Aureomycin, in growth rates and prevention of scours in dairy calves, when supplied up to 7 weeks of age.

Several experiments under the leadership of Loosli and Warner demonstrated the value of corn distillers' grains in rations for lactating cows when used not to exceed 40 percent of the concentrate mixture. Another product, corn distillers' dried solubles, although extremely useful in nonruminant feeding, did not have unique value for lactating cows fed liberal amounts of hay and silage.

Much of the research in animal nutrition and in all other areas of the department was conducted by graduate students for their theses, working under the supervision of their major professors. These students are listed in appendix 2, along with their major professor, graduate field, and thesis title. A large proportion of them have become successful, widely known, and respected teachers and scientists or leaders in industries in the United States and other countries.

Three remarkable men in the history of this period in nutrition and biochemistry retired from the faculty: Maynard on June 30, 1955, after 40 years; Sumner on June 30, 1955, after 41 years, most of the time in Arts and Sciences, but in Animal Husbandry, 1940-1945; and McCay on August 1, 1962, after 35 years on the faculty. (Professor Maynard died on June 22, 1972; Professor Sumner on August 12, 1955; and Professor McCay on June 8, 1967.)

We spent almost a year recruiting a biochemist who would be interested in coming into the vice-McCay position in animal nutrition. Dr. Duane A. Benton was appointed May 1, 1963, as associate professor shortly before I finished my duties as department head. He was highly recommended by his professors at the University of Wisconsin where he earned the Ph.D. in biochemistry. Also, he had served on the faculty at Oklahoma State University and the University of Buffalo and as a senior cancer research scientist at the Roswell Park Memorial Institute, Buffalo, N.Y. He was attracted by opportunities to undertake basic research combining nutrition and biochemistry. However, his stay in the department was relatively brief since he resigned on January 31, 1966, for a position in human nutrition, U.S. Department of Agriculture.

## Livestock Feeding Division

A new position for teaching the course in livestock feeding and for research was made available to the department in 1946 when Professor Morrison requested that he be placed on one-half-salary basis. After a period of intensive evaluation of several potential candidates, Dr. S. E. Smith was invited to transfer from his position in the U.S. Plant, Soils, and Nutrition Laboratory, and he was appointed associate professor of animal husbandry. Dr. Smith completed his Ph.D. under the direction of Professor Asdell in 1939 and during the next 3 years conducted research with fur-bearing animals on a joint project between the U.S. Department of Agriculture and the Department of Animal Husbandry here at Cornell. As an animal physiologist in the federal laboratory, Smith held a joint appointment as assistant professor of animal husbandry.

A new division of livestock feeding, with a budget allocation, was created for teaching and research. Smith taught the course in livestock feeding 36 semesters to 5,308 students. The course was well taught and was highly rated by the students. Smith's research covered a wide range of subjects. Perhaps his greatest contributions in research resulted from his work on mineral nutrition and metabolism in animals. He and his graduate students contributed greatly to the knowledge of the nutritional significance of iron, copper, zinc, manganese, calcium, magnesium, sodium, chloride, phosphorus, selenium, molybdenum, and cobalt in one or more animal species. An especially important accomplishment was Smith's research that resolved the cobalt-vitamin B<sub>12</sub> interrelationship in the ruminant animal. It was his hypothesis that cobalt, when fed to ruminants, is utilized by rumen bacteria to synthesize some unknown metabolically active compound, a lack of which was the fundamental cause of the syndrome recognized as cobalt deficiency. Eventually, other scientists detected small amounts of cobalt in vitamin B<sub>12</sub> and demonstrated that this vitamin ameliorates pernicious anemia in man. With this knowledge, Smith and his colleagues were the first to demonstrate that cobalt deficiency in ruminants is primarily a metabolic deficiency of vitamin B<sub>12</sub>.

Another series of comprehensive and definitive investigations dealt with the sodium chloride requirements of high-producing dairy cows. Among a variety of observations, Professor Smith noted that a long period of time elapsed before the cow's health deteriorated as the result of salt deprivation, illustrating the great capacity of the animal body to husband its supply of sodium and chlorine. The feeding of salt produced rapid recovery in cows suffering acute symptoms of deficiency. Further, the results of these investigations demonstrated that health defects resulting from a lack of salt are due primarily to a deficiency of sodium rather than chloride.

Other studies determined the availability of phosphorus in four major sources of the element to young dairy calves as based on a variety of criteria. Availability of phosphorus in certain supplements was less than half of that from other sources. The results of these studies made it possible for feed manufacturers to save thousands of dollars annually in the cost of formula feeds for young dairy animals.

In addition to his research with farm animals, Smith's research was extended to laboratory rats, minks, foxes, rabbits, and guinea pigs. Through

these investigations, many contributions were made to the knowledge of the comparative physiology and pathology associated with mineral nutrition.

Throughout his career Professor Smith played an active and competent role in the college and the university. On several occasions he was the acting head of the department. He was chairman of the Morrison Hall building faculty committee (1953–61), chairman of the department's graduate student selection committee for many years, and served on several college committees dealing with educational policies, scholarships, and graduation requirements. (Professor S. E. Smith retired on January 31, 1977, after 35 years of dedicated teaching and research.)

## Animal Breeding and Physiology

Research and instruction in animal breeding and physiology expanded fairly rapidly during the period 1945–63, with research moving into several new areas to meet the needs of changing times and conditions. The adoption of artificial insemination increased rapidly in New York and throughout the northeastern region that was being serviced by the New York Artificial Breeders' Cooperative (NYABC). When the cooperative moved to the Cornell campus in 1944, additional research facilities were provided for Professor Salisbury and his associates. The NYABC increased its grants for research concerned with preservation of semen and development of methods for increasing the usefulness of artificial insemination in dairy herd improvement.

Dr. C. B. Knodt was in charge of details of the experiments conducted in cooperation with the NYABC. In his short time on the staff, he made important contributions to research on semen physiology, adaptation of practical methods for handling of semen, and in the operation of the artificial insemination research laboratory. Dr. Knodt resigned from the staff on December 31, 1945, to accept a position of higher rank and salary at Pennsylvania State University. Dr. Robert W. Bratton was appointed assistant professor on April 1, 1946, on the State Artificial Insemination and Dairy Herd Improvement fund to succeed Dr. Knodt.

Salisbury continued his studies on dilution rates of semen to extend the usefulness of the most outstanding sires. It was found that the addition of sulfanilamide to the diluent increased the maximum at which semen can be diluted. Dilution rates of 1 part of semen to up to 400 to 800 parts of yolk-citrate and yolk-citrate-sulfanilamide diluent could be used without any effect on fertility compared with much lower rates used previously.

A significant series of studies was initiated by Salisbury on nutritive requirements of dairy bulls and the relationships of nutrition to semen production and fertility. When mature bulls received a vitamin A deficient ration, there was no noticeable impairment of semen production, even though clinical manifestations of vitamin A deficiency and deterioration of germinal epithelium were produced. Another study dealt with total digestible nutrients and protein requirements of bulls used routinely in artificial insemination. Controlled levels of TDN of 100, 120, and 140 percent of recommended levels and total protein levels of 12, 16, and 20 percent in concentrate mixtures did not influence semen production or fertility in mature dairy bulls. In other studies, three different sources of protein quality—soybean oil meal, corn gluten feed, and dried skim milk—when fed in the concentrate mixtures gave

no differences in volume of semen per ejaculate, numbers of spermatozoa, percentage and rates of motility, or in other criteria used.

These and other studies were initiated by Professor Salisbury before he resigned from Cornell in 1947 and were continued by Professor R. W. Bratton and a group of graduate students. Salisbury was leader of instruction and research in dairy cattle breeding and artificial insemination for 8 years at Cornell. He and his colleagues put Cornell among the leaders in the world in basic and applied research on semen preservation and storage and the use of artificial insemination as a tool in dairy cattle improvement. He accepted a position as head of the Department of Dairy Science at the University of Illinois. Later, he served as director of the Agricultural Experiment Station at Illinois and was elected to the National Academy of Sciences.

As artificial insemination became more widely accepted by dairy cattle farmers during the 1940s, many of them became more aware of reproductive problems in their herds than they were when bulls were used for natural service. One of these dairy farmers was Governor Thomas E. Dewey who owned a farm in Dutchess County. The breeding records of the cows in his herd identified a number of cows with problems of fertility. The governor came to the college for help in solving these problems. We responded that we did not have all the answers, and more research was necessary. The communications and discussions that took place eventually resulted in a special appropriation in the 1949-50 budget of \$17,000 for research and extension on the causes and prevention of reproductive failures in dairy cattle. This appropriation provided two faculty positions at the assistant professor level, two graduate assistant items, and a modest amount for research. Another item in the appropriation provided for a position on the faculty of the College of Veterinary Medicine, which was filled by Dr. Kenneth McEntee.

Dr. William Hansel was named assistant professor of animal husbandry on this special appropriation on July 1, 1949. He was a graduate of the University of Maryland and completed his Ph.D. at Cornell in reproductive physiology under the direction of Professor Asdell.

Dr. Robert H. Foote was appointed assistant professor of animal husbandry on November 30, 1950, in the second position. Dr. Foote took his graduate work at Cornell, initially under the direction of Professor Salisbury and later with Dr. R. W. Bratton. He came to Cornell after his undergraduate studies at the University of Connecticut. Hansel and Foote, along with Asdell and Bratton in this department and Dr. McEntee in the Veterinary College, gave Cornell an outstanding team working in reproductive physiology. Bratton and Foote gave leadership to continuing research on bull semen and artificial insemination, and Asdell and Hansel concentrated on problems of reproduction in dairy cattle and other species, including basic studies on the mechanisms of ovulation and estrous cycle regulation.

Research on aging by Dr. McCay and associates was accompanied by important studies by Professor Asdell, Miss Gladys Sperling, and several graduate students, on the relationship between dietary restriction and reproductive performance. In one series of experiments, Asdell had groups of rats that were kept for their lifetime on different reproductive schedules and with sex hormone implants to find the effect of each upon the span of life. Late initial breeding tended to shorten the life span, whereas no breeding at all increased it considerably. Castrated males lived longer than normal males, and ovariectomized females had shorter lives than normal females. Both males and females with estrogen tablets implanted lived about as long as ovariectomized females, but with testosterone implants a considerable drop in

life span was experienced. There was very little evidence for the view that difference in longevity is genetic, but a great deal for the view that it is sex-steroid-hormone controlled.

Professor Foote and his colleagues were among the first to test the effects of adding several antibiotics to semen diluents. An antibiotic combination of penicillin, streptomycin, and polymixin that prohibited bacterial growth and gave an increase in fertility with a higher percentage of 60-90-day nonreturns with dairy cows was developed. The term "extender" was coined at Cornell, denoting a reinforcing medium and not just a diluter. The antibiotic extender (CUE) was widely adopted by artificial breeding associations through the United States. Better extenders and methods for cooling of semen in them raised fertility by 15 percent and led to a marked improvement in the acceptance of artificial insemination techniques by farmers. These research developments were worth millions of dollars to dairy farmers. Techniques developed with dairy cattle were extended to research with boars, dogs, and rabbits.

As a result of research by Bratton and Foote, the frequency of ejaculation by bulls was increased from one ejaculate per week to seven ejaculates, thus increasing sperm output. Sexual preparation and excitement of bulls demonstrated a 4 percent increase in sperm harvested. These and other studies made possible greatly increased numbers of cows that were bred to herd-improving bulls. For example, up to 1953, over 30,000 cows had conceived by one outstanding bull in the NYABC bull stud.

After a publication in England in 1949 reported that bull semen could be frozen in glycerol-containing diluents, Professors Bratton and Foote conducted field studies on frozen semen with New York dairy herds. Satisfactory results were obtained in comparison with unfrozen semen. During these trials, dry ice was used to keep the semen in a frozen state. After liquid nitrogen became available, a frozen semen program was started by the NYABC in 1962.<sup>10</sup>

In his work on the mechanisms of ovulation, Professor Hansel found that administration of atropine blocked ovulation in the bovine. Subsequent experiments led to the development of neurohormonal concepts of the mechanism of ovulation and rapid, accurate assay of methods for determining blood concentrations of the major ovarian and pituitary hormones controlling reproduction in domestic animals. It was demonstrated that pituitary luteinizing hormone (LH) is the major hormone controlling corpus luteum growth and function in the bovine ovary. This and additional knowledge made it possible to develop simple efficient techniques for estrous cycle regulation in cattle and sheep, which allow insemination of large numbers of animals at a preset time

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<sup>10</sup> Professor Foote's research has gained wide recognition throughout the world as indicated by the following awards: New York Farmers' Award (1969), National Association of Animal Breeders' Award (1970) and Upjohn Physiology Award (1985) from the American Dairy Science Association, Animal Physiology and Endocrinology Award (1970) from the American Society of Animal Science, Distinguished Andrologist Award (1985) from the International Society of Andrology and the American Society of Andrology, and the Student-Alumni Award (1976), University of Connecticut.

without checking for estrus. Further, it was found that early embryo mortality is a major cause of infertility in dairy cattle and that the normal embryo stimulates the corpus luteum to secrete increased amounts of progesterone at about the time that most embryo deaths occur in repeat breeding animals.

Between 1951 and 1956 Hansel was the leader of a team conducting research that led to the identification of the causative agent of bovine hyperkeratosis (X-disease) and its elimination from cattle feeds. The causative agent was found to be a highly chlorinated naphthalene, which also has an adverse effect on vitamin A metabolism in cattle.<sup>11</sup>

Long-time studies were initiated in 1948 on the effects of plane of nutrition during early life on growth, reproduction, production, health, and longevity of Holstein cows. These studies received substantial federal support, in addition to several state appropriations, and were contributing projects to the Northeastern Regional Project No. 1 (NE-1), Causes and Prevention of Reproductive Failures in Dairy Cattle. Professor Asdell served very effectively for 10 years as chairman of the regional project committee, which had the responsibility to coordinate the various projects of several experiment stations in the region. Many faculty members in animal husbandry at Cornell were involved in these experiments including Asdell, Bratton, Foote, Hansel, Reid, Loosli, Smith, Trimberger, and Turk, plus several graduate students, and Dr. McEntee of the Veterinary College.

These studies on nutrition and reproduction continued for several years under the leadership of Hansel, Bratton, Asdell, and McEntee. One phase, involving groups of heifers raised on three planes of nutrition and slaughtered at various ages, demonstrated that puberty can be delayed or hastened to a remarkable degree by underfeeding or overfeeding. Detailed studies of the endocrine glands and reproductive tracts, however, revealed few differences after puberty that were attributable to the plane of nutrition (Cornell Univ. Agr. Exp. Sta. Bul. 936, 1959).

A mobile laboratory equipped to sample feed, blood, semen, and reproductive organs was staffed by animal scientists (Asdell, Hansel, and Foote) and veterinary scientists (McEntee and Gilman) to visit herds over the state with reproductive problems. This cooperative approach helped to solve many problems, and pregnancy rates were increased dramatically in some dairy herds.

In another phase of the long-time project, Bratton and Foote were the leaders of studies on the influence of underfeeding and overfeeding of Holstein bulls, from birth to 80 weeks of age, on growth, sexual development, semen production, and fertility. The results showed that body development and the onset of semen production in young bulls can be accelerated by a high level of

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<sup>11</sup> In recognition of his teaching and research contributions, Professor Hansel has received the New York Farmers' Award in 1962, Animal Physiology and Endocrinology Award (1962) and the Morrison Award (1979) from the American Society of Animal Science, National Association of Animal Breeders' Award (1973) and the Borden Award in Dairy Production (1972) from the American Dairy Science Association, and the Hartman Award of the Society for Study of Reproduction (1978). Hansel transferred to the Veterinary College in 1978 as chairman of the Department of Animal Physiology.



feeding during early calthood, but that a low level of feeding does not result in damage to the sperm-producing tissue and delays the onset of semen production only temporarily (Cornell Univ. Agr. Exp. Sta. Bul. 940, 1959). In a subsequent series of experiments, the principal effect on the reproductive function of bulls receiving less than normal amounts of feed appeared to be restriction of sperm output as a consequence of slower development of the testes. After feed intake was raised to normal, sperm output increased gradually to normal levels. Different feeding levels early in life had no marked effect on fertility based on 60- to 90-day nonreturns of cows bred artificially to the experimental bulls (Cornell Univ. Agr. Exp. Sta. Bul. 964, 1961). (Professor Bratton retired on June 30, 1978, after 35 years of teaching, research, and extension at Cornell.)

About 1958 the Office of Experiment Stations, USDA, in Washington, made this comment on the NE-1 project: "A narrowing of the physiological phase of the study appears to be desirable as it seems that the field now under study is much too broad and all-inclusive." Some of us disagreed because sterility in cattle is very complex, and we felt that progress would not be made by narrowing the scope of investigations. Nevertheless, changes were made, and the physiological research on reproductive failures at Cornell became a part of regional project NE-41, Endocrine Factors Affecting Reproduction and Lactation in Dairy Cattle, with the Cornell project having the title, Factors Affecting Ovulation and Ovarian Function in Cattle (Hansel, Asdell, Foote, and Bratton).

I should like to give special recognition to the superb qualities and contributions of Professor S. A. Asdell in his teaching and research in reproductive physiology. The high quality of his scholarship is abundantly evident in his approach to research, and in his teachings, lectures, and writings, all of which have had a profound influence on the science of animals and on people studying this science.

Professor Asdell's lectures were noted for thorough coverage of the subject, interspersed with a subtle humor. He was articulate and possessed an uncanny ability to take a complex subject and present it in a clear, concise, understandable manner to fit his audience, whether it was scientists, students, farmers, county agents, artificial breeding technicians, or DHIA supervisors. These same qualities were exemplified in his many scientific publications, popular articles, and books. His book *Patterns of Mammalian Reproduction* published in 1946 (2d edition 1964), has been a leader in the world in this field. In addition, he wrote *Cattle Fertility and Sterility*, a book published in 1955 with several subsequent reprintings, and a third book, *Dog Breeding: Reproduction and Genetics*, published in 1966.

Professor Asdell proposed many new concepts that led to a better understanding of the reproductive physiology and genetics of animals. Much of his research was conducted in a fundamental manner, but he always sought answers that would have practical value or that in some way would benefit humankind. He had a decided influence on his graduate students and younger colleagues, stimulating them to a high degree of excellence in their teaching, research, and writing.

Because of his work Professor Asdell was invited for guest lectures at universities in many states and in European countries. He was a Fulbright Scholar in Denmark in 1952-53, and on several occasions he served as an official delegate to international symposia and congresses on endocrinology and animal reproduction. Professor Asdell retired on July 1, 1963, after a notable career in teaching and research in animal physiology. He was

awarded the Marshall Medal in 1977 from the Society for the Study of Fertility, Dublin, Ireland, in recognition of distinguished and long-standing contributions to the understanding of reproductive biology. Dr. Asdell was the first Ph.D. student of Dr. F. H. A. Marshall, Cambridge University, in whose honor the award was made.

### **New Directions in Animal Breeding**

As we looked for a replacement for Professor Salisbury, the faculty decided that we should obtain better balance in our work by recruiting a specialist in animal genetics or statistical genetics to fill this position. It was felt that existing staff were well qualified to continue the physiological approaches and a geneticist was needed to fill a void. After months of looking over and evaluating several fine candidates, we were able to attract Dr. Charles R. Henderson, who was completing his Ph.D. at Iowa State College (now Iowa State University) under the direction of Dr. Jay L. Lush. Dr. Lush was considered the dean of animal breeders at that time and gave Henderson an exceedingly high recommendation. He joined our staff with the rank of associate professor on September 16, 1948.

Dr. Henderson had an unusually good background of experience and training for the work we envisioned for him. He was raised on an Iowa crops and livestock farm, earned the B.S. in agriculture and M.S. in nutrition at Iowa State College, spent 5 years in county agent work in Iowa, had 2 years of college teaching and management of livestock herds at Ohio University, and 4 years in nutrition and statistics research as an officer in the Sanitary Corps, U.S. Army, during World War II. For the Ph.D. at Iowa State College, his major field was animal breeding, with minors in genetics and statistics.

Professor Henderson soon demonstrated that he was the "right man" for the "right job" at the "right time." Over many years Cornell had been a leader in utilizing dairy records as a basis for herd improvement. These programs provided a strong foundation for new directions in research in dairy cattle breeding. Henderson recognized the potential for the application of statistical methods to genetic analysis of dairy records and soon became generally recognized as the leading authority in the world on sire evaluation for production traits. He recognized practical problems, developed statistical methods and techniques to solve them, and then devised computing procedures to make these methods practical. The results of his work and those of his associates and graduate students have contributed greatly to increased efficiency of milk production. He became one of the "greats" of the new generation.

In his early work at Cornell, Henderson was a pioneer and leader in the development of young-sire sampling programs in the artificial insemination of dairy cattle. Differences in rate of genetic gain increased greatly after 1958 when the results of the young-sire sampling became visible. The validity of this procedure was verified, and the essential features were adopted by many of the large artificial breeding organizations in the United States.

Further studies provided refined techniques and more-accurate methods of evaluating sires used in artificial insemination. Henderson's leadership is well attested by the adoption at the National DHIA level of the sire evaluation procedure and sire summaries developed by him in New York. This method adjusted daughter records for herd, year, and season effects as well as for numbers of daughters included in the evaluation, thus removing most of the possible environmental biases from AI sire proofs. An earlier method had

used adjusted stablemate averages in sire evaluation in New York and was adopted by the USDA.

In one of his studies, Henderson found that fertility in dairy cows, as measured in DHIA records, is primarily an environmental rather than a genetic problem. This trait was shown to have a very low heritability and provided a basis for artificial breeding organizations to select bulls for predicted daughter production without the handicap also of having to select for high fertility.

An important factor in the rapid application of Henderson's research findings was his close relationships with the extension specialists, Brownell, Albrectsen, Burke, Carter, Spalding, and others. This made possible quick dissemination of information to New York farmers, minimizing the usual time lag between research results and application in the field. Further, active participation of extension-research specialists in the program provided a constant stream of field problems to the animal-breeding research laboratories for solution. This combination of Henderson and his co-workers, together with the availability of a large body of data to be used in an ever-expanding computer capacity, put Cornell ahead of all other institutions in dairy cattle genetics.

Application of research improved the genetic merit of dairy cattle and resulted in 30 to 50 percent faster improvement in milk production in the artificially inseminated cow population than in naturally sired herds. We made a calculation in 1961 showing that every dollar spent on research in dairy cattle breeding was returning more than \$240 to New York's dairy farmers.

Another important contribution during this period of time was Henderson's role in future development of the New York dairy records processing laboratory into a valuable source of data for genetic research. Many genetic theories have been substantiated from the data collected at this center. As an outstanding statistical geneticist, Henderson developed independently, although simultaneously with other geneticists, a method for partitioning genetic variance into components due to additive genetic variance, dominance variance, and higher-order epistatic genetic variance. He has been a foremost contributor to the theory of the selection index and a developer of procedures used in complex statistical analyses. Many of his scientific papers became classics in the field, making major contributions to animal research.<sup>12</sup> Some examples of a long list are these papers: "Selecting and Sampling Young Bulls," "Selection Index and Expected Advance," "Design and Analysis of Animal Husbandry Experiments," "Specific and

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<sup>12</sup> Professor C. R. Henderson reached retirement age on June 30, 1976, and is continuing with productive research in 1986. In recognition of his contributions, he has received many major awards: Borden Award in Dairy Production (1964), National Association of Animal Breeders' Award (1977), and Jay L. Lush Award (1982) from the American Dairy Science Association; Animal Breeding and Genetics Award (1964) and Morrison Award (1971) from the American Society of Animal Science; Eastern Artificial Insemination Cooperative Award of Merit (1968); Hermann von Nathusius Gold Medal (1981) from the German Society of Animal Production; Alumni Research Award (1984), Iowa State University; Henry A. Wallace Award (1984), Iowa State University; member of the National Academy of Sciences (1985); and the Pioneer Award, Beef Improvement Federation (1986).

General Combining Ability," and "Estimation of Variance and Covariance Components." Many others followed in succeeding years, continuing to this day (1986).

Henderson's reputation for providing statistical analyses for complex problems grew rapidly, and he constantly devoted much assistance to colleagues and graduate students in the department, as well as other departments in the university, in other states, and in many other countries. He assisted in setting up analyses on a wide variety of research problems, ranging from physiological measurements in humans to fur animal nutrition.

Increasingly, Henderson was in great demand for lectures and participation in symposia, seminars, and conferences all over the United States and in many other countries to discuss various aspects of his work. He presented many valuable discussions at training schools for AI technicians and DHIA supervisors and at meetings of dairy and livestock breeders.

Much of Professor Henderson's research program was financed on regular state funds and grants from the NYABC, but was greatly strengthened with two special state appropriations, one in 1959 for genetic analysis of dairy records and a second one in 1962 for dairy cattle genetics. These grants and special appropriations helped to meet research costs and provided support for graduate students and other research staff. For example, L. D. Van Vleck came to Cornell on a graduate fellowship from the National Science Foundation. With his superior scholarship record and other qualities, he was appointed research associate and then served as research geneticist and research specialist on NYABC grant funds before his appointment as assistant professor, September 1, 1962. During this time Van Vleck already had published several papers that established a practical basis for use of part lactation records in sire evaluation. This allows use of superior sires much earlier with greater opportunity for increased genetic improvement than is normally the case. Some of the artificial breeding associations soon started screening their young bulls on part lactation performance of daughters to identify superior bulls so that their semen could be banked earlier. Van Vleck made important comparisons of genetic trends resulting from the use of sires in artificial insemination and natural-service sires.

In all of his early work, he demonstrated a keen insight, with an imaginative approach to the solution of practical problems in animal breeding. In a relatively short period of time, Van Vleck became one of the most-productive members of our staff and one of the most-promising among the country's young animal geneticists. His work was complementary to that of Henderson; they provided an unusually strong, capable team in both teaching and research.<sup>13</sup>

In addition to Van Vleck's scientific publications, one of his major contributions soon became evident in the interpretation of his research findings for dairy cattle breeders and farmers through numerous articles in the farm press, such as *Hoard's Dairyman*, the *American Agriculturist*, dairy breed

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<sup>13</sup> Professor Van Vleck's work has been recognized by several awards: Animal Breeding and Genetics Award (1972) from the American Society of Animal Science; National Association of Animal Breeders' Award (1974) and J. L. Lush Award in Animal Breeding and Genetics (1983) from the American Dairy Science Association; and an honorary doctor of science degree from his alma mater, the University of Nebraska (1986).

journals, and other farm magazines. Many of his interpretative articles have also appeared in the farm press in several other countries.

## Dairy Cattle Division

### Management of the Dairy Herd

In addition to my responsibilities as head of the department, I continued in charge of the dairy cattle division, having succeeded Professor Savage in 1944. Until he resigned in 1947, Professor A. A. Spielman gave general faculty supervision to the dairy herd. After that time, Professor George W. Trimberger had this responsibility. Paul Dean continued to do an excellent job in active charge of the main dairy herd on campus and at the Warren farm and of the heifer and dry cow units at Mt. Pleasant. His title was changed from time to time from herdsman to dairy farm manager and finally to dairy cattle superintendent.<sup>14</sup>

Soon after I returned to Cornell in 1944, the decision was made to discontinue the Advanced Registry system of testing for milk and fat production of selected cows, and all the breeds were put on the Herd Improvement Registry system that provides continuous milk records on all cows. Also, a shift was made to twice-a-day milking of cows to conform with the practice of most breeders. Regular type classification was initiated under each of the breed association programs. Later, the herd was entered in the dairy herd improvement association as these records became recognized officially by the several breed associations. Gradually over the next several years, artificial insemination was used in the herd.

We believed that all the livestock herds were maintained for the primary functions of student instruction, for basic and applied research, and as a demonstration of desirable feeding, breeding, and management practices. This was in contrast to some universities that maintained herds for teaching and demonstration purposes separately from herds used for research. No animal was too good to use in an experiment if the problem under study was important to New York farmers. A majority of the animals in the dairy herd were Holsteins, with smaller groups of Brown Swiss, Guernseys, and Jerseys. A small select herd of Ayrshire cows was added in 1957-58. Trimberger worked with a committee of Ayrshire breeders in making the selection.

Some of the better-quality dairy cows and heifers were exhibited at the New York State Fair for a few years, but gradually this practice was discontinued.<sup>15</sup>

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<sup>14</sup> Paul Dean continued as dairy cattle superintendent until 1970 when he retired after 38 years of distinguished service. He suffered a bad accident at the farm in 1969, losing a leg and sustaining other injuries.

<sup>15</sup> The main dairy barns on Tower Road on campus burned on the afternoon of June 22, 1968. All the animals, with the exception of a few small calves, were saved and transferred to the Warren farm.

### Gift of McDonald Farms

An unusual and significant gift to Cornell of the famous McDonald Farms, Cortland, N.Y., was made in 1956. This fine herd of Guernseys was bequeathed to Cornell for use of the College of Agriculture under the will of the late James M. McDonald. The gift included about 1,700 acres of land, along with the farm buildings, appraised at \$338,450; approximately 400 head of registered Guernsey cattle, \$341,000; and farm equipment, \$51,681, making a total value of \$731,131.

The basis for McDonald's interest in the gift to Cornell probably was his close personal friendship with Dean Myers, which came partly from their association together on the Board of Directors of the Marine Midland Bank. Also, Mr. McDonald had close personal relationships with Professors Trimberger and Turk, and Paul Dean. He had high regard for the department's research and extension efforts in dairy cattle improvement in the state and nation.

In discussions that Dean W. I. Myers and I had with Mr. McDonald late in 1955, we had a clear understanding that the gift to Cornell was unrestricted and that, if necessary at some future date, the herd and farm might be sold. But we also had a mutual understanding that it would be Cornell's objective to maintain the herd indefinitely, preferably at McDonald Farms, for educational, research, and demonstration purposes for the good of the dairy industry and as a living memorial to Mr. McDonald. In accepting the gift in 1956, the university assumed the responsibility to fulfill the trust and confidence Mr. McDonald had in us to meet this objective.

Mr. McDonald had planned to establish an endowment fund from sales of cattle from the herd, but unfortunately he died before this was accomplished. We anticipated that it would be difficult for the farm to be self-sufficient financially, so we encouraged Mr. McDonald's son and daughter and her husband and the McDonald Foundation to continue their interest and support. The foundation responded with a yearly grant of \$15,000. This was applied toward costs of operation and research during each of the next several years. Two of the outlying farms were sold, and the funds were used to start an endowment fund for the farm.

Soon after McDonald Farms became Cornell's property, we established a departmental committee comprising Professors Albrechtsen, Brownell, Henderson, and Foote to work with me in developing plans for using the farm for educational, research, and demonstration purposes. Trimberger was added to the committee when he returned from his assignment in the Philippines in 1957. After suggestions from nearly all staff members, as well as from breeders, general agreement was reached on three research areas: (1) the inheritance and progress possible within a herd when selections are based on either milk or butterfat; (2) the efficiency of feed utilization of the milking cows in the herd; and (3) milk composition, especially solids-not-fat, and factors affecting milk composition.

An advisory committee was established, comprising four or five prominent Guernsey breeders in New York State and other states, plus Robert D. Stewart, secretary of the American Guernsey Cattle Club, and Dr. Ned D. Bayley, chief of Dairy Cattle Breeding Investigations, U.S. Department of Agriculture. Members of the advisory committee were rotated about every 3 years. They met with us from time to time, usually once each year, to give us their counsel and advice on policies relating to operations and research. Mr. K. C. Sly continued to serve as farm manager and Mr. Henry Thomas served as herdsman and Professor Trimberger as faculty liaison.

The herd was adjusted somewhat in size to about 80 cows and placed on HIR and DHIA testing programs, and all cows were classified for type on a regular basis. Selected animals were exhibited at two or three of the major dairy shows each year to maintain interest among breeders and sales value of bulls and other animals that would be sold. McDonald Farms animals maintained the high standards that had been established earlier in production and in the show ring.

In addition to the annual grant from the McDonald Foundation, a special state appropriation of \$10,000 was obtained in 1962-63 for support of dairy cattle genetics studies at McDonald Farms. Also, some state funds were obtained for partial support of feed efficiency studies. The farm was located about 22 miles from the campus, which required about 30 minutes of travel time each way.<sup>16</sup>

### Research with Dairy Cattle

Dairy cattle research expanded quite rapidly beginning in the mid-1940s with the addition of new faculty members. Excellent cooperation developed with mutual interests among the staff in dairy cattle and those in animal nutrition, animal breeding, and physiology. Although major interests continued on solving practical problems of dairy farmers, there was a fairly rapid trend toward more basic and fundamental areas.

During the 3 years that Professor Spielman was on the staff, his research in dairy cattle nutrition was concerned mainly with carotene and vitamin A requirements of the dairy calf from birth to 60 days of age, factors affecting the vitamin A and carotene content of colostrum, and use of supplementary vitamins for young dairy calves under farm conditions. Professors Loosli, Norton, and Turk cooperated in all these projects, along with several graduate assistants. It was demonstrated that, by adding a concentrated vitamin A supplement to a good ration for dairy cows for several weeks before calving, the vitamin A of the colostrum and also the storage of it in the body of the calf could be considerably increased. Incidence of scours was significantly lower in calves from dams fed supplementary vitamin A than in calves from control dams.

A large-scale field trial involving over 1,300 dairy calves in 48 farm herds did not show any advantage to feeding extra vitamins to newborn calves raised under farm conditions of good, fair, or poor feeding and management. Feeding of supplementary vitamins did not materially reduce the incidence or duration of scours, nor was there any apparent improvement in the general appearance and condition of the calves up to 30 days of age.

Spielman resigned on August 1, 1947, to become head of the animal industries department at the University of Connecticut. Later, he served as dean of agriculture at the University of Massachusetts. Professor George W. Trimberger was transferred from extension to the resident staff for teaching and research in 1947 to the position vacated by Spielman.

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<sup>16</sup> The McDonald Farms herd was dispersed at public auction on September 25, 1967. The farms, buildings, and equipment were sold to Eleanor and Reed McJunkin (daughter and son-in-law of the late Mr. J. M. McDonald). Several factors were involved in the decision to sell the herd of cattle and farms, the most important being the high labor costs of operation.

Dr. Norton continued some feeding trials with lactating cows that indicated little or no difference in the palatability and feeding value of concentrate mixtures that varied widely in the ingredients used. Also, he contributed to the improvement of the Cornell dry calf starter that was used by dairy farmers throughout the Northeast.

Dr. Norton left Cornell on February 14, 1947, to accept a position as head of the animal industry department at the University of Rhode Island. He moved on later to the headship of the Departments of Dairy Science at Oklahoma State University and Kansas State University.

Dr. Samuel T. Slack joined the faculty in 1951 on a joint appointment as assistant professor in extension and research. His research interests focused on calf feeding and management and on forage utilization by dairy cattle.

A long-term project on the nutritive value of forages, started in 1944, expanded into several areas in succeeding years and involved cooperation with staff in other departments, mainly agronomy and agricultural engineering. Twelve years of studies were devoted to the effects of harvesting and curing methods on the feeding value of forages. During the first 3 years, K. L. Turk was the leader of the project, with the collaboration of Spielman, Norton, and Loosli. After Spielman and Norton left, Trimberger and Slack were leaders of the investigations.

Comparisons were made of barn-dried hay (using unheated air), field-cured hay stored loose, and field-cured hay windrow baled. No significant differences were measured in hay consumption or milk production. The forages (mixed timothy-legume) were all cut at the same time from the same field. The barn-dried hay was generally greener in color and graded approximately one federal grade higher than the other hays. Also, the barn-dried hay was higher in carotene at time of feeding than the field-cured hays.

Further experiments showed the barn drying method resulted in greater preservation of dry matter per acre than did hay-crop silage or field curing. Although the differences were not significant, slightly more milk was produced per pound of dry matter intake from hay-crop silage than from barn-dried or field-cured hay. Because of the savings in dry matter, there was a difference favoring barn drying on a milk-production-per-acre basis. The use of a hay crusher greatly speeded the curing of hay in the field, compared with a regular mower, resulting in higher-quality hay (Cornell Univ. Agr. Exp. Sta. Bul. 874, 1951).

Another series of trials conducted over a 5-year period clearly demonstrated the superiority of early harvested forages in promoting and sustaining high milk production in comparison with the same forages cut at late stages of maturity. The cows produced more milk on a low grain level and early cut forages, than on a higher grain level and late-cut forages, thus demonstrating the grain-saving power of early harvested forages (Cornell Univ. Agr. Exp. Sta. Bul. 957, 1960).

Farmers sometimes question whether experiments conducted at the experiment station will give the same results on their farms. So during the 1958-59 winter feeding season, seven good dairy farmers in the state participated in 12-week tests on their farms comparing early and late-cut forages. On each of these farms, the cows were fed late-cut forage for 4 weeks, early cut forage for the next 4 weeks, and late-cut forage for the final 4 weeks. Milk production jumped 34 percent when early cut forage was substituted for late-cut forage and feeding rates for grain and silage were kept constant. Hay consumption went up 26 percent when the cows were switched from late- to early cut hay.



Switching the same cows back to late-cut hay resulted in a 21 percent decrease in intake.

A series of experiments demonstrated that partial wilting of the legume-grass mixtures before ensiling was more effective in the reduction of nutrient losses than the addition of dry chopped hay. Wilting the forage before it was ensiled resulted in a significant saving of nutrients during storage and avoided the offensive odors that result from excessive juice runoff. Several preservatives were tested, and none of them decreased storage losses sufficiently over untreated silage to warrant their use (Cornell Univ. Agr. Exp. Sta. Bul. 912 and 913, 1955).

The addition of Professor J. Thomas Reid to the faculty as associate professor in 1948 brought a new aggressive dimension to the work in dairy cattle nutrition. He quickly became one of the most-productive scientists in the history of the department, and his research and publications rapidly led to national and international recognition. He had the drive of a workaholic who thought working hard is the way life is supposed to be. Methods and principles he developed were widely adopted as research tools by fellow scientists around the world. One of his early contributions was the development of a new indicator method for the determination of digestibility and consumption of forages by ruminants. He found that forages contain natural chromogenic substances that are indigestible, completely recoverable in the feces, and, therefore, adaptable to use as a reference material for the indirect measurement of digestibility and consumption of forages by ruminants. Later, chromogen and chromic oxide indicators were used simultaneously for measuring the digestibility of forages.

Over the next few years Professor Reid and his graduate students contributed much new knowledge on the digestibility and interrelationships of various carbohydrate fractions of pasture herbage and harvested forages. Important investigations were conducted on degree of herbage selection by grazing animals.

A significant contribution of Reid's work on perennial forages was the demonstration that nutritive value could be predicted by the date of harvest. This complemented the applied research on effects of curing and storage methods on nutritive value of forages and helped in the establishment of a principle that changed forage harvesting and storage patterns throughout the northeastern United States. In just a few years, a vast majority of farmers in the region advanced their dates for harvesting of forages for either hay or silage by approximately 3 weeks.

A new state appropriation was obtained for research on forage utilization in 1948-49, and grants from the Cooperative G.L.F. Exchange supported the work for many years. Federal Hatch funding also was provided for the forage research, and in 1958 four of the department's projects, involving seven or eight faculty members and several graduate students, became part of the Northeastern Regional Research Project (NE-21).

A new interdepartmental forage utilization laboratory was completed in 1958-59 at a cost of \$30,000 provided by the state. This facility located just east of the dairy barns permitted plant breeders and agronomists, in cooperation with Dr. Reid, to evaluate new varieties, as well as fertilizer and management practices, in terms of actual animal performance. Professor Reid and associates in animal husbandry investigated the relationship between forage quality and efficiency of utilization by cattle and sheep. Fundamental studies in this laboratory did much to further understanding of the biological processes involved in forage digestion, assimilation, and

metabolism. Significant contributions were made toward the ability of animal and plant scientists to evaluate forage quality by methods other than time-consuming and expensive feeding trials.

Professor Reid led a team of colleagues and graduate students in long-term studies on energy use by dairy cattle for productive, reproductive, and life-span performance that led to the determination and clarification of the nutritional requirements of various species. A classical study was conducted, beginning in 1948, on the effect of level of early nutrition on ultimate lifetime performance of dairy cattle. The results showed some disadvantages of both overfeeding and underfeeding during the growing period. Further, the results indicated that the plane of nutrition provided during lactation has a much more pronounced effect on milk yield than does the level of feeding imposed during the early growing period. Except for differences in onset of puberty, there were no differences in reproductive efficiency attributable to feeding levels early in life.

Another significant area of Professor Reid's intensive research dealt with the quantitative nature of body composition as influenced by energy, growth rate, age, and species. These studies with cattle, sheep, and swine demonstrated that sex, breed, and body weight are more significant in predicting the composition of carcass at slaughter than the kind of ration fed. He used antipyrone and tritium for measuring body water of animals and worked out procedures for using these data in arriving at the body composition of living animals. Substantial grants were obtained from the U.S. Public Health Service for measurement of chemical composition of farm animals.<sup>17</sup>

Professor Trimberger's interests covered the whole spectrum of dairy production.<sup>18</sup> For example, in his earlier work at the University of Nebraska, he pioneered in studies on artificial insemination and reproductive physiology. His recommendations on the A.M.-P.M. detection of estrus and insemination still stand. After he transferred from extension to resident teaching and research here at Cornell, Trimberger collaborated with Hansel on studies of

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<sup>17</sup> Professor J. T. Reid succeeded Professor Loosli as department head on July 1, 1971, and served in this capacity until 1976. Tom's brilliant career ended on November 18, 1979, when he died suddenly of a heart attack. His research was widely acclaimed and recognized with many awards: American Feed Manufacturers' Award in Animal Nutrition (1950) and Borden Award in Dairy Production (1951) from the American Dairy Science Association; New York Farmers' Award (1963); American Grassland Council's Award (1965); and Morrison award (1967) from the American Society of Animal Science. Many of his graduate students are now leaders in their fields.

<sup>18</sup> Professor Trimberger retired on December 31, 1974, after 30 years of extension, teaching, and research at Cornell. He received the following recognitions of his work: New York Farmers' Award, 1973; president of the Dairy Shrine Club, 1973-74, and Guest of Honor, 1982; New York Holstein Association Portrait Presentation, 1974; Brown Swiss Cattle Breeders' Association National Award of Merit, 1974; and first recipient of the Distinguished Service Award, New York Purebred Dairy Cattle Association, 1985.

Two funds that bear his name have been established in the College of Agriculture and Life Sciences by former students and friends: the Trimberger Scholarship for worthy students interested in dairy judging and the Harrison-Trimberger-Slack Fund to support the department programs in dairy cattle selection and judging.

conception rate and ovarian function following estrous control by progesterone injections in dairy cattle. Other studies dealt with time of ovulation, and it was found that optimum time of first service was obtained by breeding after 50 days postpartum. This type of information was widely used in artificial insemination programs. In cooperation with Dr. Fincher of the Veterinary College, Trimmer made an exhaustive study of the regularity of estrus, ovarian function, and conception rates in the Cornell dairy herd (Cornell Univ. Agr. Exp. Sta. Bul. 911, 1956).

We were successful in getting a new state position in the 1948-49 budget for teaching and research with dairy cattle. Dr. L. H. Schultz was appointed assistant professor on this item effective July 1, 1949. Dr. Schultz was brought up on a purebred Guernsey farm in Wisconsin and was an excellent undergraduate student at the University of Wisconsin. He obtained the M.S. degree in dairy husbandry at the University of Minnesota and Ph.D. at Wisconsin with outstanding records of accomplishment. He had an unusual experience as one of the student herdsman for the Borden Company dairy cattle exhibit at the 1939 New York World's Fair. At the beginning, we asked Dr. Schultz to assist with the teaching of the dairy cattle course, but ultimately we expected him to devote his major research interests to milk secretion and lactation physiology and to teach courses in this field.

Professor Schultz quickly demonstrated unusual abilities in teaching and research and gave freely of his time for meetings and demonstrations with dairy farmers and 4-H clubs over the state. All these qualities gained him rapid promotion to associate professor in 1952 and professor in 1954.

In his early work Schultz investigated machine milking methods, including the effects of various combinations of vacuum and pulsation rates and teat cup design on milking speed. Effects of many factors on milking rate were studied, including variations between cows, stage of lactation, age, and breed differences. Effects of oxytocin on rate of milking of slow-milking cows also were measured.

Research under the leadership of Professor Schultz on the causes and prevention of ketosis, or acetonemia, in dairy cows is a good example of basic research in the solution of practical farm problems. Ketosis is a serious metabolic disease in dairy cows that was costing dairy farmers more than nine million dollars annually at that time. Studies by Schultz and his graduate students on the production, absorption, and metabolism of volatile fatty acids in the rumen of dairy cattle, especially propionic acid, provided the basis for the effective use of sodium propionate in the treatment of ketosis. Further studies indicated its value in prevention of the metabolic disorder.

When Professor Schultz was attracted back to his home state of Wisconsin and the university at Madison in 1957, one of his graduate students, Dr. Glen H. Schmidt, was appointed as his successor in 1958. Dr. Schmidt's thesis research dealt with the effect of three levels of grain feeding during the dry period on the incidence of ketosis, severity of udder edema, and subsequent milk production of dairy cows. It was significant that heavy concentrate feeding did not have an adverse effect on mastitis and udder edema. During the next few years Schmidt's research involved basic studies on the physiology and biochemistry of milk secretion and on applied work relating to management of dairy cattle. Some of this work included the effects of milking machine design on milking rate and mastitis, of unequal milking intervals on milk production, and of management practices on milk yield and mastitis (Cornell Univ. Agr. Exp. Sta. Bul. 983, 1963; 996, 1964).

In addition to his teaching and research, Professor Schmidt participated in one of the department's major extension projects—Project M (managed milking, milk quality, milking machines, and mastitis control). Professor G. H. Schmidt resigned on August 20, 1974, to accept a position as chairman, Department of Dairy Science, Ohio State University.

## Beef Cattle and Meats Divisions

### Beef Cattle Operations

Professor J. I. Miller was in charge of beef cattle teaching and research beginning in 1943 and continued in this capacity during my period as head of the department. He had faculty responsibilities for the beef cattle herd and all the facilities. Kenneth Tillapaugh succeeded William Slaight as beef cattle manager in 1946 and was responsible for all day-to-day operations of the cattle and the pastures, including feeding and grazing experiments.

Some additional facilities for beef cattle became available in 1949. After the second horse barn burned, we asked for a new state appropriation in 1946 to rebuild it. Considerable difficulty was encountered in getting the funds because of declining numbers of horses on New York State farms. But we had good herds of Belgian and Percheron horses that were used for teaching and no suitable barn for them. Horse breeders came to our support, and a compromise was worked out with the state to construct a barn that could be used for both beef cattle and horses. This new barn was built near the existing beef cattle barn, with one wing providing pens and lots for cattle. The other wing contained box stalls for horses. The new cattle pens soon were filled to capacity with experimental steers.

The Angus and Hereford herds increased gradually with some gifts from interested breeders and with purchases of selected animals. The first sizable and notable donation of Herefords came in 1956 from Northern Pump Farm in Wisconsin, owned by Mr. John B. Hawley, a Cornell graduate, who was interested in helping improve the Cornell herd. He donated 17 purebred heifers that contributed to the quality of the herd. Another breeder in New Jersey dispersed his Herefords and gave 10 cows and their calves to Cornell.

The donor of the first purebred Herefords to Cornell back in 1917, Mr. Albert K. Mitchell of New Mexico, was a frequent visitor. A bull of his selection from his well-known herd, purchased in 1954, turned out to be an excellent sire, and two of his male offspring were used successfully in the Cornell herd. After this time, Mr. Mitchell and his son, also a Cornell graduate, donated a succession of good bulls that were used.

Professor Miller started the first official herd classification for beef cattle in 1945 with the Cornell herd. This was patterned after type-classification programs used by dairy breed associations. It was significant that in 1957 the American Angus Association adopted a national type-classification program based on the New York plan.

We were pleased that each of the state beef cattle associations chose to have their annual sales in the livestock pavilion on the Cornell campus. Professor Miller and Ken Tillapaugh cooperated with a consignment of one or two animals at each of the Hereford and Angus sales as a means of marketing surplus animals. The department continued to exhibit selected animals of the beef breeds each year at the New York State Fair. They competed successfully

and always were well presented by Ken Tillapaugh. Although there were few Shorthorn breeders, they also held an occasional sale on campus.

Cornell consigned animals to regional sales once in a while. A notable example was the Angus heifer, Kindew Cornell, that sold in the 1944 Eastern Regional Sale held at Trenton, New Jersey, for \$6,250. This was a high price at that time and helped the budget considerably! Professor Hinman had purchased this heifer's mother several years earlier for \$100.

Another noteworthy event took place a few years later. Professor Miller received a telephone call one day from a close personal friend of President Eisenhower. He wanted to buy from Cornell an Angus heifer, which he could present to the president as a birthday gift to add to a small herd on his farm at Gettysburg, Pennsylvania. John Miller selected a high-quality yearling heifer for the president's friend. Somewhat later, I was privileged to have lunch one day with President Eisenhower, as a guest of Deane W. Malott, president of Cornell University. I inquired about the Angus heifer, and President Eisenhower told me she turned out to be one of the best cows in his herd. She was a member of the Kindew family.

Our beef cattle program received some unusual publicity on national TV on Sunday, October 29, 1961. A Cornell Hereford steer, champion at the New York State Fair, was chosen as a gift for Kyle Rote, captain of the New York Giants football team, from the American and New York Hereford Associations. With Ken Tillapaugh at the halter, the presentation was made just prior to the start of the game against the Dallas Cowboys before an audience of 60,000 people and many thousand TV viewers.

## Beef Cattle Research

In his research Professor Miller gave emphasis to practical problems of beef cattle production in New York and the Northeast. His first priority in utilizing his data was to put the results in a form that associates, students, county agents, and livestock producers could use. Therefore, his research data were often published first in mimeographs. He also published results of many experiments in scientific journals and experiment station bulletins.

In his earlier research Miller made extensive studies of the protein requirements of beef cattle and sheep in collaboration with Professor Morrison. These data served as the basis for Morrison's recommendations in *Feeds and Feeding* for these species. His findings on protein requirements were used by the National Research Council in 1945 in its first publication on the *Nutritive Requirements of Sheep*.

Extensive trials were conducted to determine how best to utilize New York's permanent pastures in the growing and fattening of steers. In this grain-deficient and natural good-grass region, these experiments were of great value in demonstrating the quality of beef that can be produced most economically, under varying conditions, with 100 days or more on good pasture. The more growth and fattening made on pasture, the cheaper the cost per hundredweight of gain (Cornell Univ. Agr. Exp. Sta. Bul. 890, 1953).

Another long series of experiments was completed to determine the feeding value of common harvested forages, including the effect of stage of maturity and ensiling, for wintering rations for steer calves and for mature brood cows. The results of these investigations demonstrated that cattlemen in the Northeast obtain the best results by following a flexible feeding

program, with each stage including pasture and other high-quality forages (Cornell Univ. Agr. Exp. Sta. Bul. 923, 1957).

Professor Miller was one of the pioneers on the use of pelleted forages for livestock and demonstrated that the original quality of the forage made into pellets had the greatest influence on their feeding value, especially in fattening rations in dry lot. Under the conditions of these experiments with fattening steers, hay pellets contributed to the rations about 50 percent more feeding value than would be expected from comparable long hays. Other significant research involved the use of stilbestrol in fattening rations of steers.

Along with his work with livestock farmers and his studies to solve practical problems, perhaps Professor Miller's greatest contributions were through his students, especially undergraduates. He was successful as a teacher because he always had an excellent grasp of subject matter, he was fair and objective in his appraisal of his students, and he passed on his own genuine interest to those around him. His expectations were high, and the students respected him. He modified the subject matter taught as the demands and conditions changed with time. His courses in beef cattle production and livestock selection and management always attracted unusual numbers of students year after year, despite the fact that New York is primarily a dairy cattle state. The significance of this is put in perspective when it is recognized that selection of courses, with a few exceptions, was left largely to the option of the students.

Throughout his career Professor Miller served each year as faculty adviser to 30 to 50 undergraduate students. He served also as adviser to the Round-Up Club (Cornell Chapter of Block and Bridle) and to Ho-Nun-De-Kah (student honorary club in the College of Agriculture). A list of his former students resembles a "Who's Who" in New York State and American agriculture. Included are dozens of current leaders in livestock production; agricultural business and banking; university teaching, research, and extension in the United States and abroad; governmental agencies; and agricultural industries.

In recognition of his contributions Professor Miller received the New York Farmers' Award in 1951 and the Distinguished Service Award, North Atlantic Section, American Society of Animal Production the same year.

Professor Miller was a leader in the American Society of Animal Production and was elected president in 1955. In addition, he held a number of positions in the society, serving as a member of the editorial board and business manager of the *Journal of Animal Science*, treasurer and director, and on many important committees.<sup>19</sup>

### Meats Research and Instruction

Professor Miller served concurrently in charge of the beef cattle division and the meats division from 1943 to 1956, at which time Professor George H. Wellington was placed in charge of the meats work.

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<sup>19</sup> Professor J. I. Miller died after a brief illness on December 8, 1980. He had retired in 1976 after 40 years at Cornell. He was named an Honorary Fellow of the American Society of Animal Science in 1980.

During the late 1940s and early 1950s, Wanderstock and Miller continued their studies on effects of rations on quality and palatability of beef; methods of storing cured pork products during the summer without refrigeration; quality and keeping qualities of meat as affected by various treatments and wraps before storage in freezers; time and temperature factors in aging of beef for preservation in freezers; and quality of frozen beef as affected by rations, rate of freezing, and period of storage. Dr. J. J. Wanderstock transferred from animal husbandry to the School of Hotel Administration on February 15, 1952.

Professor Wellington's major research included pioneering studies on the effect of steroid hormones on meat production and quality, humane slaughter of animals, and the development of techniques for live animal and carcass evaluation. In the carcass studies in collaboration with Professor Reid, the interrelationships among concentrations of the chemical components of various meat-producing animals were found to be quite specific within species irrespective of breed, sex, and level of nutrition. Long-term studies with cattle were concerned with the influence of energy input, sex, body type, age, and body size on carcass composition and meat quality. Tenderness, cookability, and acceptance of meat products were measured. An interesting observation was that beef of higher fat content was not more tender than leaner beef if produced by animals of the same age.<sup>20</sup>

Mr. C. D. Schutt retired from the staff on June 30, 1953, after 31 years of work, most of it as an instructor in the meats laboratories. He taught several thousand students, primarily through courses in slaughtering of meat animals and meat cutting. He was held in high regard as a teacher, both by his colleagues in the department and by his students. Schutt's position was upgraded and filled by Mr. Hugh D. Nauman on October 1, 1953, with his appointment as assistant professor for teaching and research in meats. Mr. Nauman had completed the M.S. degree at the University of Missouri and most of the requirements for the Ph.D. in meat technology before coming to Cornell. He made good progress, especially in teaching, but was attracted back to Missouri and resigned on July 1, 1955.

A new faculty member was added with the appointment of Dr. James R. Stouffer, assistant professor, for teaching and research in meats on September 1, 1956, to succeed Mr. Nauman. He came to us from the University of Connecticut; earlier his graduate work was at the University of Illinois.

Wellington and Stouffer made extensive studies on beef marbling—estimating the amount and its influence on tenderness and juiciness. Photographic standards were established for different degrees of marbling to study their influence on the palatability factors. Although marbling was associated with juiciness and flavor, its influence on tenderness was only slight. At the time of this research, most beef and meat authorities were convinced that marbling was the ultimate index of beef palatability. Our Cornell scientists were perhaps the first to have the courage to challenge this and to say that other factors were largely responsible for tenderness. These were the collagen cross-linking that develops with animal maturity and the extent of muscle

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<sup>20</sup> Professor George H. Wellington retired December 31, 1977, after 30 years on the faculty. He was the recipient of the Signal Service Award of the American Meat Science Association in 1966 and served as president of this association in 1970.

"cold shortening," which occasionally develops during carcass chilling (Cornell Univ. Agr. Exp. Sta. Bul. 941, 1959).

Stimulated by studies that had been reported elsewhere on the use of ultrasonic techniques for measuring back fat in live cattle and hogs, Professor Stouffer initiated long-term investigations early in 1959 to develop an ultrasonic method for detecting the borders of the rib-eye and associated fat in live animals. Simultaneously with this, the objective was to record the results in a cross-section photograph. Another objective was to test the accuracy and practical use of the method in the field with cattle and hogs.

This work in adapting ultrasonic techniques to measurement of fat and lean in live animals attracted wide attention throughout the United States and in other countries. Stouffer was in great demand to give lectures and demonstrations to various livestock groups and universities in several states and at some of the major livestock shows. It was felt (and hoped) that further refinement of this technique would have great promise for use in progeny testing of animals and might enable breeders to select and produce meat animals that more nearly met consumer demands. The first studies showed that the instrumentation and techniques used at that time were not sufficiently accurate to be used as a commercial selection tool by livestock breeders. However, the principle and sensitivity of the method warranted further refinement of the equipment and technique, which took place in succeeding years and ultimately attracted attention and application in human medicine.<sup>21</sup>

Before the construction of Morrison Hall, the meats laboratories were not adequate for high-quality teaching and research. But with the new building, excellent facilities were provided for both functions. Also, a salesroom was provided to market the meat utilized in the teaching laboratories. (After more than 60 years of operation, the retail meat salesroom was closed in 1983.)

## Sheep and Swine Divisions

Professor J. P. Willman continued his diligent work in charge of the teaching and research with sheep and swine in the department during the late 1940s and early 1950s. He was at the Waite farm almost every day checking on the routine management operations and experiments in progress.

G. L. (Larry) Hunt continued as shepherd, or sheep farm manager, responsible for the operations at the sheep farm. John A. Dunn was the swine herdsman, later swine farm manager, during this period of time. They were cooperative with faculty and graduate students and effective in teaching husbandry practices to students.

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<sup>21</sup> After the retirement of Professor Wellington, Professor Stouffer was in charge of the meats division through 1983. In recognition of his effectiveness as a teacher, Stouffer received the Distinguished Teaching Award of the American Meat Science Association in 1974, and his research contributions earned him the Signal Service Award from this association in 1982. Also, Stouffer received the William J. Fry Memorial Award in 1982 from the American Institute of Ultrasound in Medicine.



## Faculty Additions

Swine research was strengthened in 1951 with the appointment of Dr. B. E. Sheffy as assistant professor. He completed his graduate studies for the Ph.D. in swine nutrition at the University of Wisconsin. This salary item became available when Professor Morrison requested that his status be changed to serve as professor without salary, effective April 1, 1951.

After Willman retired in 1957, the sheep and swine divisions were separated. Dr. Douglas E. Hogue was appointed assistant professor, in charge of sheep instruction and research, on October 1, 1957. Hogue did his undergraduate work at the University of California and graduate studies for the M.S. and Ph.D. at Cornell. Dr. Wilson G. Pond was appointed assistant professor on August 1, 1957, in charge of instruction and research with swine. After his undergraduate work at the University of Minnesota, Pond earned the M.S. and Ph.D. at Oklahoma State University.

## Sheep Research

Over the years, Willman's investigations provided much information on the protein requirement of fattening lambs and on the feeding value of many by-product feeds in the rations of fattening lambs and breeding ewes. In cooperation with veterinarians, he helped solve the problems of internal parasites in sheep and worked out successful treatment and management practices. The results of all these studies were carried directly to producers and were used successfully in improved sheep production throughout the state. With changing conditions among the sheep farmers in New York, however, the research on fattening feeder lambs gradually was phased out during the late 1950s.

Perhaps Professor Willman's most noteworthy accomplishment in sheep research was his long-time study of the stiff-lamb disease, which resulted in solving this important problem. As the leader of the research team, he demonstrated that the disease was caused by a nutritional deficiency that could be prevented by proper feeding and that a deficiency of vitamin E (alpha tocopherol) was the specific cause. Although the practical problems had been corrected, Willman and colleagues continued to study the basic problem to obtain more scientific answers.

With the collaboration of nutritionists in the department, it was shown that a low level of total tocopherols in the milk of ewes fed the basic ration of alfalfa and cull beans was the cause of the muscular dystrophy observed among the lambs. The condition was cured by administering tocopherols to the lambs, but it was not prevented by prepartum supplementation with tocopherols.

Although vitamin E was effective in preventing muscular dystrophy, some of Professor Willman's colleagues and graduate students did not feel that the complete answer was a simple vitamin E deficiency. One of the graduate students, D. E. Hogue, conducted some experiments beginning in 1955 to elucidate further the nutritional factors involved in the stiff-lamb disease. These tests demonstrated that another factor(s) was effective in preventing muscular dystrophy in lambs and that selenium was apparently the factor, or one of them. Also, it was found that cull beans may contain an inhibitory-like factor that enhances muscular dystrophy in lambs.

After he joined the faculty, Dr. Hogue gave leadership to additional studies on the vitamin E-selenium relationships. It was clearly demonstrated that selenium is effective in prevention of muscular dystrophy in lambs, although placental and mammary transfer of either selenium or vitamin E may not be sufficient for complete protection. But when both selenium and vitamin E were given the ewes, dystrophy was completely prevented in the lambs. Cooking of the basal ration fed the ewes prevented the condition in lambs, indicating a heat-labile antagonist may be present in the basal feeds. Also, selenium did not overcome muscular dystrophy produced by including cod liver oil in rations of calves.

In another area of sheep research, Dr. Hogue and graduate students studied the effects of energy intake and number of lambs suckled, on milk yield, milk composition, and energetic efficiency in lactating ewes. Significant increases in lamb weight gains were obtained by raising the energy levels fed in excess of the requirements recommended by the National Research Council (1957) without a loss in energetic efficiency.

Studies were conducted on the efficiency with which single lambs and twin lamb pairs convert milk and supplemental feed energy and protein into weight gains, as well as the energy and protein of these gains at different levels of milk intake.

As a phase of the department's long-term studies on forage utilization, 3 years of experiments with lambs of native and western origin showed that early cut hay gave significant increases in digestibility of dry matter, crude fiber, and protein over late-cut hay (alfalfa-clover-timothy mixture), even though wide variations were observed from year to year.

Other significant research efforts dealt with early weaning and artificial rearing of lambs and the development of highly productive frequent-lambing sheep-management systems.

### Swine Research

Professor Willman's contributions to swine production in New York State and the Northeast were equal in value to his contributions to sheep production. His bulletins served as a guide to swine production in this region. His extensive and thorough studies on anemia in suckling pigs and the widespread dissemination of his reports to swine producers brought about the almost complete elimination of this important problem. He made careful studies of the value of most of the common protein supplements and of many special by-product feed ingredients for swine. He added new knowledge on such problems as causes of stillbirth in swine, the relation of specific feeds to carcass quality, the influence of thiouracil on growing and fattening of swine, and the value of special mineral and vitamin supplements.

Noteworthy among Willman's contributions toward the end of his active career was the first demonstration that the feeding of trace mineral elements significantly increases the rate of growth of fattening swine, even when they are fed rations that had previously been considered to be of excellent quality.

Dr. Sheffy collaborated with Professor Willman on swine-feeding experiments, but in addition, he initiated a series of investigations of the nutritive requirements of baby pigs. Maximum growth and feed efficiency occurred on 32 percent protein diets; however, relatively good growth was obtained on protein levels of 25-28 percent. Requirements of suckling pigs for the amino

acids, threonine and leucine, also were determined. Minimum requirements to provide a trace of liver storage of vitamin A were established.

During 1952 and 1953, a serious outbreak of atrophic rhinitis in the Cornell swine herd interfered considerably with the swine research program. Professors Sheffy and Willman worked with members of the Veterinary College staff in an effort to obtain a better understanding of the disease and its causes and to develop plans for its elimination.

### **J. P. Willman Retires**

"J. P.," as he was known by his students, friends, and associates, was a popular, effective teacher in the sheep and swine production courses and in the elementary course in livestock production. Indicative of his unusual success as a teacher was his selection by the students of the College of Agriculture for the Professor of Merit Award in 1951. At that time he was one of only five professors in the college who had been honored with this award. He was a very popular teacher, unusually effective as a counselor and adviser to students. He served as a "father confessor" to hundreds of students who went to him with their personal and scholastic problems.

In all his investigations, "J. P." was always willing to tackle an important problem, first, with the idea of finding a practical solution of value to the livestock producer and, second, to find the scientific explanation of the problem involved. He was one of the rare individuals in research who was willing to stick with an important problem until he obtained a complete and final answer rather than leave it partially done and move to new areas that promised quick results.

In spite of gradual failing health with Parkinson's disease, Professor Willman maintained an optimistic outlook and carried a full load of work effectively and efficiently until his physical condition made it necessary for him to take early retirement on January 31, 1957. He had a distinguished record of 35 years at Cornell. After a long illness Professor Willman died on November 8, 1963.

After Willman's retirement, Dr. Pond continued the research, in cooperation with veterinary scientists, on the relation of nutrition and management to diseases in swine. A practical program was worked out for elimination of virus pneumonia and atrophic rhinitis from swine by inexpensive practices. Previously, infectious agents had been considered the cause, but these experiments showed that adequate intakes of calcium were critical for prevention of typical pathological changes seen in atrophic rhinitis.

Dr. Pond's research over the next several years provided much useful information on swine nutrition and utilization of feeds by swine. These studies demonstrated the value of specific amino acid supplements and contributed to knowledge on the utilization of soybean protein by baby pigs and the effects of amino acids and antibiotics in improving the utilization of corn protein for growing pigs. Comparisons were made between different protein sources and levels as they are interrelated with dietary fat and total energy level in their effect upon growth rate and feed utilization. Basic studies on protein-calorie malnutrition in baby pigs helped to define the pathological and metabolic parameters involved. The role of enzymes in the improvement of the utilization of protein and other nutrients by swine was refined and extended.

Other studies demonstrated that growing pigs have a requirement for zinc in their rations. The usefulness of several iron compounds in swine nutrition was evaluated. It was shown that none of the iron-containing compounds were transferred from the sow's ration through the mammary gland into the milk in sufficient amounts to prevent baby-pig anemia.

In addition to his productive scientific findings, Dr. Pond recognized that research results need to be applied by producers if they are to have value; therefore, he helped swine producers make maximum use of the newest and best information about nutrition, breeding, and management. Most of the experimental results were put out in mimeographs for use by county agents and producers and also were published in scientific journals for use by fellow scientists. He wrote articles extensively for livestock magazines and extension service news releases for the benefit of swine producers.<sup>22</sup>

## Horse Division

Bob Watt retired from his position as superintendent of horses in September 1945 after 13 years of work at Cornell. He was most dependable, loyal, and capable. Bob was a superior horseman, admired by students and all who knew him. He was succeeded by J. M. (Jack) Briggs on October 1, 1945. In addition to his duties as superintendent of horses, Jack also was in charge of the department's farm maintenance crew.

After Salisbury resigned, Professor Wanderstock had faculty responsibility for teaching and research with horses.

Jack Briggs continued to exhibit some of our best purebred horses at the New York State Fair. Although workhorses largely had disappeared from New York farms, there were a few horse breeders left, and they liked to show their animals. About 1950, however, we discontinued exhibiting our horses, in spite of pressures from a few breeders. In December 1952 all the purebred Belgians and Percherons were sold at auction. They had only been used for some teaching for the past several years and a very limited amount of research. Only one workhorse was kept to pull a manure cart in the dairy barns. Some of the news media picked up this story and used a picture of the horse and manure cart and facetiously referred to Cornell as a "one-horse college."

After the horses were sold, that portion of the barn that they had occupied was used by beef cattle. Jack Briggs continued in charge of the farm maintenance crew responsible for movement of animals and materials between the several farm units operated by the department.

About that time we had some pressure from the breeders of thoroughbred horses to conduct research on nutrition in relation to bone weakness and diseases in young running horses. We considered the request and had some

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<sup>22</sup> Professor Pond resigned on October 15, 1978, to accept a position in charge of nonruminant nutrition investigations at the R. L. Hruska, U.S.D.A., Meat Animal Research Center, Clay Center, Nebraska. His research was recognized with the AFMA award in nutrition (1969), the Bohstedt award in minerals research (1979), and the Morrision award (1985) from the American Society of Animal Science. He served as president of this society in 1980-81.

discussions with Dean William A. Hagan and others in the Veterinary College. We all agreed that we could not conduct an equine nutrition project with existing funds and facilities. It was requested that we draw up a plan indicating what would be needed for a good project. We did this, and Dean Hagan and I went to Saratoga Springs at the time of the race meet and presented to a group of thoroughbred breeders a brief project outline with estimated costs of facilities, operations, and research. They listened, asked a lot of questions, made suggestions on problems they would like to have solved, but never came through with any money to support the proposed research program.<sup>23</sup>

## Animal Husbandry Extension Functions Effectively

The postwar years after 1945 were ones of transition from war to peace; and because of the need for food for famine relief in a war-torn world, our farmers were asked to maintain or increase food production. The situation presented a real challenge to the extension service and to the specialists in animal husbandry. There were many problems that had to be solved. Farm labor was scarce, and wages continued to increase. Farmers were unable to purchase needed machinery and repair parts, fertilizers, and other supplies. In addition, New York farmers experienced one of the worst feed shortages in history in 1946. Quality of hay and other roughages were below normal, and there was a shortage of feed concentrates. Milk production was low during the fall months, so special efforts were made to increase production to meet the market needs without increasing the size of the milk-producing area for New York City and other cities in the state.

### Program for More Fall Milk

The 1946 More Fall Milk Program was organized by the College Dairy Commodity Committee to meet the acute situation that existed. Extension specialists from several departments worked together to provide increased information on better feeding, higher-quality feed crops, improved livestock management, and a better understanding of the situation. This program was adopted and given full support by the dairy industries and farm organizations of the state. Dairy specialists from the department contributed to the program by emphasizing specific practices that would increase fall milk production in 1946 and in future years.

All methods of communication were employed—radio talks, radio transcriptions and briefs, stuffers mailed with milk checks from plants by milk companies and cooperatives, posters, and newspaper publicity—in getting information out to dairy farmers. A series of special service letters was issued

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<sup>23</sup> A new state appropriation was obtained in 1965-66, for an equine research and extension program with light horses, cooperative between the Veterinary College and animal science. Dr. Harold F. Hintz was employed for a position in animal science on July 1, 1967, for research and instruction with horses. The Warren farm is the site for the Equine Research Center.

and sent out to 80,000 dairy farmers. An outstanding 1,600-foot sound color film, *The Challenge to New York State Dairymen*, was made cooperatively by several departments of the college for use in furthering the educational program. This was before the widespread use of TV came on the American scene.

The results of this educational program were quite satisfactory. In November 1946, as compared with November 1945, 2 percent fewer cows in New York State produced 5 percent more milk delivered to milk plants, and the average production per cow was increased by 8 percent.

This program was continued for 2 years and was followed by special emphasis on labor efficiency and launching of the Dairy Barn Management Program in the fall of 1947. Other special programs were developed from time to time over the next several years.

### **Farm and Home Special Train**

In April 1946 eight railroad cars of exhibits prepared by different departments of the college were transported over the lines of the New York Central and Erie railroads. Most of the exhibits were designed to show efficient labor-saving devices and arrangements in the house, barn, chicken house, and other farm buildings. The train made stops of several hours, each, in 33 counties, where the exhibits were viewed by more than 68,000 persons. This was the last time, following those of earlier years, that a special train was used in the extension program of the college.

### **Some Changes in Functions of Extension Specialists**

During the 1940s the relationship between the number of extension specialists and the number of county agents began to change. The size of the extension staff in the counties increased considerably, whereas the number of specialists remained rather constant, necessitating some changes in the functions and responsibilities of extension specialists. It was felt that a larger county staff would permit some specialization and a larger share of the direct teaching by agents. Accordingly, it was believed that the extension specialists would tend, increasingly, to become "teachers of teachers," working chiefly with county agents, vocational agricultural teachers, personnel of other government agencies, field representatives of commercial and industrial concerns, and dealers and distributors of feeds and farm supplies.

The college extension specialists were in a difficult transition period for a few years. They had the job of stepping up training programs of county agents and other key operatives while they continued to carry about the same load of field work on educational programs as formerly. In short, many of the specialists were overworked.

This situation was alleviated when the department was able to obtain funds in 1943 and 1944 for additional extension specialists to work in artificial insemination and dairy herd improvement and livestock production.

The worldwide demand for food, fiber, and other important products of the farm continued for the next several years. Our farmers were called upon to maintain and, in some cases, to increase the unprecedented production of the wartime years, in spite of high production costs and declining prices. The extension program in animal husbandry adjusted its sights from year to year with these changing economic conditions. It was not until 1956-57 that Dean

W. I. Myers in his annual report for the College of Agriculture said, "The readjustment from war to peace is now behind us and farm prices and incomes have shown moderate improvement since the low point of December, 1955. New York farmers are faced with a continuing squeeze because of rising costs for tractors, machinery, and labor. To earn satisfactory incomes under these conditions, farmers will have to give greater attention to farm business management."

## Extension Programs with Dairy Cattle

### Dairy Records

Records of the dairy herd improvement associations continued to provide the backbone of the department's extension program with dairy cattle. Professor W. T. Crandall was in charge of this phase of our activities until he retired in 1954 and was succeeded by Professor J. D. Burke.

Recruitment of DHIA supervisors was difficult after World War II, and it was necessary for Tailby and Burke to conduct frequent training courses to try to meet the demands of the county associations for qualified supervisors. After the dairy record club form of testing was phased out, an owner-sampler method of testing was developed as a part of the DHIA program. This served a dual purpose, getting more cows tested and incidentally helping to augment the income of the supervisors.

Several significant developments took place over the next few years to improve the dairy records program. The first county testing laboratory in New York was built in 1948 in Monroe County. Others followed, and eventually there were 23 county laboratories functioning.

The senior member of the animal husbandry extension staff, Professor G. Walter Tailby, Jr., retired on August 31, 1950, after 43 years of continuous service to New York dairy farmers. Most of his career was devoted to the organization and operation of dairy herd improvement associations.

Harry R. Ainslie was appointed assistant professor in extension on September 1, 1950, on the vice-Tailby item. Although he was raised on a farm in New York, Ainslie did his college work at Kansas State University for the B.S. and M.S. degrees. After he later earned the Ph.D. at Kansas State, his appointment was changed to 60 percent extension and 40 percent research. Ainslie worked in several phases of animal husbandry extension, but later devoted his major interests to dairy records, working closely with Professor Burke in the training of DHIA supervisors and all other aspects of the program.

In the rebuilding of the DHIA program following the war, it became apparent that better organization was needed if continued progress was to be made. Consequently, a plan was initiated to combine all the county DHIA units in each county into one countywide organization. By 1950 almost all were organized as county units with uniform bylaws for all counties.

### New York Dairy Herd Improvement Cooperative Formed

Although the formation of county units solved many problems, it created others that were recognized by the county agricultural agents and local farm leaders in the administration of DHIA. Increased volume of business, ownership of property, labor laws, social security, workmen's compensation,

withholding taxes, all pointed up the need for a better organizational structure for financial management and bookkeeping procedures. Through the timely suggestions and leadership of Jim Burke, a meeting was held in the summer of 1949 for county agents and farmer representatives from 12 counties to discuss the situation. There was agreement on the need for a statewide organization, and over the next few months the New York Dairy Herd Improvement Cooperative (NYDHIC) was formed.

The early efforts of the cooperative focused on the affiliation of all the county organizations, clarification of some basic policies and objectives of the DHIA program in the state, and cooperation with the College of Agriculture in general administration of the program. Memoranda of understanding spelled out the objectives and responsibilities of the college and the cooperative and between the county Extension Service and the county DHI Associations. Membership in NYDHIC was voluntary, and by 1955 all counties had become affiliated.

In 1952 Norman W. Rollins, assistant professor in animal husbandry extension, was employed as full-time executive secretary of the NYDHIC. In addition, the cooperative employed an office secretary and clerk and a substitute supervisor.

The main responsibilities of the statewide cooperative were in the enforcement of DHIA rules and policies and the financial and business administration of all the county cooperatives. The college, primarily the extension specialists, Burke and Ainslie, in animal husbandry, continued to assume major responsibility in guidance and in conducting the educational activities at the state and county levels. During the next 10 years, this idea of county and state DHIA organizations was adopted by 15 other states.

### **Automated Data Processing**

Except for some improvements with the establishment of county testing laboratories, very little progress was made in mechanizing or increasing the efficiency of milk testing and record procedures until 1947. At that time the first IBM equipment was brought in by the Department of Animal Husbandry to establish the dairy records processing laboratory (DRPL). The initial pieces of equipment were a card punch, sorter, tabulator, and printer, which were lifted through a window to the attic of Wing Hall. Soon it was apparent the space was inadequate, and the processing equipment was moved to the NYABC headquarters on Judd Falls Road. The amount of equipment and personnel involved continued to expand, and after a few years the laboratory was moved into one of the old workshop buildings formerly used by the Department of Agricultural Engineering. Later, in 1961, greatly enlarged facilities were provided on the ground floor of Morrison Hall.

From a historical standpoint, it is worth noting that in 1947 the Ayrshire Breeders' Association announced the adoption of IBM data-processing equipment in the calculation of Herd Improvement Registry milk records. This was a pioneering step and was intriguing to Professor Burke and others, and stimulated the application of these methods in the analysis of DHIA records that were under the general supervision of universities. The states of Utah, Michigan, and Illinois were the first to start using data-processing equipment for calculating DHIA records. Professor Burke spent a sabbatical year at the University of Illinois to study developments there and those in



Utah and Michigan. He was impressed with the potentials of their data-processing systems.

After he returned to Cornell, Burke worked on preliminary programs and the calculations involved and concluded that the computer being used could not do the job and that the new IBM-650 was the answer. He said in a letter recently, "Since Brownell was in Greece, Turk in the Philippines, and Dean Myers in Washington and nobody to say no, we went ahead on the assumption that we could somehow get an IBM-650."

When it came time to contract for this new equipment, Controller Arthur H. Peterson did not believe there was enough computing work in the college to justify it, but later he was one of its strongest supporters.

Actually, in 1954 when this computer first became available, Dr. John F. Kendrick, head of Dairy Herd Improvement Investigations, USDA, at the annual meeting of ADSA at Pennsylvania State University, proposed that a national computing center be established. This met with vigorous rejection by the dairy extension specialists, especially those from the midwest region, who felt their autonomy threatened. After the stormy meeting, Burke, Carter, and Kendrick walked back to their rooms and agreed to try the plan in New York.

They were anxious to get the program started, so arrangements were made with Kendrick to develop a completely automated data-processing system of dairy herd records at Cornell. Some assistance was given by IBM personnel. This new system was completed in the fall of 1956. The first herds processed came from Tioga County, and after many kinks were ironed out the first year, the program grew consistently until nearly 90 percent of the DHIA herds in the state were converted to this system.<sup>24</sup>

An important feature of this development was that it was shared with the other northeastern states and records were processed from all of the New England states, plus New Jersey, Delaware, Maryland, and West Virginia. By 1963 the dairy records processing laboratory (DRPL) was processing over 9,000 herds and 375,000 cows, including both DHIA and owner-sampler herds.

These developments provided Cornell with a unique opportunity in both extension and research, compared with universities in other states. The dairy records processing laboratory had a direct linkage with the New York Dairy Herd Improvement Cooperative (NYDHIC) and a close relationship with the New York Artificial Breeders' Cooperative (NYABC). As an operating unit of the Department of Animal Husbandry, the processing laboratory was able to perform many functions including (1) automated data-processing of records, (2) evaluation of sires used in artificial breeding, as well as (3) statistical analyses of department research and (4) instruction of graduate students in data processing.

Financing the DRPL came primarily from service charges to the dairy farmers. The NYDHIC paid a fee for each DHIA or owner-sampler record

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<sup>24</sup> Professor Burke retired on December 31, 1970, after a career of 34 years in extension in which he showed unusual ability to accept and develop new concepts. He was selected by the American Dairy Science Association in 1967 to receive its DeLaval Award for the outstanding extension dairyman in the United States.

processed each month. The NYDHIC collected all the processing fees from the counties in New York and from the other states. Originally, some state funds were needed to get the laboratory started, and as time went on, many grants were provided for herd-breeding analysis and sire-evaluation studies.

These developments in the supervision and organization gradually improved the prestige of DHIA records. Dairy specialists working through the American Dairy Science Association developed DHIA rules comparable to those for official testing. Professor Brownell was instrumental in 1955 in getting the Holstein-Friesian Association to adopt a plan whereby DHIA records calculated by automated data processing or by a clerk in a county testing laboratory could be accepted as an official record by the breed association. A bit later in 1959, the Purebred Dairy Cattle Association adopted a program in which all breeds agreed to accept DHIA records calculated by automated data processing methods. By 1963 over 50 percent of official records were of this type, and it was predicted that within a few years all DHIA records on registered purebred cows would be accepted and used by the breed associations.

To summarize the success of the DHIA program for the period 1945-63, milk production increased at a rate of about 200 pounds per cow per year and reached a yearly average over 12,000 pounds. About 25-27 percent of this increase was attributable to higher genetic potential and the remainder to better feeding and management. DHIA cows exceeded non-DHIA cows in annual milk production by almost 5,000 pounds per cow.<sup>25</sup>

The era of Advanced Registry records initiated by Professor H. H. Wing many years earlier had become past history. Also, it appeared the Herd Improvement Registry of the breed associations was on the way out.

An important addition to the staff of the dairy records processing laboratory was made in 1961 with the appointment of Dr. Lyle H. Wadell as director. Under his capable leadership, the computing center provided effective and efficient service to dairy farmers of the Northeast and to the extension and research functions of the Department of Animal Husbandry. With Dr. Wadell's consistent and detailed attention to the management of laboratory operations and to the supervision of the staff, the department's specialists were able to devote their full energies to extension and research.

The staff of the laboratory increased to about 40 as the volume of business grew. The work was divided into three sections: data entry and auditing, machine operations and computing, and programming. As new technology and computing equipment became available, they were incorporated into the laboratory. The quality of service and DHI reports going back to dairy farmers was constantly improved.

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<sup>25</sup> Professor Ainslie continued to devote his major interests to the dairy herd improvement program and was honored with the National DHIA Outstanding Service Award in 1981. He was the recipient of the DeLaval Extension Award in 1978 of the American Dairy Science Association, the fifth member of the department's extension faculty to be honored with this award. Ainslie retired on May 30, 1983, after completing 33 years in extension. He was departmental leader of Cooperative Extension programs from 1969 to 1981.

About 1960 there were pressures from university administration and certain staff from the endowed colleges to incorporate our dairy records processing laboratory with its computing facilities into the University Computing Center. We opposed this very strongly for many fundamental reasons. We felt that we could continue to be a significant force in dairy cattle improvement only if we had control of the data, equipment, and tape files; an efficient production staff; and proximity to our research and extension staff. We knew that we could be of greatest service to the College of Agriculture, Cornell University, and, most importantly, to our cooperating dairy farmers by continuing the development and functioning of the dairy records processing laboratory as an integral part of the department.

After a number of discussions, we won the "battle" but had a feeling the issue would crop up again in the future.

### **Dairy Cattle Breeding Extension**

With the pressures to increase food production in the post-World War II period, more emphasis was given to extension educational activities in dairy cattle breeding and artificial insemination. Greater use of desirably proved sires through artificial breeding provided the best means to bring about genetic capabilities for higher milk production among the state's dairy cattle population. This was demonstrated by the first 21 sires in the artificial breeding program, who were real herd improvers, based on the production of their daughters in comparison with their dams.

Professor Brownell continued as project leader of the extension division, but as an increased proportion of his time was necessary for leadership of the program as a whole, he gradually shifted the responsibility for dairy cattle breeding and artificial insemination (AI) to Professor Ray Albrechtsen.

With funds provided by the special state appropriation (1944) for AI and dairy herd improvement, additional specialists (Brandt, Taylor, Trimberger, Walker, and Young) devoted full time to this program. The number of local AI associations grew rapidly, with an accompanying demand for qualified technicians and supervisors. Three to five 10-day extension schools were held each year to train manager-technicians for the associations. For example, in 1946, 220 trainees participated in four training programs. They came from 23 different states and 8 foreign countries, so we were providing trained technicians far beyond the boundaries of New York State.

The success of this program drew attention to our staff, and the young specialists soon had many doors of opportunity opening for them at higher salaries. J. E. Taylor resigned October 31, 1945, to accept a position in extension at Pennsylvania State University; W. R. Walker on January 1, 1946, to accept a position at the University of Connecticut; D. J. Young on September 30, 1946, for a position in dairy cattle extension at the University of Delaware; Dr. G. W. Brandt later on June 1, 1948, for a position at the Clemson Agricultural College.

One of these vacancies was filled on March 16, 1946, with the appointment of H. Wilmot Carter as extension instructor. He came to Cornell from Berea College in Kentucky where he served as associate professor of animal husbandry. Carter worked constantly to improve himself professionally by graduate studies during his off-salary months and completed the requirements for the Ph.D. at Pennsylvania State University in 1951. He then was given a joint appointment in extension and research.

About this time Professor Brownell was on sabbatical leave, and his position was filled temporarily by Professor James W. Linn as acting extension professor during the period July 1, 1946, to May 31, 1947. Professor Linn was on leave from Kansas State University where he chalked up a fine record. His work at Cornell was with the dairy herd improvement program and the state dairy cattle breed societies.

Robert W. Spalding joined the extension staff as assistant professor on February 15, 1947, after completing work for B.S. and M.S. degrees at the University of Missouri. He completed his Ph.D. at the Ohio State University in 1962. This advanced study, contributing to his value on our staff, was carried on in connection with his regular duties by using his off-salary months, sabbatic leave, and the G.I. Bill of Rights. After the completion of the doctorate, Spalding's appointment was changed to joint extension-research. During the first several years, Professor Spalding's work was in dairy breeding extension, especially the organization and promotion of artificial breeding, training of artificial insemination technicians, sire selection and evaluation. Later on, he also worked in the dairy feeding, herd improvement, and herd health extension programs.<sup>26</sup>

John B. Peterson was appointed assistant professor in animal husbandry extension, for work in artificial insemination and dairy herd improvement, on October 15, 1948. After serving on our staff for less than 2 years, Peterson resigned on June 30, 1950, for employment with a commercial artificial breeding organization.

During the summer of 1949, Russell D. Martin served as acting assistant professor for 3 months to assist with the general dairy extension programs. He was succeeded on September 16, 1949, by Norman W. Rollins, acting assistant professor, for work in dairy herd improvement. Rollins transferred to the NYDHIC as executive secretary in 1952.

Along with the rapid development of artificial breeding, the extension staff continued the proved sire and herd breeding analysis programs as basic breeding demonstrations. Continuing supervision was given to 35 active cooperative bull associations in 1946. These associations gradually declined in number over the next few years, however, with the increase in number of farmers shifting to AI in their herds.

Starting in 1947, Professor Carter compiled the Cornell sire summary, which was printed three times annually for use by dairy farmers and sire selection committees. Beginning in 1952 and for the next 9 years, he was responsible for general direction of the dairy records processing laboratory, which provided huge masses of data for study and application.

One of the major efforts of the extension dairy breeding specialists at this time was to assist in locating and selecting sires for use in the AI program. Recognizing this, the NYABC made research grants for genetical analysis of milk records to make possible more rapid and complete information to use in evaluation of sires. This team of specialists collaborated with Professor

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<sup>26</sup> After 30 years, Professor Spalding retired on June 30, 1977. During his later years on the active faculty, he served part-time on the college farm labor program and, for 2 years, was leader of the College Agricultural Man-power Program.

Henderson and his research team in these analyses in the development of improved methods and techniques. For example, Professor Carter acted in a triple capacity, as a linchpin. He worked closely with management and members of the NYABC to promote adoption of methods and techniques that made possible much of the genetic improvement. Working with Henderson, he was able to bring research findings to the field and, in return, to bring the feedback from farmers to research.<sup>27</sup>

Throughout the 1950s the role of our extension specialists in animal breeding was to (1) present the potentials of artificial breeding in dairy herd improvement through all possible communication channels and (2) review and publicize the results that were being obtained from the use of desirably proven sires and the genetically analyzed young sires. An example of these efforts for the year 1950 showed that our extension specialists assisted county agricultural agents in planning and conducting 55 local artificial breeding association annual meetings; held 35 two-day dairy breeding schools in the counties; conducted 15 one-day breeding meetings with dairy farmers; conducted 50 barn meetings to discuss dairy cattle breeding; and assisted with 6 countywide dairy tours devoted to demonstrations of desirable breeding practices. Similar extension activities took place each succeeding year.

A new feature was initiated in 1952 with a 2-day training school by the extension specialists for members of the NYABC sire selection committees. The objective was to acquaint these farm leaders with the principles of genetics, sire evaluation, and sire proving methods and the results of artificial breeding in dairy herds of the state. This training school was held annually for the next several years.

Based on studies by Professors Henderson, Carter, and colleagues, the NYABC embarked upon a planned, selective mating program to produce young sires to be sampled through artificial insemination. This young-sire sampling program proved to be very effective as a source of herd-improving sires and became the regular program of almost all AI organizations.

The first NYABC competitive cattle show of animals resulting from artificial insemination was held in 1951. Other shows were held from time to time as a promotional and educational event.

A new training school for dairy farmers on administration of AI cooperatives was offered by our extension specialists in 1953. Also, the first of several annual schools was held to train herdsman and farm managers on AI techniques. About this same time, dairy conformation, or type, appraisal demonstrations were initiated to add another dimension to selection procedures. The extension specialists were assisted in this program by county agents, prominent dairy farmers, and the NYABC staff.

During all of these years, there was a constant flow of new research information on semen extenders and sire evaluation conveyed through the

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<sup>27</sup> After 25 years of meritorious service in dairy cattle breeding and herd improvement, Professor Carter retired on May 31, 1971. In recognition of his work, he received the DeLaval Extension Dairyman's Award of the American Dairy Science Association in 1968, the fourth member of the department's faculty to receive this award.

work of the extension specialists to AI associations and to farmers. There was an increasing pool of data for genetic studies.

An important step forward in sire evaluation was made in 1954 with the development of herdmate and daughters-of-sire comparisons. This opened another approach to the measurement of the genetic process in individual herds. By 1956 some extension studies on the use of AI showed three times the rate of improvement over that obtained by dairy cattle breeders who kept their own bulls.

Another important factor in herd improvement is that of maintaining a high breeding efficiency in dairy herds. Research on reproductive failures in dairy cattle was expanded because dairy farmers became more aware of breeding problems after AI came into widespread use than when they were using bulls for natural service. To assist farmers in solving these problems and to transfer knowledge from research, Dr. H. Joe Bearden was added to the extension staff in 1954 for work in dairy cattle breeding and reproductive physiology. With a joint appointment in research, Dr. Bearden cooperated closely with Professors Asdell, Foote, Bratton, and Hansel.

Dr. Bearden resigned on September 30, 1960, to return to his home state as head of the dairy department at Mississippi State University. He had a desire to move into resident teaching and research, and this position also provided a good opportunity for him in departmental administration.

By this time all the faculty had been changed to a 12-months' salary basis rather than 9 as had been the case previously. Thereby we lost the margin of time that had been used in the past for upgrading extension specialists who did not have advanced degrees. We wanted our extension specialists to be just as well trained as those doing resident teaching and research, so this new salary policy meant that we had to look for first-rate Ph.D.'s who were willing to do extension work, along with a joint appointment in research. Most of the good, young Ph.D.'s preferred resident work, and it was difficult to recruit the right kind of a person for the Bearden position.

After several months of active recruiting, however, we obtained an outstanding candidate who would soon be completing his Ph.D. in animal breeding at Iowa State University. Dr. A. M. (Sandy) Meek was appointed assistant professor on September 1, 1961, for work in the dairy cattle breeding and herd management programs. He came to the department with an unusually good combination of experience and training, along with the ability to work well with people, which made him a valuable addition to the faculty. He grew up in Scotland, graduated from Edinburgh University, had experience as a herdsman and farm manager in England and Canada and at Kansas State University, Strathglass Farm in New York, and Quiet Valley Farm in Connecticut. Sandy's stories and Scottish brogue endeared him to his audiences, and almost immediately he became one of the most sought after extension specialists in the College of Agriculture.

By 1962 about 50 percent of all dairy cows in the state were bred artificially. It was estimated that the gross income of participating dairy farmers had been increased by two to three million dollars annually from the improved production of their artificially bred animals.

Gradually the NYABC increased its field staff, which took over the promotional and organizational work formerly carried out by the extension specialists. M. W. Johnson retired as manager of NYABC in 1960 and was replaced by Charles Krumm, who provided excellent leadership for future growth and development of the cooperative. The New York Artificial

Breeders' Cooperative merged with all organizations in the New England states in 1966 to form the Eastern Artificial Insemination Cooperative (EAIC).

Professor S. J. Brownell retired on December 31, 1959, after 30 years of dynamic leadership in the extension division of animal husbandry. More than any other individual, he was responsible for the growth of the department's extension programs to a place of leadership among all universities in the United States. One of Professor Brownell's most significant accomplishments was the development of an unusually competent extension staff from 5 specialists in 1929 to a total of 16 working with all classes of livestock. His abilities as an administrator were recognized internationally. Professor Brownell's leadership in dairy extension was recognized by the American Dairy Science Association in 1952. He was the second dairy extension specialist in the United States to be honored with the DeLaval Extension Dairymen's Award. Professor Brownell died on January 16, 1979, after a long illness at his home in Sun City, Florida.

### **Albrechtsen Assumes Duties as Project Leader**

Ray Albrechtsen was project leader in the extension division of the department from 1958 to 1969. He succeeded Professor Brownell. Ray was an effective and well-organized administrator in the planning and further development of the extension program and in coordinating the staff, while carrying on the work in his own field of dairy cattle breeding and herd improvement. He had an inherited Danish sense of humor and quick wit, along with a clear and forceful manner of presentation. He spoke and wrote in the language of farmers and was perceptive and sensitive to their needs. Ray and his wife, Louise, had an outstanding herd of purebred Holstein cattle, and so he had a practical outlook on farmers' problems, which they appreciated. He worked well with the breed associations and artificial breeding and dairy herd improvement associations.

During his active career, Albrechtsen had many honors and recognitions. In 1957 the American Dairy Science Association presented him the DeLaval Extension Dairymen's Award, and he received the Superior Service Award from the United States Department of Agriculture.<sup>28</sup>

### **Extension Program in Dairy Feeding and Management**

In the years immediately after the end of World War II, the regular long-time extension dairy feeding program was exceedingly effective with major emphasis on those phases most important in the adjustment period. More than any other single factor, improved feeding practices played a significant role in solving the milk production problems to meet market needs.

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<sup>28</sup>Professor Albrechtsen was on the Board of Directors of the American Dairy Science Association and was president in 1966. He was the first and only extension specialist to be elected to this office. Later in 1975, the ADSA gave him its highest award, the Award of Honor. Albrechtsen retired on November 30, 1969, after 31 years in the department and died in August 1976.

Professor W. T. Crandall continued to head the extension feeding program, with Burke's able collaboration. Their analysis of feed records and practices of DHIA herds became an increasingly important activity and was a popular feature at annual meetings over the state. Special feeding analyses, which had been started by Burke in 1939, helped individual farmers find weak spots in their feeding methods and also made local demonstrational results available to other farmers.

A new series of six regional feeding schools for local feed dealers was initiated in 1946. These meetings, offered jointly by specialists in animal husbandry and poultry husbandry, came about at the request of the New York State Feed Dealers' Association and were continued for the next 12 or 15 years. The purpose was to provide a training service for feed industry personnel so that they would be more effective in their day-to-day contacts with dairy farmers and thus help "to sell" a good feeding program, not just a bag of feed. Also it increased the likelihood that dealers' suggestions to farmers would be integrated with college recommendations. These regional training programs for local feed dealers provided a good complement to the annual Cornell Nutrition Conference for Feed Manufacturers, sponsored jointly by the animal husbandry and poultry husbandry departments, with the cooperation of the American Feed Manufacturers Association.

Dr. S. T. Slack joined the extension faculty in 1951 as assistant professor to work in the dairy feeding program. He was especially effective in this program, his appointment being joint with research. He continued work on feeding and management of dairy calves and was an active member of the research team on forage utilization. On the extension side, he brought back field problems and fresh ideas to this research team and then followed up by interpreting and transmitting the results back to the dairy farmers. It was much easier for Slack in this dual role to sell farmers and feed manufacturers on the desirability and value of harvesting forage early for maximum nutritive value and of wilting grasses and legumes for silage because he could speak authoritatively on the subject and in language they understood and accepted.

One measure of success of the program is the extent to which the harvesting time of first-cut forage was advanced during the 10-year period beginning in 1951. This meant the nutritive value of forages in the state was upgraded by approximately 20 percent. Dairy farmers were feeding and managing their cows better during the pasture season, making greater use of seeded pastures, grazing aftermath, using temporary crops, such as sudangrass, and feeding more concentrates. There was less dependence on permanent pastures.

### **Professor Crandall Retires**

Professor W. T. Crandall retired on June 30, 1954. Always sound of judgment and responsive to the needs of dairy farmers, Professor Crandall was one of the most highly respected specialists, both by the faculty and by dairy farmers and extension workers out in the state. During most of his 32 years on the staff, he was in charge of the dairy feeding extension program and all of the dairy records work for the state. He gave supervision to the development of the Advanced Registry system and then its eventual replacement by the Herd Improvement Registry for purebred herds of dairy cattle. After he took over the leadership of the DHIA program in 1928, he was



the primary specialist concerned with its growth and development, New York being placed among the top three states in the number of associations and the number of cows enrolled.

After Professor Crandall retired, the leadership of the extension feeding program was turned over to Professor Slack. Another specialist working in extension-research was Dr. Charles M. Chance, who was appointed in 1952. As with almost all the new extension specialists, we at first preferred to give Chance experience in all the major programs of dairy records, feeding, breeding, and management. But later, with his training and experience mainly in nutrition, he gave special attention to dairy cattle feeding and management during the 7 years he served on the staff.

Keeping New York's dairy cattle well fed was the broad objective of the extension feeding program during the 1950s and early 1960s. Continuing emphasis was given to the role of high-quality early cut roughages in reducing winter feed costs and of high-yielding pasture crops in lowering summer milk production costs. Emphasis was given to feeding cows according to their individual needs, one of the most important factors in providing good nutrition and also, at the same time, in reducing costs. With rising costs of production, activities were directed toward stimulating dairy farmers to adopt practices of feeding that would maximize the use of homegrown grains and roughages.

The attendance of farmers and farm leaders at the various activities of the dairy cattle feeding program gave testimony to their interest and desire to obtain more information. For example, in 1957-58, feeding meetings and activities were conducted in 43 countries with an attendance of 7,600 persons.

Dr. Chance resigned from the faculty effective October 31, 1959, to accept a position that was more remunerative financially with the Cooperative G.L.F. Exchange. His duties with the cooperative complemented the work he had been doing in extension.

While Professor Spalding was on assignment on the Cornell project in the Philippines, 1957-59, John A. Sims was employed on his salary item as acting assistant professor in extension. Mr. Sims had served as field representative for the N.Y. State Guernsey Breeders' Association and later was part owner of a purebred Guernsey herd. He was thoroughly familiar with our extension staff and programs. His work involved training DHIA supervisors and giving training courses in artificial insemination for technicians, herdsmen, and farm managers. As demands of dairy farmers increased for programs on herd management, Mr. Sims was also an active participant in this phase of work. His appointment was extended to June 30, 1959, when he accepted a position at Iowa State University.

### **TV Feeding Schools**

With the cooperation of a television station in Binghamton and the leadership of Professor Slack, a different approach to teaching dairy cattle feeding practices was undertaken in 1961. Ten county agents in the New York viewing area and six agents in Pennsylvania cooperated in signing up viewers and conducting pre- and postprogram viewing surveys. Upon enrolling, each person was provided with a workbook to be used in conjunction with the telecasts. It contained five related lessons, and viewers were expected to do some calculations and evaluations of their own operations.

Lessons were given for 5 consecutive days to an "enrolled" audience of 2,100 persons. Evaluation surveys showed some significant changes in feed-

ing practices among a sizable number of viewers. The success of the series was demonstrated by requests for more TV schools on other subjects.

A second feeding school was given over a Buffalo station, using similar procedures and materials, and was held on a once-a-week basis for 5 weeks.<sup>29</sup>

### **Dairy Herd Management**

Emphasis was given for many years to herd management, and the focus was intensified in 1957-58 with the "Cow College" series. In addition to two sessions on feeding, three sessions on a one-day-a-week basis were geared to meet each individual farm situation. Dairy herd management newsletters were prepared and distributed through county extension offices, along with the radio talks, news articles, conferences, and barn meetings to disseminate up-to-date information.

Increased emphasis was placed on electronic data machine processing of dairy records, and many added herd management guides prepared from these records were presented at the cow college and herd management meetings.

Early in 1959 we were able to work out arrangements with the dean and the director of finance for a salary item to employ W. G. Merrill as assistant professor in dairy extension and research on July 1. Mr. Merrill was one of our outstanding graduate students, who was to complete the Ph.D. in June 1959. After he joined the faculty, Professor Merrill's duties were with the general extension program, but mostly with dairy cattle feeding and herd management and with project M.

### **Project M**

Substantial planning efforts were carried out during the year 1960-61 by the milking management subcommittee of the college Dairy Committee for a comprehensive interdepartmental-intercollege extension program to be initiated the following year. This program, Project M, involved the Departments of Agricultural Engineering (milking machines), Animal Husbandry (milking methods), Dairy and Food Sciences (milk quality), and the Veterinary College (mastitis control). Specialists from the three departments and the Veterinary College each shared a common goal in carrying out their respective phases of this program. Professors Merrill, Schmidt, and Meek represented animal husbandry.<sup>30</sup>

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<sup>29</sup>After almost 32 years in extension, research, and resident teaching, Professor Slack retired on December 30, 1980. Beginning in 1974, he taught the courses in dairy judging and selection and coached the college dairy-judging teams. He has continued since 1956 to serve as superintendent of the dairy cattle division of the New York State Fair. After the establishment of the Animal Science Teaching and Research Center, Slack was responsible for the coordination and operation of the dairy herd and the farm. He was recognized by the Harrison-Trimberger-Slack Fund to support the department's program in dairy cattle selection and judging.

<sup>30</sup> Professor A. M. Meek was actively involved in the application of milking management techniques and dry cow therapy in the control of mastitis and in other herd management programs. His career ended too quickly when he died on March 17, 1972, after a short illness.

The milking machine, cow management, and milking practice, as well as good mastitis treatment and prevention, are all essential elements in reducing mastitis and producing high-quality milk. Because the proper operation of the milking machine is basic to efficient milk production and maintenance of udder health, much effort was spent on this phase.

As with all comprehensive programs of this type, the key ingredient is the county agricultural agent; therefore, the first activity in the planning phase was a 3-day county agents' training school. After the project was initiated, four regional 1-day training conferences were held each year to bring agents up to date on methods, materials, and activities available for winter meetings with dairy farmers. Also, these conferences provided for feedback and recommendations from the county agents on additional program elements.

Thirty-five counties included Project M as a major dairy activity. County meetings, one or more on each of the four phases, were held. Extension specialists led the discussions at most of the meetings, and some counties invited local milking-equipment personnel and local or regional veterinarians to discuss their areas of special interests.

A mobile demonstration truck with milking equipment was developed by specialists in agricultural engineering for educational meetings on the principles, maintenance, and operation of milking machines and was used extensively throughout the state. Project M quickly won support of nearly all equipment manufacturers, with many of them making contributions in the form of teaching aids. But most important was the overall impact of Project M on dairy farmers to improve their milking methods and make changes in management practices. The emphasis on sanitation in milk production and handling in Project M reflects Professor Wing's early extension work in this area and illustrates the never-ending role of education.

A new activity was added to the herd management extension program in 1962-63, namely, a short course for the progressive dairy farmers and dairy leaders who requested information on recent developments and a basic analysis of successful dairy herd management.

Our staff of extension-research specialists was strengthened in 1962 with the addition of Dr. J. Bruce Stone who came from the University of Guelph, Canada. With his previous experience as a graduate assistant in the department, he was thoroughly familiar with our programs and made a good addition to the dairy feeding and herd management projects. As it turned out, the appointment of Dr. Stone was the last one made to our extension faculty during my administration. He continued on the faculty until 1966 when he returned to the University of Guelph.

### **Drought Conditions in 1962**

Severe drought conditions throughout most of New York State during early spring and summer of 1962 resulted in reductions in hay and other forage production up to 60 percent of normal. Several counties were declared "disaster areas" and became eligible for shelled corn through an Emergency Livestock Feed Program. Our extension specialists gave special assistance to dairy farmers on the best methods for using the corn.

An interdepartmental drought committee prepared and presented materials and information on feeding and management adjustments needed to meet the shortages of hay and other forages. Special training schools were held for county agents to discuss use of the available information and to plan

meetings to assist dairy farmers to make adjustments as early in the season as possible. A 15-minute color movie film on feeding dairy cattle was developed and was especially useful during the drought period. As a whole, the educational program provided information on steps farmers could take on their own farms to meet the emergency.

### **Herd Health Extension Activities**

The keynote of the herd health extension program, under the leadership of Professor C. G. Bradt, was to keep farmers informed of the latest developments and to remind them constantly of health management practices that were effective and sound. The long-time objectives were (1) to protect human health, (2) to cut livestock disease losses, (3) to increase fluid-milk sales, (4) to extend profitable life of cows, and (5) to assure consumers of adequate milk supplies that were safe and wholesome. Special efforts were made to use the best public relations and teaching methods. Good cooperation was obtained from the New York State Veterinary College, the State Department of Agriculture and Markets, and practicing veterinarians.

Brucellosis in cattle (Bang's disease) and mastitis were the most-important disease problems facing dairy farmers. The number of cattle owners enrolling in the state Bang's Control Program increased by 8,000 to 10,000 each year until a peak of over 80,000 herds was reached in 1950-51. In his annual report for 1954-55, Professor Bradt wrote: "After nearly 20 years of united effort, the elimination of brucellosis, one of the most costly diseases in New York State, is becoming a reality. When the program began, an infection rate of 17 percent was reported. Of the cattle tested last year, only 1.7 percent were reactors." Regular testing of herds, elimination of reactors, and use of calfhood vaccination proved effective methods in bringing down the rate of infection.

The intensity of the program increased considerably when the Boards of Health for the New York City area milk market set deadlines. For milk to be sold in the city, these dates were set for herds to be brucellosis free: New Jersey, April 1, 1958; New York, July 1, 1959; and Connecticut, April 1, 1957.

New York State missed its deadline by a few months, but was declared a modified-certified brucellosis-free area on November 1, 1959. This was the climax of 25 years of diligent work and cooperation between our extension specialists in animal husbandry, the Extension Service through the county agricultural agents, the New York State Veterinary College, and the federal and state livestock sanitary officials in Albany.

During these years, the forces of herd-health education also were unleashed on mastitis on an ever-broadening scale with major emphasis on prevention. In 1946 regional laboratories were established in Canton, Kingston, East Aurora, and Farmingdale as a part of the New York State Mastitis Research Control program of the Veterinary College, in cooperation with the state Department of Agriculture and Markets. These laboratories with their staffs of veterinarians and technicians added another dimension to the department's activities in the maintenance of healthy herds.

In addition to brucellosis and mastitis, many other health problems were given attention. These included prevention of and control measures for cattle parasites, calf diseases, calf scours, vibriosis, leptospirosis, ketosis, milk fever, foot rot, winter dysentery, and hyperkeratosis (X-disease). Also, the importance of continuing testing for tuberculosis in dairy herds was stressed.

All these efforts helped to make dairy farmers conscious of the need to keep and maintain healthy herds. With the increased use of antibiotics and pesticides on farms during the 1950s, it was necessary to conduct intensified educational programs aimed at keeping milk free from these contaminants. Flash cards, service letters, and warning messages were prepared and widely distributed. In these efforts the cooperation of artificial breeding technicians, feed dealers, and milk handlers was enlisted.

Professor Bradt retired on January 1, 1960, after 38 years of work in extension education as a county agricultural agent and animal husbandry specialist. His first responsibility in this department was the organization of dairy record clubs. Later, he was noted for his work on herd health programs. Bradt did not have advanced scientific training, but he had the ability to work successfully with veterinarians and research specialists and to translate their findings into workable programs for farmers, and a persuasive way of assuring their adoption. He wrote prodigiously—extension bulletins, special reports, farm magazine articles, and regularly for the Farm Bureau News Service, contributing more than 1,000 individual articles.

In 1951 while on sabbatical leave, Professor Bradt made a thorough study of public livestock health programs in 24 states, and his final report was circulated widely by the United States Department of Agriculture.

When he retired from the College of Agriculture, Professor Bradt worked as a part-time consultant for the James A. Baker Institute for Animal Health.

After Bradt's retirement, herd health extension in animal husbandry was conducted primarily as a part of the herd management program, with continuing emphasis on milking methods and mastitis prevention and control. Bradt died suddenly on June 22, 1977.

## Livestock Extension Gains Momentum

During the summer of 1945, before I assumed the headship of the department, I learned that we would be losing Dr. C. S. Hobbs, professor in livestock extension, for a position as head of the Department of Animal Husbandry at South Dakota State University. Dr. Hobbs had done an excellent job, but he preferred resident teaching and research, along with administration, rather than a career based in extension. As a consequence, Dr. Hobbs resigned effective October 15, 1945. Later, he transferred to the University of Tennessee as head of the Department of Animal Science.

When he joined the faculty in 1943, Dr. Hobbs had the responsibility for organizing, developing, and conducting the livestock extension program with beef cattle, sheep, swine, horses, and meats. As a tribute to his initiative and extension teaching ability, there were 26 active county livestock commodity committees functioning when he left. He had spent more than 60 percent of his time in the field responding to livestock farmers' requests for assistance and had obtained the respect, confidence, and enthusiastic support of farmers all over the state. There were more requests from farmers for assistance than the staff could fill.

Professor Morrison started the job of finding a replacement for Hobbs and then turned this over to me on the first of October 1945. Several qualified candidates were considered and evaluated, and the top ones invited for interviews. Myron D. Lacy, county extension director (county agent), Clinton County, Iowa, was selected for the position and was appointed extension

professor of animal husbandry, effective February 1, 1946. He was the first new faculty member employed under my administration.

Professor Lacy grew up on a cattle ranch in Texas, graduated from Texas A&M College, and had a master's degree from Iowa State College. He continued his graduate studies for 2 years and needed only one more year, plus the thesis, for the Ph.D., when he accepted a position as county agent in Iowa.

Building on earlier programs, Professor Lacy quickly demonstrated progressive leadership. His primary responsibility was with beef cattle producers plus some work with swine producers, for we did not have a swine specialist at that time. George R. Johnson continued his work with sheep producers and lamb feeders and also was responsible for meats extension for a couple of years.

During the first postwar years, the meat situation continued to be critical. The seriousness of feed grain shortages became quite apparent during the first half of 1946. Specialists conducted field days and many general meetings to stress greater use of hay, silages, and pastures to attain maximum meat production with a minimum use of grain and other concentrates. Many requests for varied types of assistance from the specialists came from producers as a result of rationing and price controls, shortages of labor and farm machinery, and along with this there was an increase in the number of beef producers.

In addition to the emergency situation, the long-term problems facing general livestock producers needed attention. These included (1) need for improved pastures and higher-quality forages; (2) higher-quality breeding stock, especially sires; (3) control of diseases and parasites; (4) use of more labor-saving equipment and more-efficient management; and (5) improved marketing procedures and facilities. Specialists met regularly with county agents and county livestock committees to plan programs in these areas in the counties to help solve both the emergency and long-term problems.

### **Beef Cattle**

Over the next several years, Myron Lacy developed one of the most outstanding programs in beef cattle extension in the United States. He possessed unusual abilities as a teacher of both youth and adults and as an organizer of educational programs. Through his work, he gained the respect and support of livestock producers, agricultural leaders, and extension workers throughout the state.

Under Lacy's guidance and leadership, the New York State Beef Breeders and Feeders Improvement Project was expanded. A Beef Production Project was initiated in 1947 with the primary purpose of collecting data on farms to be used to promote better cow and calf programs. Increasing numbers of breeders participated annually to have their calves weighed and graded at weaning time. This project was designed to study the production and management practices on each farm that affected the value of the calf crop at weaning time.

As an outgrowth of the beef production project, Lacy initiated and developed the 500 Beef Club in 1949. The purpose was to establish standards for achievement with calf crops. To qualify as a member of this club a producer was required to (1) wean 90 percent of a calf crop, (2) produce calves that averaged in the choice feeder grade, and (3) wean calves that averaged

500 pounds at 225 days of age. Certificates were awarded annually at Farm and Home Week to those who qualified.

The New York Beef Cattlemen's Association was organized in 1950 to provide an impetus to beef cattle production and to aid in improving conditions for effective marketing of cattle in the state. Lacy provided the drive and leadership for this association to function. He served as the secretary and regularly provided timely information on feeding, breeding, and management to its members. In just a few years the association had an active membership of over 500 beef producers.

By the early 1950s beef cattle numbers had increased rapidly in the state. For example, on January 1, 1952, beef cow numbers were up 20 percent over the previous year. It was felt much of this increase could be attributed to (1) increased supplies of roughages that farmers wished to market through a low-labor livestock program and (2) the diversification of the farm business and the use of beef cattle as a supplementary enterprise.

From time to time county extension agents, especially those who were new in the general livestock field, were given special training courses. Demonstrations, field days, farm tours, lectures, news articles, radio, circular letters, bulletins, and farm visits were all methods used to reach producers. Special schools for herdsmen were conducted every few years. Professor Lacy developed many improvements in the highly successful Beef Cattlemen's Short Course. It was held annually at Cornell and provided high-quality instruction and practical experiences in all phases of beef cattle production and management. This short course attracted beef cattle producers from the northeastern states and Canada, with many returning for successive courses. Professor John Miller and others on the teaching and research staff cooperated fully in this short course and the extension activities for beef cattle improvement.

Always alert to changing conditions and new ideas, Professor Lacy initiated a feed-lot performance-testing program for bulls in 1955 at Cornell. Space was available for only a limited number of bulls, but the program served as an excellent demonstration. In 1959 this activity was expanded into a statewide performance-testing program sponsored by the New York Beef Cattlemen's Association in cooperation with the extension division of animal husbandry and the county agricultural extension services. Performance testing offered beef cattle breeders a method of measuring differences among animals in their inherited ability to grow rapidly, use feed efficiently, and develop the kinds of carcasses preferred by packers and consumers. Increasing numbers of breeders accepted this method as an additional "measuring stick" in their selection and management programs.

Throughout these years Professor Lacy cooperated closely with the beef breed associations and marketing organizations on the production and sale of breeding animals and slaughter stock. Assistance was given to feeder-calf sales and in grading demonstrations at different locations. Lacy judged beef cattle at many shows across the country and served as superintendent of the beef cattle division of the New York State Fair beginning in 1949. He was especially well known and respected among Hereford breeders across the nation. He served as secretary of the New York Hereford Association after February 1946. In this capacity he contributed greatly to the growth of this organization through his recommendations, suggestions, and educational programs.

Professor Lacy's accomplishments and those of his associates in general livestock have even greater significance when one realizes that New York is

predominantly a dairy state. Lacy's success over many years was due largely to his techniques in working out organized educational programs through the county agricultural agents for livestock breeders and producers. His fine personality and an unusual ability to interpret the results of research greatly enhanced his effectiveness. His counsel and advice were eagerly sought by livestock owners, and they were grateful for the time he spent with them.<sup>31</sup>

### Sheep Production

After W. T. Grams was transferred from the staff in 1934, there was no full-time extension sheep specialist on the faculty until 1943 when George R. Johnson was employed. George brought to our faculty an unusually good background of experience and understanding of extension teaching and organizational methods essential for success. He continued to work with the New York State Purebred Sheep Improvement Project and served as its secretary for the next several years. This project demonstrated the need for measuring and evaluating production in ewe flocks. Flocks for which accurate records were kept showed a wide range from 60 to 105 pounds of lamb produced at weaning time. Obviously, this reflected large differences in income to producers.

Many other activities were greatly expanded in the postwar years. For example, in 1945-46 ten sheep-shearing training schools were held to help relieve the shortage of shearers. Sixteen portable sheep-dipping vats were operated in 26 counties to help control external parasites. Assistance also was given in drenching demonstrations for control of internal parasites.

A new lamb-grading and marketing project was initiated in 1946 and proved to be quite revolutionary in its effects on the quality of lambs produced and marketed. In a few years the marketing of graded lambs developed beyond the extension demonstrational stage, and over 9,000 lambs were sold by grades through established markets in 1955. Approximately 70 percent were in top grades, compared with only 38 percent in these grades in 1950. Beginning in 1951, the lambs were "followed through the coolers," and the carcass information from the lamb pools was made available to the producers. This program was most effective in acquainting farmers with market grades of fat lambs and in helping them to realize the value of producing a good-quality product.

By 1950 fairly stable lamb prices and higher wool prices created more interest in sheep production. Special efforts were made continuously to inform both experienced and prospective growers on sound sheep production prac-

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<sup>31</sup> The American Society of Animal Science Extension Award was presented to Professor Lacy in 1966. In 1955 he received the Swift and Company Founder Centennial Award of the ASAS and was honored by the New York Beef Cattlemen's Association in 1967. He retired from Cornell in 1971. In 1974 friends and associates of Professor Lacy and his co-worker, John I. Miller, established the Lacy-Miller Scholarship Fund in the College of Agriculture and Life Sciences to support outstanding students in animal science at Cornell. Lacy died January 26, 1982, at his winter home in Lake Park, Florida.



tices. These activities included assistance and advice on internal and external parasite control, feeding and management educational meetings, breeding stock procurement, and training schools for shepherds. Emphasis was given to marketing problems, and wool market information was supplied weekly to counties. In addition, farm flock owners had to be concerned with dog control problems.

Throughout much of this period, George Johnson continually improved his scientific knowledge by studying for advanced degrees during his off-salary months and a sabbatical leave. He earned the M.S. degree, with honors, in 1947 and the Ph.D. in 1954 at Michigan State University. He was then on a joint appointment, which permitted about 30 percent of his time to be spent on research. Some preliminary experiments in which hormones were fed to, or implanted in, feeder lambs were conducted on producers' farms as well as on the sheep farm of the department. Some advantages were increased rate of gain and less feed required per pound of gain, but some disadvantages included lower carcass grades and yields.

It was not surprising that Professor Johnson's successful sheep production program and his fine personal qualities brought several offers of jobs. He finally accepted a position at Ohio State University and resigned from Cornell on October 16, 1955. He was one of our most-effective extension specialists, and we were extremely sorry to lose him from our staff. In addition to the attraction of resident teaching and research, another factor in his decision was the relative importance of the sheep industry in Ohio compared with New York. In a few years George became chairman of the Animal Science Department, serving with distinction until 1984.

Dr. Warren F. Brannon joined our faculty on April 1, 1956, in the vice-Johnson position for sheep extension and research. He continued the work on better marketing for both lambs and wool. An early-season lamb pool was held in June that year in St. Lawrence County. A cooperative wool pool operated by producers was established in the south central area of the state to provide an improved market for wool. In 1957 Brannon organized four regional wool marketing cooperatives, which handled about 60 percent of the wool produced in the state. Wool-grading schools were conducted for producers and personnel of the New York State Department of Agriculture and Markets.

Over the next few years, continued emphasis on marketing resulted in the establishment of graded lamb markets at six different locations and another regional wool market. Eventually, in 1961, they merged into a federation that represented all of the state. Additional field trials were conducted on the use of hormones, antibiotics, and tranquilizers, with little effect in rate of gains reported. Educational meetings on feeding and management were usually held in about 40 percent of the agricultural counties. As part of a program to promote more-efficient spring-lamb production, during the summer of 1960, Brannon conducted creep-feeding trials on four farms that produced top-quality lambs. The creep ration was a complete, pelleted, hay-grain mixture, with hay comprising 36 percent of the total ration. In comparison with production of lambs under a system of grazing, creep feeding of lambs increased the rate of gain by 33 percent and produced fat lambs 66 days earlier.

Assistance was given to the farm-flock record-keeping program of the Empire Shepherds' Club. Complete records were kept on the production of each ewe. These records were gathered and processed with electronic computers. Summaries returned to cooperating farmers helped them cull their

flocks and measure the success of their production. Some growers got extremely high production, and most of those involved in the project increased their total flock production.<sup>32</sup>

### Swine Production

Relatively little organized extension work was done with swine producers before 1943 when livestock specialists (Hobbs and Johnson) were added to the staff. Only limited assistance had been provided to swine breeders and producers by Professors J. P. Willman and F. B. Morrison and others from the resident teaching and research staff. Few farmers made swine production a primary enterprise, but increasing numbers began raising some pigs as a secondary enterprise. These swine producers could be classified into three groups: (1) purebred breeders who sold breeding stock, (2) commercial producers who fed hogs for market, and (3) those who raised feeder pigs that were sold to neighbors for their home meat supply. As corn production for grain increased in the late 1940s, there was an increased interest in swine production in many areas of the state with a need for more extension work from the college.

Lacy devoted some of his activities to swine production. A sow-testing program was started, and within a short time producers in 15 counties entered this program. Farmers were encouraged to save pigs of the best type from the top litters for breeding stock.

In April 1947 swine producers from 17 counties organized a state Swine Improvement Group. They adopted a program to (1) encourage the sow-testing program, (2) support 4-H and F.F.A. swine work, and (3) conduct two regional field days and one statewide meeting each year. They asked for a strong educational program as a part of each of these events, with discussions on problems of breeding, management, feeding, disease control, and marketing. Tours, field days, meetings, and printed materials were used to get farmers to adopt improved practices. Increased emphasis was given to leaner-meat-type hogs in all extension programs.

A directory of stock for sale was prepared at regular intervals and distributed to county agents. This information was useful to agents in locating good breeding animals for local producers. In 1954 an annual swine field day at Cornell was initiated.

Many of the largest swine-feeding operations were near New York City and other large cities and used raw garbage. But in 1953 a new law required that all garbage had to be cooked before it was fed to pigs. Our extension personnel cooperated at district meetings with regulatory officials and swine producers in making this change.

A special appropriation of state funds for research and extension on beef cattle and meats was made in 1955. Some of the funds were used for a new faculty position, and Dr. Ellis A. Pierce was appointed assistant professor on September 1. His efforts were to be concentrated on meats and swine exten-

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<sup>32</sup> Professor Brannon retired on August 31, 1979, after 22 years on the staff. During the last 10 years before retirement, he also devoted 70 percent of his time to 4-H livestock programs.

sion and research. Dr. Pierce gave increased emphasis to marketing in the swine program. A market-hog pool was established to provide a system of marketing in which hogs were graded and sold according to their grade and weight. Interest in this program increased rapidly, and the following year 21 market-hog pools were held with 175 consignors and over 4,000 hogs were marketed. This system encouraged farmers to produce higher-quality pigs, for they sold at a premium at these markets. The number of market-hog pools and pigs marketed continued to increase each year.

Pierce cooperated with staff members in agricultural economics in a cost-account survey of hog production in western New York counties in 1957. This uncovered several areas for additional study and improvement. Individual farm studies enabled swine producers to learn more about their own enterprises and how to make them more profitable.

Another activity was the establishment of a cooperative feeder-pig sale in 1959. This marked the beginning of an educational marketing program for feeder-pig producers to help increase efficiency of production and marketing. These feeder-pig sales and grading demonstrations were sponsored by the New York Swine Improvement Cooperative. This cooperative also sponsored tours and field days, which were popular with producers.

Lack of concentration of swine producers in a given area made individual farm visits more important than in some phases of animal husbandry extension. Often these visits were to farms where the owner was interested in a swine operation in conjunction with other farm enterprises. In addition Pierce conducted a number of group activities, such as regional swine schools.

### **Meats Extension**

A severe meat shortage in the immediate postwar years brought increased requests to the college for assistance. The extension meats program encouraged a better standard of living among farm people through an improved family diet and also encouraged urban consumers to make better selection of meats in their dietary planning. The work of our extension specialists in animal husbandry was cooperative with specialists of the College of Home Economics at the university level and with extension agents of the Farm Bureau, Home Bureau, and 4-H club at the county level.

Professor George R. Johnson continued to devote part of his time to the meats program; but with increased demands for service, a full-time meats specialist, George H. Wellington, was added to the staff as assistant professor on January 1, 1947. This position was made available by a special state appropriation for extension and research in beef cattle and meats.

Wellington graduated from Michigan State University in 1937 and taught vocational agriculture for a year before going to Kansas State University for graduate study, earning the M.S. degree in 1940. After 4 years in military service, he served as an assistant county agent in Michigan for 2 years. By using off-salary months and leaves of absence, Wellington earned the Ph.D. in meat science at Michigan State University during the next several years.

A "new-fangled" dimension was introduced to the meats program. Freezing of meat came on the scene as a means of preservation and created a lot of interest and excitement. Professor Wellington gave special assistance to county extension workers to acquaint them with techniques of freezing. Cooperation was given to frozen-food locker plants, which were increasing

fairly rapidly around the state at that time. Through the influence of H. E. Babcock, the GLF operated a frozen-locker plant in Ithaca known as "mother zero." A promotional campaign was conducted to sell food freezers to consumers, which were called "baby zeros." Frozen storage rapidly became more readily available to farm families. I went ice fishing on Lake Champlain one time with a farmer friend in Essex County. Among many things we talked about was the use of home freezers. He made this observation, "With our new home freezer, we may not save money, but we sure eat better than we ever did before."

Demonstrations and meetings were held in as many counties as possible by our specialists to present information on cutting and proper wrapping of meat for frozen storage. Emphasis was also placed on selection of animals for slaughter and on chilling, aging, and preparation for cooking. Services available at the locker plants and their relationship to modern meat preservation on the farm were stressed continually in educational programs. Through close cooperation with the New York Frozen Food Locker Association, information on meat handling was presented to locker managers at schools and association meetings.

Meetings with urban homemakers were developed to assist them in meat selection, identification, grades, inspection, and price evaluation. Increased use of radio, television, circular letters, and exhibits were an important part of the meats extension program. For example, an 80-foot meats exhibit was displayed at the New York State Fair in 1951, showing the usual cuts of meat.

Professor Wellington's transfer to the resident teaching and research staff in February 1952 handicapped our extension meats program for the next few years. During this time only a few routine meat-cutting demonstrations were held. On the other hand, self-service meat sales were increasing, so some meetings were conducted with consumers to prepare them for this type of meat buying.

But extension programs in meats were strengthened again in 1955 with the addition of Professor Ellis A. Pierce for dual responsibilities for swine and meats. Leaders' training schools in the counties were expanded in cooperation with food and nutrition specialists from home economics. They provided information on efficient and proper use of different meat cuts and on the food value and seasonality of supply of the various kinds of meat—lamb, pork, veal, and beef.

Another contribution of Pierce was the development of barrow and wether carcass competitions at the New York State Fair. These contests placed emphasis on the quality of the carcass rather than on the external appearance of the live animals. The number of participants increased during the first few years and encouraged improvement in the production of all meat-animal species. Through the leadership of Professor Pierce, these carcass competitions led to the establishment of a quality-meats department at the state fair. He served as its superintendent during its existence over the next several years. Pierce became recognized nationally and internationally as an authority in the field of carcass judging and the evaluation of meats.

As time went on, Pierce devoted a larger portion of his time to the swine extension program, with less emphasis on consumer education on meats.

With a joint appointment for extension and research, he gradually became more involved in research both with swine and meats.<sup>33</sup>

## Junior Dairy and Livestock Extension

The 4-H dairy and livestock programs continued to grow in their effectiveness throughout the years 1945-63 under the guidance of H. A. Willman. From about 7,000 enrollments in 1945, the number increased to over 13,000 boys and girls participating in some kind of animal project in 1963. Dairy projects predominated, but those involving beef cattle, sheep, and swine also increased. These increases in enrollments were made in spite of downward trends in the number of farms and in farm population.

An important factor in this growth was Professor Willman's leadership in developing 4-H club agents and local leaders in the counties. The size and scope of 4-H club membership made it necessary for Willman to develop teaching methods and aids that could be used readily by lay people who served as leaders. By the early 1960s many of the local leaders were second and third generation former 4-H members.

Willman's well-written bulletins, leaflets, teaching guides, and 4-H manuals were widely used. His illustrated book, *4-H Club Handbook*, published in 1952 by the Cornell University Press and revised in 1963, was the first complete reference of its kind.

Dairy and livestock judging teams trained by Willman were unusually successful in regional and national competition. But he recognized that competition through judging and showing of animals was only a part of 4-H livestock activities; therefore, he continually broadened the scope of the programs, with emphasis on appropriate record keeping and demonstrations of desirable feeding and management practices. He encouraged balanced programs through incentives that recognized group efforts in livestock improvement. He challenged young people to learn the why and how of their projects. He targeted high standards and the mastery of applied skills.

Throughout his years as the leader of 4-H club extension in dairy and livestock, Willman was imaginative and successful in working with breed associations, other dairy and animal industry organizations, banks and other commercial interests. He enlisted their support and assistance in setting up an extensive award program to recognize high quality and standards of achievement.<sup>34</sup>

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<sup>33</sup> Professor Pierce retired on September 1, 1975. He died suddenly in Rome, Italy, on November 5, 1978, where he was working with the Food and Agriculture Organization of the United Nations.

<sup>34</sup> Professor H. A. Willman retired on April 1, 1964. The Willman 4-H Dairy and Livestock Fund was established as a tribute to his 35 years of dedicated work with rural youth, farm families, and the livestock industries. He received a long list of awards in recognition for his work with 4-H'ers, among them the New York Farm Bureau's Distinguished Service Award in 1982, the State 4-H Foundation's Distinguished Service Award, and a certificate of appreciation from the State Department of Agriculture and Markets in 1986.

Additional specialist assistance to the 4-H club program was provided in 1950 with the appointment of Thomas E. Wiley, assistant professor in extension. He worked on general extension activities in dairy husbandry as well as on all aspects of the 4-H dairy projects. Wiley's work in our extension program over the next 4 years attracted the attention of other organizations. He accepted the challenging position as editor of the *Jersey Journal*, American Jersey Cattle Club, Columbus, Ohio, and resigned from Cornell on October 31, 1954.

This position was filled with the appointment of Dennis A. Hartman in 1956 for 4-H dairy and livestock extension. For the next several years he worked on all phases of the well-established programs with dairy cattle and other livestock. During this time he used his off-salary months each year, plus a 6 months' leave of absence in 1960, to complete the requirements for the Ph.D. at Ohio State University.

After this time Professor Hartman took a fresh look at the 4-H program in animal husbandry. He asked the state 4-H leader to set up a committee of county 4-H agents to assist in determining further needs and objectives. This approach revealed a need for new educational materials for 4-H dairy and livestock project members. After a study of 4-H materials being used in other states, Hartman started a new trend in the preparation of teaching materials using a "graded approach." Materials were prepared to fit the age and experience level of the youngster. The first-, second-, third-, and fourth-year materials were written in such a way that the subject matter would progress with the age and development of the animal and its young owner. This approach in the preparation of 4-H materials was adopted in several other states.

A substantial and growing interest in light horse husbandry and horsemanship brought about the development of the 4-H Light Horse Project during the late 1950s. Emphasis was on care and management and on understanding and competence in horsemanship, but many leaders and members also were trained in horse judging. Enrollment in this program increased quite rapidly, and by 1963 over 3,800 4-H members were participating.

Beginning in 1961, Hartman had the responsibility of the 4-H dairy cattle judging teams for competition in regional and national contests. Regardless of one's opinion of judging as a means of evaluating animals, it is important in the 4-H program because youngsters learn from the decision-making process and from competition at county, state, and national levels. Teams trained by Hartman maintained the high degree of success that was traditional in the New York programs.

Recognizing the role of companion animals, Professor Hartman initiated the 4-H dog care and training project in 1962. A program for training of leaders in dog obedience was started in a few counties, and they in turn taught 4-H members to train dogs. This program expanded rapidly into more than 30 counties and more than 3,000 members. (Professor Hartman resigned effective January 27, 1978, to accept a position at the Virginia Polytechnic Institute and State University.)

### **Farm Study Courses**

Until the mid-1950s several farm study courses were offered by the department to reach those individuals who were unable to attend college, but wished to learn the fundamental principles of livestock production. The courses offered included Feeding and Management of Dairy Cattle, Dairy

Herd Improvement, Rearing Calves and Heifers, Sheep and Wool Production, and Pork Production. Although these courses served a useful purpose during the earlier years, interest and demand for them gradually declined. Their function largely had been replaced by vocational agriculture in the high schools and the 2-year agricultural and technical schools.

## Status of Faculty in Animal Husbandry

The faculty and organization of the Department of Animal Husbandry on April 1, 1963, are illustrated in table 4 (p. 186). In comparison with 1945 (table 3, p. 106), there was growth in the teaching and research faculty and changes in the functions of those in extension. For example, of the 14 positions in the extension division in 1963, 10 of them were occupied by faculty holding the Ph.D., with joint appointments in research. This was in marked contrast to the situation in 1945 when only 2 out of a total of 14 extension specialists had training through the Ph.D. level. We had come reasonably close to our objective of having all members of the faculty, regardless of their function in teaching, research, or extension, with equivalent scientific and technical training.

In regard to the status of extension professors, I like this quotation from a letter written many years ago by Professor H. H. Whetzel, distinguished plant pathologist and the first head of that department at Cornell, to one of his former assistants, "The application of scientific discoveries to the solution of practical problems calls for quite as much ability and initiative as does pure research: I sometimes think more. Beware of getting into the frame of mind that puts extension work and practical application in a lower category than pure research."

## Cornell Increases Its International Dimension

From the earliest days of agriculture at Cornell, its influence has been extended to many countries through the training of students and through programs to increase agricultural productivity. A pioneering project was started in 1925 when the College of Agriculture cooperated in training and research in plant improvement with the University of Nanking in China. Later, this program served as the model for many U.S. universities following World War II in their assistance to less-developed countries. The China program was the forerunner of a most-significant international effort of institutional building between the College of Agriculture at Cornell and the University of the Philippines' College of Agriculture at Los Baños. The Cornell-Los Baños program was a remarkable history of an investment in education and research with its major thrust on the development of people (Turk 1974).

Toward the close the fiscal year 1951-52, Cornell University and the University of the Philippines entered into an agreement for a unique partnership to rebuild the Philippine College of Agriculture following its almost complete destruction during World War II. This project was largely financed by the United States Mutual Security Agency (later the International Cooperation Administration and eventually the Agency for International Development) and the National Economic Council of the Philippines.

Table 4. Faculty in Animal Husbandry, April 1, 1963

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<b>Head of Department</b>	
Professor K. L. Turk <sup>1</sup>	
<b>Animal Nutrition and Physiology</b>	<b>Extension</b>
Professor J. K. Loosli <sup>1</sup>	<i>Dairy Cattle</i>
Professor S. A. Asdell	Professor R. Albrechtsen, extension
Professor W. Hansel	project leader, dairy cattle breeding
Associate Professor R. G. Warner	Professor H. W. Carter, <sup>3</sup> dairy cattle
Associate Professor D. A. Benton <sup>2</sup>	breeding
Assistant Professor J. M. Elliot	Professor J. D. Burke, dairy records and
	management
<b>Animal Breeding and Artificial Insemination</b>	Associate Professor R. W. Spalding, <sup>3</sup>
Professor C. R. Henderson	dairy cattle breeding
Associate Professor R. H. Foote	Associate Professor S. T. Slack, <sup>3</sup> dairy
Associate Professor R. W. Bratton	feeding and management
Assistant Professor L. D. Van Vleck	Associate Professor H. R. Ainslie, <sup>3</sup>
	dairy records
<b>Dairy Cattle</b>	Assistant Professor W. G. Merrill, <sup>3</sup> dairy
Professor K. L. Turk <sup>1</sup>	cattle feeding and management
Professor G. W. Trimberger	Assistant Professor J. B. Stone, <sup>3</sup> dairy
Professor J. T. Reid	cattle management
Assistant Professor G. H. Schmidt	Assistant Professor A. M. Meek, <sup>3</sup> dairy
	cattle breeding and management
<b>Beef Cattle</b>	<i>Other Livestock and Meats</i>
Professor J. I. Miller	Professor M. D. Lacy, beef cattle
	production
<b>Sheep</b>	Associate Professor W. F. Brannon, <sup>3</sup>
Assistant Professor D. E. Hogue	sheep production
<b>Swine</b>	Associate Professor E. A. Pierce, <sup>3</sup> swine
Associate Professor W. G. Pond	production and meats
<b>Meats</b>	<i>4-H Dairy and Livestock</i>
Professor G. H. Wellington	Professor H. A. Willman, junior
Associate Professor J. R. Stouffer	livestock programs
<b>Livestock Feeding</b>	Associate Professor D. A. Hartman, <sup>3</sup>
Professor S. E. Smith	junior livestock programs

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<sup>1</sup> K. L. Turk transferred to administration as director, Program in International Agricultural Development, on July 1, 1963, and J. K. Loosli succeeded as head of the department at this date.

<sup>2</sup> Appointed May 1, 1963.

<sup>3</sup> Also part-time research.



Over a period of 8 years (1952-60), a total of 51 American professors, including 35 from the Cornell campus, participated in the project, each serving from 1 to 3 years at Los Baños. Included among these visiting professors and their families were four from animal husbandry: J. K. Loosli, 1952-53; K. L. Turk, 1954-55; G. W. Trimberger, 1955-57; and R. W. Spalding, 1957-58. These professors taught classes and conducted research in close cooperation with their Philippine counterparts.

A relationship of mutual trust and confidence between Cornell and the University of the Philippines became firmly established. When the program was terminated by mutual agreement in 1960, the physical plant of the college at Los Baños had been largely rebuilt, the Central Experiment Station was established and functioning, and teaching programs had been improved. Enrollments reached an all-time high, and procedures were established to stabilize them and improve the standards of admission. During the period of the contract, almost 200 staff members from the Philippines received advanced training, either at Los Baños or in other countries, primarily the United States. Los Baños was rapidly becoming recognized as an agricultural teaching and research center extending far beyond the boundaries of the Philippines.

### **Cornell Program in International Agricultural Development**

Because of the efforts of Dean Charles E. Palm and his associates and the support of leaders in agriculture and several foundations, the College of Agriculture received a special appropriation of \$25,000 in the 1962-63 state budget for the establishment of a program in International Agricultural Development.

Soon after he became Dean in 1959, Dr. Palm reviewed in the Philippines the Cornell-Los Baños program. After he returned home, Dean Palm set up a committee, chaired by Dr. Richard Bradfield, head of agronomy, to advise him on two questions relating to international agriculture. First, Should the college have a program in international agriculture? If the answer was yes, What should be the program? The answer was yes, and the recommendation was made that the dean go to the State Legislature for an appropriation to help start the new international agricultural development program, a fourth dimension to the traditional functions of teaching, research, and extension. This new program was initiated in 1963, the first of its type in any college of agriculture in the land-grant university system. The objective was to integrate expanding activities into a program that would serve agriculture, not only in New York and the nation, but throughout the world. (Sixty-sixth Annual Report, 1963).

I was invited by Dean Palm to become the first director of this new program, beginning on January 1, 1963. I functioned on a part-time basis for the first 6 months, spending most of the time developing objectives for two major areas to be given emphasis: (1) on-campus educational and training programs to prepare students for productive careers in world agriculture and (2) overseas activities—research and institution building. Objectives were agreed upon, and a "game plan" to meet them was developed.

I transferred to Roberts Hall on July 1, 1963, to assume full-time responsibilities for this new position as director, International Agricultural Development.

## A Final Word

So 1963 ends my account of the early history of animal husbandry at Cornell University. I am proud to have been a part of this history.

In writing this story, I have tried to deal fairly both with events and with persons, and I trust that I have been reasonably successful in this regard. An exception is this note that I would like to add that reveals my own prideful bias.

It was a very good period in history to be the head of this department. Fine cooperation and encouragement from the deans and other administrators, an upward trend in financial atmosphere, plus helpful supporters in the state, and rare good luck in combining these with a motivated and highly productive staff brought favorable attention in its wake for the department in the university world. With this came a rewarding recognition and high marks in ratings. I am grateful to have had the opportunity to share in this winning combination.

My pride in the staff and its "track record" is evident, I am sure, in the last phase of this history and also accounts for the footnotes that often go beyond the time frame of this history.

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*Editor's note:* K. L. Turk served as director of the Program in International Agriculture for 11 years and retired on June 30, 1974, with the rank of professor of animal science, emeritus. After retirement, he served as a consultant to several international agencies, foundations, and other organizations. He was elected president of the American Dairy Science Association in 1959 and received its Award of Honor in 1967. In 1983 his international contributions were recognized with the Distinguished Service Award from the Association of U.S. Directors of International Agricultural Programs. The American Society of Animal Science presented him with the Honorary Fellow Award in 1979 in recognition of contributions to the animal industry and to the society. He was further honored on September 19, 1986, with the naming and dedication of the Kenneth L. Turk Seminar Room in Morrison Hall.



This exhibit at Farm and Home Week shows cows on long-term experiments to study effects of different planes of early nutrition on mature productive and reproductive performance.



Early use of hay crusher-mower at Warren farm, 1945.



Harvesting of forage for hay-crop silage (wilting method) to be used in feeding experiments on effects of stage of maturity at harvesting and method of storage on feeding value.



Brood mares on pasture, 1950.



A. I. Manning relaxing in his new chair at retirement party.



Staff of main office at retirement party for Madeline Bower in 1963. *Left to right:* Ruth Teeter, K. L. Turk, Madeline Bower, Evelyn Read, Louise Mose, B. E. Mapes.



Animal husbandry faculty, 1963 in seminar room, Morrison Hall. *Top row:* D. H. Hartman, J. R. Stouffer, G. W. Trimberger, M. D. Lacy, J. M. Elliot, D. A. Benton, R. Albrectsen, G. H. Schmidt, J. B. Stone, G. H. Wellington, D. E. Hogue, C. R. Henderson, R. W. Spalding, L. D. Van Vleck, W. G. Merrill, W. F. Brannon, A. M. Meek. *Center row:* J. T. Reid, S. E. Smith, J. D. Burke, K. L. Turk, J. K. Loosli, J. I. Miller, E. A. Pierce, H. W. Carter, S. A. Asdell. *Front row:* H. F. Travis, B. E. Mapes, W. G. Pond, H. R. Ainslie, S. T. Slack, R. H. Foote, R. G. Warner, F. G. Dodd (vis. prof.).



Professor Wellington evaluating beef carcasses for beef cattlemen's short course.



New Faculty in Animal Husbandry, 1945-1963  
(those who attained rank of professor or associate professor)



M. D. Lacy, 1946-1967.  
Extension—beef cattle.



H. W. Carter, 1946-1971. Ex-  
tension, research—dairy cattle  
breeding.



S. E. Smith, 1946-1977.  
Teaching, research—feeding and  
nutrition.



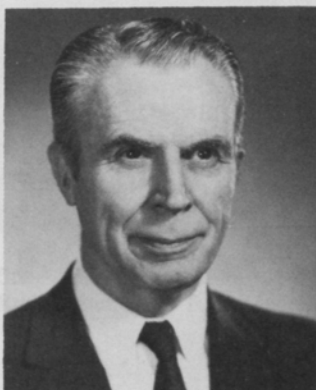
R. W. Bratton,\* 1946-1978.  
Teaching, research—animal  
breeding.



G. H. Wellington, 1947-1977.  
Extension, teaching, re-  
search—meats.



R. W. Spalding, 1947-1977.  
Extension, research—dairy cattle.



C. R. Henderson, 1948-1976.  
Teaching, research—animal  
breeding.



J. T. Reid, 1948-1979.  
Teaching, research—dairy  
cattle nutrition.



Wm. Hansel, 1949- .  
Teaching, research—animal  
physiology.



L. H. Schultz, 1949-1957.  
Teaching, research—lactation  
physiology.



R. H. Foote, 1950- . Teaching,  
research—reproductive  
physiology.



H. R. Ainslie, 1950-1983.  
Extension, research—dairy  
records.



S. T. Slack, 1951-1980.  
Extension, research—dairy  
feeding.



R. G. Warner, 1951- .  
Teaching, research—animal  
nutrition.



C. M. Chance, 1952-1959.  
Extension, research—dairy  
cattle.



E. A. Pierce, 1955-1975.  
Extension, research—swine,  
meats.



D. A. Hartman, 1956-1977.  
Extension, research—4-H  
livestock.



W. F. Brannon, 1956-1978.  
Extension, research—sheep  
production.

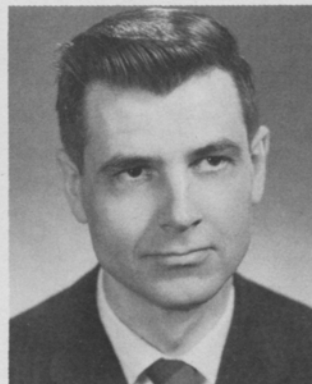
New Faculty in Animal Husbandry, 1945-1963  
(those who attained rank of professor or associate professor)



J. R. Stouffer, 1956- . Teaching, research—meats.



D. E. Hogue, 1957- . Teaching, research—sheep production.



W. G. Pond, 1957-1978. Teaching, research—swine nutrition.



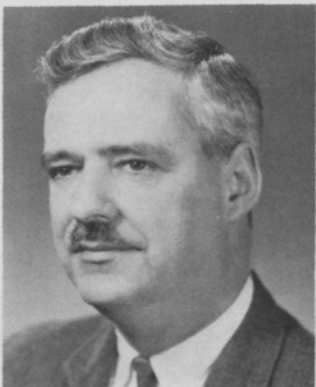
G. H. Schmidt, 1958-1974. Teaching, research—lactation physiology.



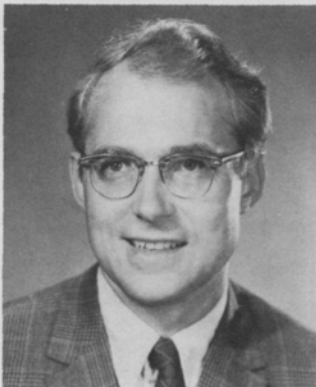
W. G. Merrill, 1959- . Extension, research—dairy cattle management.



J. M. Elliot, 1960- . Teaching, research—animal nutrition.



A. M. Meek, 1961-1971. Extension, research—dairy cattle.



L. D. Van Vleck, 1962- . Teaching, research—animal breeding.



# APPENDIX 1. COURSES OFFERED IN ANIMAL HUSBANDRY

## A. Selected Years, 1910-11 to 1924-25

Course no. & subject	Credit	Term	1910-11	1915-16	1919-20	1924-25
1 Animal husbandry	4	1, 2	Wing, Harper, & Savage	---	---	---
1 Principles and practice of feeding animals	2	1, 2	---	Savage & Baker	Savage	Savage
2 Meat and milk production	3	2	Wing & Harper	---	---	---
2 Principles of animal breeding	3	1, 2	---	Wing	Wing & Allen	Wing & Allen
3 Practice in feeding & stable management	3	2	Wing & Tailby, Jr.	---	---	---
3 Stock judging, elementary course	1	1	---	Wing, Harper, & Meade	---	---
5 The horse	4	1	Harper	Harper, Meade, & Ham	Harper, Haines, & Morton	Harper
6 Mechanics of the horse	3	2	Harper	---	---	---
6 Horse training	2	1	---	Harper & Ham	Harper & Morton	Harper
7 Mechanics of the horse	3	1	---	Harper	Harper	---
9 Breed study	1-4	2	---	---	---	Wing & Allen
10 Adv. stock judging	1	1, 2	Harper & Savage	---	---	---
10 Dairy cattle	4	1	---	Wing	Allen	Allen
11 Beef cattle, sheep, & swine	3	1	---	Seulke	Seulke	---
11 Swine	3	1	---	---	---	Hinman
12 Adv. course in principles of breeding animals	1-3	1, 2	Wing & Harper	---	---	---
12 Meat & meat products	3	1, 2	---	Seulke	Seulke	Schutt
12* Beef cattle & sheep	5	2	---	---	---	Hinman

## A. Selected Years, 1910-11 to 1924-25 (cont.)

Course no. & subject	Credit	Term	1910-11	1915-16	1919-20	1924-25
13 Beef cattle, sheep, & swine, adv. course	2	2	---	---	Seulke	---
14 Adv. course in principles of feeding	2	1	Wing & Savage	---		---
14 Microscopy of foods for animals	2	2	---	Savage	Maynard	---
15 Principles of feeding, adv. course	2	2	---	Savage	Savage	---
15 Principles of animal nutrition, adv. course	3	2	---	---	---	Maynard
16 Principles of breeding, adv. course	2	2	---	Wing & Harper	---	---
16 Principles of animal genetics, adv. course	1-3	1, 2	---	---	Harper	Harper
17 Animal husbandry, adv. course	Arranged	1, 2	---	Wing, Savage, & Harper	---	---
17 Advanced stock judging	1	1, 2	---	---	Wing, Harper, Savage, & Hopper	Wing, Allen, & McConnell
18 Seminary	1	1, 2	---	---	Staff	Staff
20 Gen. elementary course in animal husbandry (for veterinary students)	3	2	Wing, Harper, & Savage	---	Wing, Harper, & Savage	---
30 Health and diseases of animal†	3	1	---	---	Moore & Williams	Moore & Williams
31 Horseshoeing†	1	2	---	---	Asmus	Asmus

\*Number changed to 13 in 1924-25.

† Taught in Veterinary College.

B. Selected Years, 1929-30 to 1944-45

Course no. & subject	Credit	Term	1929-30	1934-35	1939-40	1944-45
1 Livestock production	3	Fall	Savage, Harper, Hinman, & Willman	Savage, Harper, Hinman, & Willman	Harrison, Hinman, Savage, Willman, Miller, & Salisbury	Miller, Salisbury, Turk, & Willman
10 Livestock feeding	4	Spring	Morrison	Morrison, Salisbury, & Miller	Morrison & Miller	Miller & Morrison
110 Animal nutrition	3	Fall	Maynard	Maynard	Maynard	Maynard
111 Animal nutrition, laboratory course	2-3	Fall	---	McCay	McCay	Adolph
112 War emergency food problems	1	Fall & Spring	---	---	---	Maynard
213 Biochemistry of lactation	1	Spring	---	---	Maynard & Ellis	Loosli
210 Special topics in animal nutrition	1	Fall or Spring	Maynard & McCay	---	---	Maynard & Loosli
210 Special topics in animal nutrition and physiology	1	Fall or Spring	---	Maynard, McCay, & Asdell	---	---
215 History of nutrition	1	Fall	---	---	---	Initiated 1942-43 by McCay, offered in alternate years
215 Animal nutrition, advanced course	1	Fall	---	---	McCay	---
219 Seminar in animal nutrition	1	Fall or Spring	---	---	Maynard, McCay, Norris, & Hauck	Maynard, McCay, Norris, & Hauck

## B. Selected Years, 1929-30 to 1944-45 (cont.)

Course no. & subject	Credit	Term	1929-30	1934-35	1939-40	1944-45
20 Animal breeding	3	Fall	Hinman	Asdell	Asdell	Salisbury
120 Problems in animal genetics	3	Fall	Harper	Harper	---	---
120 Problems in animal breeding	2	Fall	---	---	Change of title, 1940-41; offered in alternate years	Salisbury
125 Physiology of reproduction	1	Spring	---	Asdell	---	---
125 Endocrinology, reproduction, & lactation	2	Spring	---	---	Asdell	Asdell
126 Problems in animal physiology	Arranged	Fall	---	---	---	Asdell
130 Physiology of lactation	1	Spring	---	Maynard, Asdell	---	---
229 Seminar in animal breeding	1	Fall & Spring	---	---	Hutt, Asdell, & staff	Offered in alternate years
30 Health & diseases of animals	3	Fall	Birch	Birch	Birch	Birch
40 The horse	3	Spring	Harper	Harper	Salisbury	Salisbury
45 Horseshoeing	1	Spring	Asmus	Asmus	---	---
41 Livestock judging: beef cattle, horses, sheep, & swine	2	Fall	---	Willman	Miller	Miller
42 Livestock judging: beef cattle, horses, sheep, & swine	2	Spring	---	---	Miller	Miller
43 Advanced livestock judging	2	Fall	---	---	---	Miller
50 Dairy cattle	3	Spring	Savage & Harrison	Savage & Harrison	Savage & Harrison	Turk & Norton
51 Advanced judging, dairy cattle	1	Spring	Savage & Harrison	Savage & Harrison	Harrison	---

## B. Selected Years, 1929-30 to 1944-45 (cont.)

Course no. & subject	Credit	Term	1929-30	1934-35	1939-40	1944-45
150 Dairy cattle, advanced course	2	Spring	---	Savage & Harrison	Harrison	Spielman
60 Beef cattle	3	Spring	Hinman	Hinman	Hinman	Miller
67 Beef cattle & swine	3	Spring	---	---	---	Miller & Willman
70 Swine	3	Spring	Willman	Willman	Willman	---
80 Sheep	3	Fall	Willman	Willman	Willman	Willman
90 Meat & meat products	3	Fall or Spring	Schutt	Schutt	Hinman & Schutt	Miller & Schutt
91 Meat & meat products*	2	Fall or Spring	Schutt	Schutt	Hinman & Schutt	Miller & Schutt
92 Meat & meat products†	1	Fall or Spring	Schutt	Schutt	Hinman & Schutt	Miller & Schutt
93 Meat cutting	1	Fall or Spring	---	Hinman & Schutt	Hinman & Schutt	Miller & Schutt
200 Research	Arranged	Fall or Spring	Morrison & staff	Morrison & staff	Morrison & staff	Staff
201 Seminar	1-2	Fall or Spring	Morrison & staff	Morrison & staff	Morrison & staff	Morrison & staff

\*For students in hotel administration.

†For students in home economics.

## C. Selected Years, 1949-50 to 1963-64

<i>Course no. &amp; subject</i>	<i>Credit</i>	<i>Term</i>	<i>1949-50</i>	<i>1954-55</i>	<i>1959-60</i>	<i>1963-64</i>
<b>Livestock Production</b>						
1 Introductory livestock production	3	Fall	Miller, Willman, & Wanderstock	Sheffy	Pond	---
1 Introductory animal science	3	Fall	---	---	---	Elliot
10 Livestock feeding	4	Fall & Spring	Smith	Smith & Warner	Warner & Smith	Warner & Smith
30 Health & diseases of animals	3	Fall	---	Gilman	Gilman	Wagner
41 Livestock judging, beef cattle, horses, sheep, & swine	2	Fall	Miller	Miller	Miller	---
41 Applied livestock selection: beef cattle, sheep, & swine	2	Fall	---	---	---	Miller
42 Livestock judging: beef cattle, horses, sheep, & swine	2	Spring	Miller	Miller	Miller	---
43 Advanced livestock judging	2	Fall	Miller	Miller	Miller	Miller
60 Beef cattle	3	Spring	Miller	Miller	Miller	Miller
70 Swine	3	Spring	Willman	Willman	Pond	Pond
80 Sheep	3	Fall	Willman	Willman	Hogue	Hogue
115 Advanced livestock feeding & applied animal nutrition	2	Spring	Morrison	Morrison	---	---
<b>Meats</b>						
90 Meat & meat products	3	Fall & Spring	Miller & Schutt	Nauman	Stouffer	Stouffer
91 Meat & meat products*	2	Fall & Spring	Miller & Schutt	---	---	---

## C. Selected Years, 1949-50 to 1963-64 (cont.)

Course no. & subject	Credit	Term	1949-50	1954-55	1959-60	1963-64
<b>Meats (cont.)</b>						
92 Meat & meat products†	2	Fall & Spring	Wanderstock	Wellington	Wellington	---
93 Meat cutting	1	Fall & Spring	Miller & Schutt	Holley	Holley	Holley
94 Meat judging	1	Spring	Wanderstock	Wellington	Wellington	---
94 Meat selection & grading	1	Spring	---	---	---	Wellington
190 Meat technology	3	Fall	---	---	Alternate years	Wellington
<b>Dairy Husbandry</b>						
50 Dairy cattle	4	Fall & Spring	Turk & Schultz	Turk & Schultz	Schmidt & Turk	Schmidt & Turk
51 Dairy cattle judging	2	Spring	Trimberger	Trimberger	Trimberger	Trimberger
52 Advanced dairy cattle judging	1	Fall	Trimberger	Trimberger	Trimberger	Trimberger
150 Advanced dairy production	3	Spring	Trimberger	Trimberger	Trimberger	Trimberger
151 Physiology & biochemistry of lactation	3	Spring	---	---	---	Schmidt
<b>Animal Breeding &amp; Physiology of Reproduction</b>						
20 Animal breeding	3	Fall	Bratton	Bratton & Foote	Bratton & Foote	Foote
120 Problems in animal breeding	2	Fall	---	Henderson	Henderson	Henderson
125 Physiology of reproduction	2	Spring	Asdell	Asdell	Asdell	Asdell

## C. Selected Years, 1949-50 to 1963-64 (cont.)

Course no. & subject	Credit	Term	1940-50	1954-55	1959-60	1963-64
<b>Animal Breeding &amp; Physiology of Reproduction</b> (cont.)						
126 Applied animal physiology	1	Fall	Asdell	Asdell	Asdell	Asdell
127 Elementary endocrinology	2	Fall	Asdell	Hansel	Hansel	---
127 Fundamentals of endocrinology	3	Fall	---	---	---	Hansel
130 Livestock improvement through artificial breeding	3	Spring	---	---	---	Bratton
<b>Animal Nutrition</b>						
110 Principles of animal nutrition	3	Fall	Maynard	Loosli	Loosli	Loosli
111 Laboratory work in nutrition	3	Fall	McCay	McCay	McCay & Warner	Warner
210 Special topics in animal nutrition	1	Spring	McCay	Loosli, McCay, & Smith	Loosli & Smith	Loosli & Smith
215 History of nutrition	1	Fall	McCay	McCay	McCay	---
219 Seminar in animal nutrition	1	Spring	Maynard & Staff	Loosli & Staff	Loosli & Staff	Loosli & Staff
<b>Department Research and Seminar</b>						
200 Research	1-2	Fall & Spring	Turk & Staff	Turk & Staff	Turk & Staff	Staff
201 Seminar	1-2	Fall & Spring	Turk & Staff	Turk & Staff	Turk & Staff	Staff

\*For students in hotel administration; discontinued in 1952.

†For students in home economics; discontinued in 1961.



## APPENDIX 2

### **Graduate Students Majoring in One of the Fields in Animal Husbandry, 1890–1963**

Graduate students completing degrees with a major in one of the fields of animal husbandry, from 1890 through 1963, are listed on the following pages. Also included are those graduate students who enrolled before July 1, 1963, and completed degrees after that date. Their names are arranged alphabetically for different time periods. Information for each of them is given on the undergraduate college or university, major professor, major field, degree, date of degree, and thesis title. In some cases an attempt was made to shorten some long thesis titles. For international students their home country is shown rather than their undergraduate college.

The department library and files were the primary source of information, but these were not complete before 1930. Additional records were obtained from the Graduate School and the University Archives in the Olin Library. The records in the Graduate School are fairly complete since 1932, but for the earlier years it was necessary to make a search of all the individual graduate student folders now in the archives. Some bits of information also were gleaned from the Cornell University Register published before 1930. These sources listed several students who were admitted for graduate study in animal husbandry, but have no record of completion of the degree. These names are not included in the following summary.

The master's degrees through the 1920s are generally identified in the records as M.S. in agriculture, as distinct from the regular master of science degree. After that time the requirements for the M.S. degree in agriculture were different from the regular M.S. degree and often did not include a formal thesis. These degrees are not distinguished from each other in the summary.

Dozens of students over the years have taken minor subjects in animal husbandry fields, but no attempt was made to summarize them.

Because of the necessity for using several different sources of information, often fragmentary, it is possible that errors exist in the summary and some names have been overlooked. For these errors and omissions, the writer offers his apologies.

## Graduate Majors

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1890-1910</b>						
Anderson, L.	Cornell	Wing	An. husb.	MS	1897	Effects of food on milk secretion
Royce, C. H.	Cornell	Roberts	An. husb.	PhD	1902	Relation of food to milk fat
Shields, N. R.	Cornell	Wing	An. husb.	MS	1892	
Tarbell, E. J.	Cornell	Roberts	An. husb.	MS	1908	Economic production of pork
Thatcher, L. G.	Cornell	Roberts	An. husb.	MS	1891	Factors affecting creaming of milk
van Wagenen, J.	Cornell	Wing/Roberts	An. husb.	MS	1890	Feeding of pigs
Wing, H. H.	Cornell	Roberts	Dairy husb.	MS	1897	Percentage of water contained in butter
			Dairy husb.	MS	1891	Digestibility of cheese made by cheddar and stirred curd processes
<b>1911-1920</b>						
Brickman, B.	Cornell	Wing/Harper	An. husb.	MS	1916	Effects of stallion registration laws on the horse industry
Chang, T. T.	China	Wing	An. husb.	MS	1916	Forage crops for growing pigs
Collado, Carlos	Cornell	Wing	An. husb.	MS	1912	Influence of age of cows on productivity of their daughters
Eastman, M. G.		Savage	An. husb.	MS	1916	Husbandry of swine in New York and New England
Haines, G.	Cornell	Harper	An. husb.	MS	1918	Food and water consumption and manure production in the horse
McClung, J. M.		Savage/Seulke	An. husb.	MS	1917	Legume hay as a supplement to grain for brood sows during the winter

Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1911-1920 (cont.)</b>						
McKellip, I.	Nebr.	Wing	An. husb.	MS	1912	Relation of measurements of cows to milk production
McNatt, T. B.	Mo.	Wing	An. husb.	MS	1912	Relation of conformation to milk production
Meade, Devoe	Penn St.	Wing	An. husb.	PhD	1918	Inheritance in guinea pigs
Priestly, M. R.	Cornell	Maynard	An. husb.	MS	1920	Vitamin efficiency of raw and boiled milk
Rhea, W. A.	Mo.	Wing/Savage	An. husb.	MS	1916	Roughage vs. grain in rations for dairy cows
Savage, E. S.	N. H.	Wing	An. husb.	MS	1909	
Schreuder, H.	S. Africa	Harper	An. husb.	PhD	1911	Feeding standards for milk production
Schwarte, L. H.	Cornell	Seulke/Harper	An. husb.	PhD	1915	The Cape Horse: Its origin, breeding and development in South Africa
Seulke, K. J.	Purdue	Wing	An. husb.	MS	1920	Factors affecting the market price of beef cattle
				PhD	1916	Relation of carcass yields to live weight in meat animals
<b>1921-1930</b>						
Allen, C. L.	Cornell	Harper	An. husb.	MS	1920	
				PhD	1923	Effect of sire and dam on quality of offspring of dairy cows
Bissell, K.	Pomona	Harper	An. husb.	MS	1928	Records of milk production

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1921-1930 (cont.)</b>						
Blakely, R. W.	Mass.	Savage	An. husb.	MS	1924	Milk production as influenced by the protein in the grain mixture
Chen, T. C.	Ill.	Maynard	An. husb.	MS	1922	Efficiency of the proteins of barley and other feeds
Christy, O. B.	Ill.	Maynard	An. husb.	MS	1923	Posterior paralysis in swine as affected by feeds
Crook, R. D.	Utah St.	Morrison	An. husb.	MS	1930	Investigation of the stiff lamb disease
deForest, M. D.	Cornell	Savage	An. husb.	MS	1922	Feeding value of silages from different varieties of corn
Diakov, F. A.	Russia	Maynard/Savage	An. husb.	MS	1926	Digestibility of rations low in protein
Espe, D. L.	Iowa St.	Maynard	An. nut.	MS	1927	Use of dry skim milk in rearing of dairy calves
Krauss, W. E.	Cornell	Maynard	An. husb.	PhD	1926	Nonprotein N in dairy rations
Kuo, H. T.	Purdue	Hinman	An. husb.	MS	1922	Fishmeal vs. skim milk for fattening pigs
Liu, F. H.	Wis.	Savage	An. husb.	MS	1926	Comparison of 20 and 24% protein grain mixtures for milk production
Maury, R.	Va.	Hinman	An. husb.	MS	1921	Forage crops for pork production
McMillan, W. D.	Cornell	Savage	An. husb.	MS	1925	Cereal grains, their by-products, and other livestock feeds
Miller, G. W.	Ohio St.	Maynard/Savage	An. husb.	MS	1926	Alfalfa vs. timothy hay as a roughage for growing heifers
Miller, R. C.	Penn St.	Maynard	An. husb.	PhD	1925	Calcium and phosphorus balances with dairy cattle

Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
1921-1930 (cont.)						
Norris, L. C.	Cornell	Maynard	An. husb.	PhD	1924	Calcium and phosphorus balances with dairy cattle
Patel, M. D. J.	India	Harper	An. breed.	MS	1928	Inheritance of milk yield and butterfat in dairy cattle
Reddy, M. K.	India	Savage	An. husb.	MS	1925	Ongole cattle, origin, breeding, and development
Rhoad, A. O.	Penn St.	Harper	An. husb.	MS	1928	Statistical study of pulling power in horses
Robison, O. J.	England	Savage	An. husb.	MS	1928	Dairy farming in New York State, England, and Wales
Shu, K. T.	China	Savage	An. husb.	MS	1929	Cost of milk production
Toupin, G.	Canada	Maynard	An. nut.	MS	1921	Relation of vitamine content of the feed to vitamine content of cow's milk
White, H. G.	Utah	Hinman	An. husb.	MS	1928	Wool marketing in the United States
Williams, K. V.	Cornell	Maynard	An. husb.	MS	1923	Pathological effect of certain diets in pigs
Wohlwend, I. C.	Hood	Maynard	An. husb.	MS	1925	Vitamin content of menhaden fishmeal and oil
1931-1940						
Ace, R. B.	Penn St.	Harrison	An. husb	MS	1937	Effect of hay quality on consumption by dairy heifers
Ackerman, E. M.	S. Africa	McCay	An. Nut	MS	1934	Factors of the vitamin B complex

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
1931-1940 (cont.)						
Albrechtsen, R.	Cornell	Hinman	An. breed.	MS	1931	Coat color inheritance in cattle
Altman, M.	Germany	Asdell	An. breed.	PhD	1938	Endocrine basis for blood Ca level associated with reproduction in the fowl
Baker, T. A.	Cornell	Savage	An. husb.	PhD	1933	Relation of age to production in Holstein-Friesian cows
Bell, F. J.	N. C. St.	McCay	An. nut.	MS	1940	Digestion of wheat protein and starch by the dog
Bender, R. C.	Penn St.	Maynard	An. nut.	PhD	1931	Fat metabolism in the lactating goat
Bogart, R.	Mo.	Asdell	An. breed.	PhD	1940	Influence of reproductive state upon growth, reproduction, and lactation in the rat
Briggs, H. M.	Iowa St.	Morrison	An. husb.	PhD	1938	Net energy values of concentrates and hays as determined from trials with fattening lambs
Brooks, H. J.	Mo.	Maynard	An. nut.	PhD	1934	Factors influencing lactation in the dairy goat
Busby, A. T.	Conn.	Harrison	An. husb.	MS	1932	Hereditary influences on transmission of butterfat test
Cairns, G. M.	Cornell	Morrison/ Willman	An. husb.	MS	1938	Net energy values of distillers' and brewer's grains for lambs
				PhD	1940	Lamb feeding experiments to determine energy values
Chen, S.	China	Maynard	An. nut.	PhD	1939	Interrelationships of nutrition, chemical composition, structure, and fragility of bones in old age

Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1931-1940 (cont.)</b>						
Crampton, E. W.	Canada	Maynard	An. nut.	PhD	1937	Relation between polysaccharides of forage and its feeding value
Crawford, C. H.	Purdue	Savage	An. husb.	PhD	1933	Dry concentrates as a partial substitute for whole milk in calf rations
Crowe, C. F.	Cornell	Savage	An. husb.	MS	1935	Forecasting daughter production from parental pedigrees
Crowell, M.	William Smith	McCay	An. nut.	PhD	1935	Effect of food factors upon the life cycle of the webbing clothes moth
Davis, G. K.	Penn St.	Maynard	An. nut.	PhD	1937	Development of synthetic diets for herbivora with special reference to cod liver oil
Djermal, N.	Turkey	Asdell	An. husb.	MS	1932	Livestock improvement in Turkey
Douglass, E. L.	Mass. St.	Savage	Dairy prod.	MS	1932	Breeding efficiency in dairy cows
Ellis, G. H.	Cornell	Maynard	An. nut.	PhD	1936	Role of phospholipids in milk secretion
Emasiri, S.	Thailand	Morrison	An. husb.	MS	1940	Improvement of livestock conditions in Thailand
Foster, J. E.	N.C. St.	Morrison	An. husb.	PhD	1937	Comparison of protein supplements for fattening pigs
Gardner, K. E.	Purdue	Savage	An. husb.	MS	1939	Influence of coconut oil meal and palm kernel oil meal on the fat percentage
				PhD	1940	Effect of yeast in calf starters upon growth of dairy calves
Gormel, B.	Cornell	Morrison/ Willman	An. husb.	MS	1933	Prevention of anemia in suckling pigs

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1931-1940 (cont.)</b>						
Hanson, L. E.	Minn.	Morrison/ Willman	An. husb.	MS	1937	Vitamins A & D and protein supplements for growing and fattening fall pigs in dry lot
				PhD	1940	Vitamins A & D and protein supplements for growing and fattening fall pigs in dry lot
Harrison, E. S.	Va. Poly.	Savage	An. husb.	PhD	1931	Effect of different planes of protein intake upon milk production
Hobbs, C. S.	Okla. St.	Morrison	An. husb.	MS	1939	Value for fattening steers of various protein supplements
				PhD	1941	Relative value of different protein supplements for fattening yearling steers
Hodson, A. Z.	Iowa St.	Maynard	An. nut.	PhD	1937	Role of cholesterol esters in milk secretion
Hurley, W. C.	S. C. A&M College	Harrison	Dairy husb.	MS	1938	Effect of quality and variety of hay on consumption by dairy heifers
Hurst, R. E.	Tenn. St.	McCay	An. nut.	MS	1933	Variations in the water and lipids in the bodies of rats of different ages
Jabbar, S. A.	India	Morrison	An. husb.	MS	1936	Cattle farming in India
Johnson, P. E.	Park	Maynard	An. nut.	PhD	1939	Role of yeast vitamins in nutrition of ruminants
Khan, N. A.	India	Savage	An. husb.	MS	1932	Corn silage for wintering dairy heifers



Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1931-1940 (cont.)</b>						
Kozlowska, M.	Poland	McCay/Maynard	An. nut.	MS	1931	Influence of protein in diet on the female and suckling young with prolongation of lactation
Landis, N. E.	Va. Poly.	Savage	An. husb.	MS	1932	Curves of normal production in dairy cows
Leinbach, F. H.	Iowa St.	Morrison	An. husb.	PhD	1940	Net energy values as determined by feeding experiments with fattening lambs
Lepard, O. L.	Mich. St.	Savage	An. husb.	PhD	1939	Legumes and grasses ensiled with phosphoric acid and molasses
Loosli, J. K.	Utah St.	Maynard	An. nut.	PhD	1938	Effect of sulfur dioxide on nutritive value of alfalfa hay
Lu, L. K.	China	Willman Harrison	An. husb. An. husb.	MS PhD	1937 1940	Scientific production of swine Dried beet pulp vs. chopped mangels for milk and fat production
Madsen, L. L.	Utah St.	Maynard/McCay	An. nut.	PhD	1934	Nutritional myodegeneration of herbivora fed normal and synthetic rations
Melampy, R. M.	Wilmington	Maynard	An. nut.	PhD	1935	Nutrition studies with the cockroach ( <i>Blatella germanica</i> )
Melass, V. H.	S. Africa	Morrison/ Willman	An. husb.	PhD	1938	Cause of the stiff-lamb disease
Miller, J. I.	Kans. St.	Morrison	An. husb.	MS	1934	Protein and TDN requirements for fattening yearling steers
				PhD	1946	Relative efficiency for growing lambs of proteins in different supplements

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1931-1940 (cont.)</b>						
Newlander, J. A.	Cornell	Morrison	An. hus.	PhD	1939	Nutrient conservation of alfalfa, timothy, and soybeans as silages and as hays
Newman, P. E.	Purdue	Savage	An. husb.	PhD	1937	Use of yeast in dry starters
Osgood, H. S.	Westminster	McCay	An. nut.	PhD	1934	Nutrition of the adult using the white rat as an experimental animal
Page, E.	Canada	Maynard	An. nut.	PhD	1940	Chemical changes occurring in phosphoric acid silage
Paul, H. E.	Okla. St.	McCay/Maynard	An. nut.	PhD	1938	Fat utilization by herbivora
Pavek, M. F.	Cornell	Harrison	An. husb.	MS	1938	Complete dairy herd records
Pico, F.	Puerto Rico	Morrison	An. husb.	MS	1935	Dairy improvement in the tropics
Rasmussen, R. A.	Idaho	McCay	An. nut.	PhD	1938	Vitamin studies with lambs
Rottensten, K. V.	Denmark	Maynard	An. nut.	PhD	1933	Availability of calcium and phosphorus from different supplements
Saint-Pierre, J. M.	Canada	Morrison	An. husb.	PhD	1934	Efficiency of limited and full feeding for fattening pigs in dry lot
Salisbury, G. W.	Ohio St.	Morrison	An. husb.	PhD	1934	Early cut N-fertilized timothy hay vs. alfalfa hay for milk production
Sanchez-Diaz, P. A.	Cuba	Morrison/Hinman	An. husb.	MS	1933	Protein requirements for fattening yearling steers
Schaible, P. J.	R.P.I.	Maynard	An. nut.	PhD	1931	Plasma lipids in lactating and nonlactating animals
Schneider, B. H.	Iowa St.	Morrison	An. husb.	PhD	1931	Efficiency of the proteins of various fish meals

Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1931-1940 (cont.)</b>						
Sehgal, B. S.	India	McCay	An. nut.	MS	1931	Influence of roughage on phosphorus retention
Seidenstein, H. R.	Cornell	Asdell	An. phys.	MS	1934	Anterior hypophysis and its relation to the female reproductive system
Shen, Tung	China	Maynard	An. nut.	PhD	1939	Purified diets for herbivora, with special regard to muscle dystrophy in guinea pigs
Smith, O. D.	Ark.	Morrison	An. husb.	PhD	1933	Relation to feed intake to economical production
Smith, S. E.	Penn St.	Asdell	An. phys.	PhD	1939	Functional sterility in dairy cows
Spencer, C. M.	Cornell	McCay/Maynard	An. nut.	MS	1935	Ash and lipid content of bones of rats
Stiles, W. C.	Va. St.	Morrison	An. husb.	PhD	1932	Protein and other nutrients required by fattening cattle
Stimson, C. R.	Cornell	Maynard	An. nut.	PhD	1939	Carotene and vitamin A content of fresh and frosted green peas and sweet corn
Taylor, J. S.	Tex. A&M	Savage	An. husb.	MS	1939	Synopsis of Jersey history
Tolle, C. H.	Kans. St.	Maynard	An. nut.	PhD	1931	Phosphatic limestone in relation to the mineral nutrition of animals
Tunison, A. V.	Cornell	McCay	An. nut.	MS	1932	Effect of drying temperatures upon the nutritive value of fish meals
Turk, K. L.	Mo.	Morrison	An. husb.	MS	1931	Effect of feeds on dry matter of feces
				PhD	1934	Nutritive value of proteins of alfalfa and clover hay fed alone and with corn

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1931-1940 (cont.)</b>						
Voris, L.	Georgetown (Ky)	Maynard	An. nut.	PhD	1939	Determination of glycerol and neutral fat in blood
Williams, H. H.	Penn St.	Maynard	An. nut.	PhD	1933	Effects of specific lipids in the diet of lactating goats
Willman, J. P.	Penn St.	Morrison	An. husb.	PhD	1933	Cause of the stiff-lamb disease
Wong, C. M.	China	Willman	An. husb.	MS	1936	Application of American methods to swine production in China
Woodward, J. C.	Canada	McCay	An. nut.	MS	1932	Effects of synthetic diets on herbivora
Work, S. H.	Ohio St.	Savage	An. husb.	PhD	1934	Nutrition and physiology of the Virginian deer ( <i>Odocoileus virginianus</i> )
				PhD	1934	Influence upon milk production of feeding three different levels of protein
<b>1941-1950</b>						
Anderson, S. A.	Calif.	Turk	Dairy husb.	MS	1949	Literature review of molybdenum and cobalt
Arata, D. A.	Pratt Inst.	McCay	An. nut.	MS	1950	Effect of yeast and amino acid supplements to bread on growth rate of rats
Babcock, M. J.	Penn St.	Maynard/Asdell	An. nut.	MS	1939	Reproductive efficiency of the albino rat
				PhD	1947	Metabolizable fat in foods and feeds

Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1941-1950 (cont.)</b>						
Barrentine, B. F.	Miss. St.	Maynard/McCay	An. nut.	MS	1941	Influence of sodium metaphosphate and sodium orthophosphate upon mineral nutrition
Beardsley, J. P.	Cornell	Salisbury/Bratton	An. breed.	PhD	1943	Availability of calcium and phosphorus of defluorinated rock phosphate
Beck, G. H.	Idaho	Turk/Morrison	An. husb.	PhD	1948	Repeatability of proved sires and heritability of butterfat production
Becker, D. E.	Ill.	Smith	An. nut.	PhD	1950	Variations in cows to mechanical milking
Bell, J. M.	Canada	Maynard/Loosli	An. nut.	PhD	1949	Physiological functions of cobalt in ruminant nutrition
Bernard, R.	Canada	Maynard	An. nut.	PhD	1948	Methionine requirement for growth of swine
Blakeslee, L. H.	Mich. St.	Miller	An. husb.	PhD	1941	Digestion of cereals by minks and foxes, with special reference to starch and crude fiber
Blaser, F. R.	Kans. St.	Miller	An. husb.	MS	1947	Changes in beef resulting from aging and freezing
Branton, C.	La. St.	Salisbury	An. husb.	MS	1948	Effect of age, level of winter feeding, and time of grain feeding on steers fattened on pastures
				PhD	1946	Physiology and morphology of spermatozoa
				PhD	1950	TDN and protein requirements of bulls used in AI

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1941-1950 (cont.)</b>						
Bratton, R. W.	Purdue	Morrison	An. husb.	PhD	1942	Influence of quality of protein in concentrate mixture on milk production
Bratzler, J. W.	Penn St.	Loosli	An. nut.	PhD	1950	Vitamin E metabolism in swine
Briggs, J. E.	Okla. St.	Miller/Morrison	An. husb.	PhD	1946	Optimum protein requirements of growing fattening lambs
Burke, J. D.	Penn St.	Turk/Morrison	An. husb.	MS	1945	Effect of hay making methods on hay quality
Burkitt, W. H.	Colo. St.	Morrison/Miller	An. husb.	PhD	1948	Growth, nitrogen balance, and protein utilization by lambs
Cheng, P. L.	China	Salisbury	An. breed.	MS	1945	Problems of livestock breeding in China
Cheng, S. Y. Y.	China	Loosli	An. nut.	PhD	1944	Effect of sprouting on the nutritive value of soybeans
Clapp, E. E., Jr.	Mass. St.	Spielman	Dairy husb.	MS	1946	Analysis of reproductive history of the Cornell dairy herd
Collins, W. J.	Mont. St.	Bratton	An. breed.	MS	1950	Semen production of dairy bulls as related to sexual excitement
Cox, R. F.	Okla. St.	Morrison	An. husb.	PhD	1946	Physical balance as a factor in efficiency of feed utilization by fattening lambs
Cupps, P. T.	Mo.	Asdell/Maynard	An. breed.	PhD	1943	Study of the estrous cycle in cattle
Daniel, L. J.	Penn St.	Maynard	An. nut.	PhD	1945	Relationship of <i>Lactobacillus casei</i> factor and folic acid

Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
1941-1950 (cont.)						
de Alba, J.	Mexico	Asdell	An. phys.	MS	1942	Hormonal qualities of levulinic acid
				PhD	1945	Response of ovariectomized heifers to injections of estrogen and progesterone
Dju, D. C.	China	Adolph	An. nut.	MS	1945	Absorption of calcium in the rat and its relations to phosphorus
		McCay	An. nut.	PhD	1947	Vigor and viability of soybeans during storage, heating, and dehydration
Dunbar, R. S., Jr.	R. I.	Henderson	An. breed.	MS	1950	Heritability of fertility in dairy cattle
				PhD	1952	Methods of intraherd selection for butterfat production
Eaton, E. M.	Pratt Inst.	McCay	An. nut.	MS	1947	Dietary studies of rats fed ten percent sucrose solution
Eaton, H. D.	Iowa St.	Spielman	An. husb.	PhD	1947	Prepartal and neonatal supplementation with vitamin D in dairy cattle
Eldridge, F. E.	Idaho	Salisbury	An. breed.	PhD	1948	Evaluation of dairy bulls by multiple regression and variability of milk records
Elliott, F. I.	Ohio St.	Salisbury	An. breed.	PhD	1944	Problems related to successful artificial insemination of dairy cattle
Elliott, R. F.	Ohio St.	Loosli	An. nut.	MS	1947	Effect of curing methods on nutrient losses from hays
				PhD	1949	Carotene metabolism and requirements in young dairy calves

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1941-1950 (cont.)</b>						
Embry, L. B.	Ky.	Willman/ Morrison	An. husb.	MS	1948	Performance of feeder lambs fed different levels of protein and forages
				PhD	1950	Protein requirements of fattening lambs
Footte, R. H.	Conn.	Salisbury	An. breed.	MS	1947	Effect of sulfonamides and other bacterial antagonists upon the livability of spermatozoa
		Bratton		PhD	1950	Preservation of bovine spermatozoa in synthetic media
Forbes, R. M.	Penn St.	Maynard	An. nut.	PhD	1942	Ketosis in the ruminant species
Fung, F. H.	Hong Kong	Adolph	An. nut.	MS	1945	Availability of the indigestible residues in Chinese celery cabbage
Gall, L. S.	Cornell	Maynard	An. nut.	PhD	1946	Rumen microorganisms of sheep and cattle
Goodwin, E. E.	La. St.	Willman	An. husb.	MS	1948	Vitamin and trace mineral supplements for growing and fattening fall pigs
Gray, L. F.	Syracuse	Maynard	An. nut.	MS	1949	Interrelationships of copper, molybdenum, zinc, and lead in the nutrition of the rat
Hansel, W.	Md.	Asdell	An. phys.	MS	1947	Cellular contents of vaginal smears from normal and ovariectomized heifers
				PhD	1949	Metestrous bleeding in dairy cattle
Harris, S. C.		Maynard/McCay	An. nut.	MS	1944	Carotene and ascorbic acid in fresh and salted vegetables



Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
1941-1950 (cont.)						
Hsu, P. C.	China	McCay	An. nut.	PhD	1942	Effect of exercise on thiamine and riboflavin requirements of rats
Klosterman, E. W.	S. Dak. St.	Willman/ Morrison	An. husb.	MS	1943	Three levels of protein and quality of protein for fattening lambs
Krider, J. L.	Ill.	Morrison/ Willman	An. husb.	PhD	1946	Protein requirements and value of urea for fattening lambs
Leonard, H. A.	Maine	Turk	Dairy husb.	MS	1942	Vitamin, protein, and mineral supplements for growing and fattening fall pigs in dry lot
Lincoln, R. M.		McCay	An. nut.	MS	1950	Analysis of factors affecting artificial breeding efficiency of dairy cattle in Maine
Lofgren, G. P.	Ariz.	Loosli	An. nut.	MS	1943	Citrus peel and its use for marmalades of a high vitamin C content
				MS	1946	Value of methionine in supplementing urea in the rations of ruminants
Lord, L. H.	St. Vincent	Turk	Dairy husb.	PhD	1948	Protein requirements of growing Holstein cattle
Lucas, H. L.	Calif. (Davis)	Maynard	An. nut.	MS	1945	Improvement of livestock in St. Vincent, B.W.I.
Martins, N. A.	Purdue	Morrison	An. husb.	PhD	1943	Role of fat in lactation
Matrone, G.	Cornell	Maynard/Ellis	An. nut.	MS	1946	No thesis
				MS	1944	Lignin and cellulose methods for chemical evaluation of feeds

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1941-1950 (cont.)</b>						
McGrew, C. D.	Ohio St.	Turk	Dairy husb.	MS	1949	No thesis
Mercier, E.	Canada	Salisbury	An. breed.	MS	1944	Relationship between abnormal spermatozoa and other criteria of bull semen quality
Morrison, S. H.	Cornell	Turk	Dairy husb.	PhD	1946	Effects of season on spermatogenic activity and reproduction in cattle
				MS	1946	Effect of hay making methods on hay quality
				PhD	1949	Feeding value of barn-dried hay, field-cured hay, and hay-crop silage
Musgrave, S. D.	Ill.	Bratton	An. breed.	PhD	1950	Influence of three levels of nutrition on sexual development of young bulls
Nelson, A. B.	S. Dak. St.	Morrison/Miller	An. husb.	PhD	1950	Protein required in rations for growing, fattening lambs
Nelson, W. L.	Phila. Col. of Pharm.	McCay	An. nut.	PhD	1941	Chemical aspects of retarded growth in the albino rat
Newlin, H. E.	Williams	McCay	An. nut.	PhD	1941	Bone marrow as a site of fat deposition
Norton, C. L.	Ill.	Savage/Morrison	An. husb.	PhD	1944	Ground whole grains vs. by-product feeds in concentrate mixtures for dairy cows
Nymon, M. C.		McCay	An. nut.	MS	1945	Niacin, riboflavin, and thiamine studies on dehydrated pork

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1941-1950 (cont.)</b>						
Pearson, A. M.	Utah St.	Miller	An. husb. (meats)	PhD	1949	Influence of rate of freezing and length of freezer storage upon quality of beef
Ralston, N. P.	Mo.	Savage	An. husb.	PhD	1942	Relative feeding values of silages fed to dairy cows and growing heifers
Rasmussen, E. S.	Long Is. U.	Maynard	An. nut.	PhD	1941	Influence of dietary fat on lactation performance in rats
Reddish, R. L.	Ga.	Miller	An. husb. (meats)	MS	1949	Personalized and standardized methods of meat cutting for locker plants
Richards, C. R.	Utah St.	Turk	Dairy husb.	MS	1948	Nutritive values of alfalfa, mixed clover and timothy, and timothy hay for dairy calves
		Reid/Turk	Dairy husb.	PhD	1950	Some nutritional relationships of roughage carbohydrates for ruminants
Rogel, I.	Hunter	Asdell	An. phys.	MS	1945	Effects of pregnant mare serum (Gonadin) on the reproductive tract of the mature female guinea pig
Rousek, E. J.	Nebr.	Morrison/Miller	An. husb.	MS	1943	Protein required in the ration for fattening lambs
Smithcors, J. F.	Rutgers	Asdell	An. phys.	MS	1942	Relation of the thyroid to development of the mammary gland
Stephanides, C. S.	Greece	Morrison	An. husb.	PhD	1944	Livestock rehabilitation and improvement in postwar Greece

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
1941-1950 (cont.)						
Tabet, H. G.	Egypt	Morrison	An. husb.	MS	1944	Methods of feeding and management in fattening steers
Tanabe, T. Y.	Iowa St.	Salisbury	An. breed.	MS	1945	Influence of age on breeding efficiency
Thomas, J. W.	Utah St.	Loosli/Spielman	An. nut.	PhD	1946	Placental and mammary transfer of carotene and vitamin A as affected by diet
Thomas, W. E.	Ky.	Loosli/Maynard	An. nut.	PhD	1950	Rumen synthesis of amino acids from urea N and inorganic sulfur
Treves, G. R.	Italy	McCay	An. nut.	MS	1942	Fat metabolism and lactation
VanDemark, N. L.	Ohio St.	Salisbury	An. husb.	PhD	1948	Relation of spermatozoan metabolism and other semen characteristics to livability of spermatozoa
Visek, W. J.	Nebr.	Loosli/Maynard	An. nut.	MS	1949	Effect of a special fat supplement on lactation performance
		Loosli/Barnes	An. nut.	PhD	1951	Behavior of tracer doses of labeled calcium in lactating goats following oral and intravenous administration
Volz, F. E.	Ohio St.	Loosli	An. nut.	MS	1945	Role of various fats in the lactation performance of the albino rat
Wallace, H. D.	Ill.	Loosli	An. nut.	PhD	1950	Milk substitutes for dairy calves
Wanderstock, J. J.	Cornell	Miller	An. husb.	PhD	1945	Effect of pasture and amount of grain on the quality and palatability of beef
White, M. N.	Utah St.	McCay	Nut.	MS	1942	Factors affecting milk secretion

Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1941-1950 (cont.)</b>						
Whiting, F. W.	Canada	Loosli	An. nut.	PhD	1948	Mammary and placental transfer of vitamins A and E
Will, L. C.	William Smith	McCay	An. nut.	MS	1943	Influence of retarded growth upon the basal metabolism of the albino rat
Willett, E. L.	Mich. St.	Salisbury	An. husb.	PhD	1941	Preservation and physiology of spermatozoa
Woolfolk, P. G.	Ky.	Reid	An. husb.	PhD	1950	Evaluation of the chromogen(s) method for determining digestibility of feeds by ruminants
Zelaya, J. A.	Peru	Morrison	An. husb.	PhD	1944	Program for development of dairying in the coastal zone of Peru
<b>1951-1960</b>						
Abernathy, R. P.	Berry	Loosli	An. nut.	PhD	1960	nutrient requirements of mink
Aines, P. D.	Rutgers	Smith	An. nut.	PhD	1954	Salt requirements of dairy cattle
Anderson, M. J.	Utah St.	Reid	An. nut.	MS	1957	Influence of stilbestrol and torula yeast on utilization of N of soybean meal and urea
Anthony, W. B.	Tex. A&M	Turk/Reid	Dairy husb.	PhD	1959	Effects of grazing intensity upon performance of lactating cows
				PhD	1953	Influences of methoxyl and isolated lignin on digestibility of feeds by ruminants

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
1951-1960 (cont.)						
Armstrong, D. T.	Canada	Hansel	An. phys.	MS	1956	Pituitary hormones on growth of heifers on different planes of nutrition
Austria, L. L.	Philippines	McCay	An. nut.	MS	1959	Neurohypophyseal regulation of pituitary gonadotrophic hormone secretion
Bayer, G. H.	Cornell	Trimberger	Dairy husb.	MS	1952	No thesis
Bearden, H. J.	Miss. St.	Bratton/Hansel	An. breed.	PhD	1954	Fertilization and embryonic mortality rates for bulls used in artificial breeding
Bensadoun, A.	France	Reid	An. nut.	PhD	1960	Absorption of volatile fatty acids from the gastrointestinal tracts of ruminants
Bernholdt, H. F.	Purdue	Warner	An. nut.	MS	1954	Indices of developing rumen function in young dairy calves
Bethlen, F. R.	Hungary	Smith	An. nut.	MS	1956	Effect of diets that produce parakeratosis in swine on rats and rabbits
Bharucha, R. P.	India	McCay	An. nut.	PhD	1951	Biological availability of some calcium salts
Black, D. L.	Maine	Asdell	An. breed.	MS	1951	Longitudinal muscular activity in the oviducts of rabbits
Blackwell, R. L.	N. Mex. St.	Henderson	An. breed.	PhD	1959	Transport through the rabbit oviduct
				PhD	1953	Sources of variation in fleece weight, weaning weight, and birth weight of sheep

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1951-1960 (cont.)</b>						
Bohman, V. R.	Utah St.	Loosli	An. nut.	PhD	1952	Utilization of molasses and urea in rations of growing dairy cattle
Bradfield, R. B.	Cornell	Maynard	An. nut.	PhD	1955	Protein and calorie efficiency of rabbits
Brannon, W. F.	Nebr.	Miller	An. husb.	MS	1951	Hay-crop and corn silages for wintering beef cows
				PhD	1953	Evaluation of pasture and silages for beef cattle
Brinegar, M. J.	Nebr.	Loosli	An. nut.	PhD	1951	Lysine, tryptophan, histidine, and isoleucine requirements of swine
Buck, C. F.	Ky.	Miller/Morrison	An. husb.	PhD	1953	Value of soybean oil meal, alfalfa hay, or molasses for supplementing rations for lambs
Bush, L. F.	Ky.	Willman/Morrison	An. husb.	PhD	1954	Protein needs of lambs fed shelled corn, corn silage, and alfalfa hay and traces of cobalt and copper
Caballero, H.	Chile	Morrison	An. husb.	PhD	1954	Effect of curing methods and time of cutting upon the feeding value of forages
Card, C. S.	Maine	Schultz	Dairy husb.	MS	1955	Volatile fatty acid production in the rumen
Carter, W. R. B.	England	Schultz	Dairy husb.	MS	1957	Nutrient losses and feeding value of forages

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1951-1960 (cont.)</b>						
Castillo, L. S.	Philippines	Schultz	Dairy husb.	MS	1955	Effects of climate on production and composition of milk from cattle and buffaloes
		Trimberger	Dairy husb.	PhD	1960	Factors affecting solids-not-fat of Guernsey milk
Clamohoy, L. L.	Philippines	Trimberger	Dairy husb.	MS	1958	Coloration and preservation of extended semen
Clawson, A. J.	Nebr.	Reid	An. nut.	PhD	1955	Body composition and digestion studies with swine
Coker, S. P., Jr.	Clemson	Schultz	Dairy husb.	MS	1952	Rate of machine milking of dairy cows
Cunningham, H. M.	Canada	Loosli	An. nut.	PhD	1953	Fat requirements of ruminants
Curtin, L. V.	Ill.	Loosli	An. nut.	PhD	1952	Amino acid requirements for growth of swine
Davey, R. J.	Md.	Willman/ Wellington	An. husb.	PhD	1957	Lamb feeding studies with hormones
Davidson, J. G.	Tobago	Henderson	An. breed.	MS	1960	Foetal mummification among dairy cattle
Davis, R. F.	N.H.	Loosli	An. nut.	MS	1952	Roughages alone vs. roughages and concentrates for milk production
				PhD	1953	Utilization of molasses by growing dairy heifers
De Costa, L. C.	S.C. St.	Sheffy/ Wellington	An. husb.	PhD	1956	Value of fat, roughage, and antibiotics in growing-fattening swine



## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
1951-1960 (cont.)						
Dicks, M. W.	Conn.	McCay	An. nut.	MS	1951	Utilization of calcium in sesame seeds by the rat
Dolge, K. L.	Conn.	Loosli	An. nut.	PhD	1955	Interrelationships between carotene and vitamin A
Donefer, E.	Cornell	Smith	An. nut.	MS	1957	Protein requirement of growing and fattening rabbits
Drain, J. J.	Kans. St.	Miller	An. husb.	MS	1956	Value of mixed hays and grass silage for wintering rations of beef calves
				PhD	1957	Stilbestrol and alfalfa pellets in fattening rations; effect of stilbestrol on digestibility and body composition
Drori, D.	Israel	Loosli	An. nut.	MS	1957	Ruminant digestion
				PhD	1959	Metabolic aspects of urea and carbohydrates vs. plant protein for sheep
Drouliscos, N. J.	Greece	Turk	An. husb.	MS	1954	Vitamin A requirement of the baby pig
		Warner	An. nut.	PhD	1962	High fat milk replacers for veal production
Dunn, H. O.	Ill.	Bratton	An. breed.	PhD	1952	Influence of plane of nutrition on growth and sexual development of young bulls
Egermeier, J. C.	Okla. St.	Turk	Dairy husb.	MS	1959	Feeding value of forage as affected by harvesting method and stage of maturity

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1951-1960 (cont.)</b>						
Eggert, R. G.	Nebr.	Loosli	An. nut.	PhD	1954	Leucine and histidine requirements for growth of suckling pigs
Elliot, J. M.	Canada	Loosli	An. nut. biochem.	PhD	1958	Effect of dietary ratio of hay to concentrate on energy utilization for milk production
Elston, R. C.	England	Henderson	An. breed.	PhD	1959	Estimation of genetic gain in milk yield due to sire selection
Empey, E. L.	Canada	McCay	An. nut.	PhD	1959	Kidney calcification in female albino rats fed a diet of milk, alkali, and sucrose: Effect of adding magnesium
Ferguson, J. R.	Colo. St.	Miller	An. husb.	MS	1951	Effect of aureomycin on nursing beef calves
Fisk, G. R.		Maynard	An. nut.	PhD	1953	Comparative value of various roughages in the wintering rations for beef calves
Flatt, W. P.	Tenn.	Loosli	An. nut.	PhD	1955	Soft tissue calcification in the guinea pig produced by a limited intake of magnesium
Freeman, A. E.	W. Va.	Henderson	An. breed.	PhD	1955	Factors affecting development of ruminant stomach
Garcia, G. V.	Philippines	Loosli	An. nut.	MS	1957	Significance of genetic structures of dairy cattle herds
					1955	Nutritional relationships between gastrointestinal parasites and hosts (sheep and cattle)

Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1951-1960 (cont.)</b>						
Gregoire, A. T.	Conn.	Bratton	An. breed.	PhD	1957	Sperm output and fertility of rabbits ejaculated either once a week or once a day
Hafts, H. D.	Wis.	Bratton	An. breed.	MS	1957	Variance components of bovine semen criteria and their use in design of experiments
				PhD	1959	Libido, sperm characteristics, sperm output, and fertility of mature dairy bulls ejaculated at daily or weekly intervals
Haider, S. M. N.	Pakistan	Henderson	An. breed.	MS	1959	Production results of crossbreeding dairy cattle in Asia
Hardison, W. A.	W. Ky. St.	Reid	Dairy husb.	PhD	1952	Chromogen and other indicators in pasture evaluation
Haynes, E. H.	Ky.	Loosli/Warner	An. nut.	PhD	1959	Ruminant digestion techniques: Cotton loops as a measure of cellulose digestion
Hemken, R. W.	Ill.	Trimberger/Turk	Dairy husb.	PhD	1957	Influence of hay harvested at different stages of maturity and two levels of grain upon growth rate of dairy calves
Hickman, C. G.	Canada	Henderson	An. breed.	PhD	1954	Genetic variation and covariation in rate of maturity and level of production in dairy cattle
Hogue, D. E.	Calif. (Davis)	Warner	An. nut.	MS	1955	Antibiotics in the nutrition of dairy calves
		Loosli/Warner	An. nut.	PhD	1957	Dietary causes of muscular dystrophy in lambs

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1951-1960 (cont.)</b>						
Holmes, R. L.	Hamp. Inst.	Willman	An. husb.	MS	1954	Value of roughages for growing and fattening pigs
Holter, J. A.	Md.	Turk/Slack	Dairy husb.	MS	1955	Roughage levels, simple vs. complex starters, and cud inoculations for dairy calves
		Reid	Dairy husb.	PhD	1959	Forage and fecal protein as indicators of forage digestibility
Horrington, E.	N.C.	McCay	An. nut.	PhD	1958	Parabiosis of rats of two different ages
Horvath, D. J.	Rutgers	Warner	An. nut.	PhD	1957	Intestinal flora of simple-stomached animals
Hough, W. H. L.	Canada	Asdell	An. phys.	MS	1954	Effects of atropine sulfate and progesterone on ovulation in the cow
Hsu, C. H.	China	McCay	Nut.	PhD	1952	Biological availability of calcium sulphate for the rat
Ibbotson, C. F.	England	Loosli	An. nut.	MS	1956	Starch equivalent, E.N.E., and T.D.N. as measures of energy for lactating cows
Jerome, F. N.	Canada	Henderson	An. breed.	PhD	1956	Heritabilities, gene interactions, and correlations associated with certain traits in the domestic fowl
Jones, D. J. C.	England	Reid	An. nut.	MS	1955	Applications, potentialities, and limitations of indigestible indicators and faecal indices
Kennelly, J. J.	Cornell	Foote	An. breed.	MS	1960	Spermatogenesis in boars
				PhD	1964	Oogenesis in rabbits

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
1951-1960 (cont.)						
Kercher, C. J.	Mont. St.	Smith	An. nut.	MS	1952	Response of cobalt-deficient lambs to orally administered vitamin B <sub>12</sub>
Kerr, R. H. P.	Ireland	Loosli/Warner	An. nut.	MS	1958	Metabolism of cobalt, vitamin B <sub>12</sub> , and aureomycin by cobalt-deficient lambs
Kim, H. J.	Korea	McCay	An. nut.	PhD	1951	Digestibility studies with ruminants
Koch, B. A.	Iowa St.	Smith	An. nut.	MS	1951	Nutritional studies on mold-treated soybeans
Konishi, F.	Colo. St.	McCay	An. nut.	PhD	1958	Response of cobalt-deficient lambs to liver extract and vitamin B <sub>12</sub> therapy
Lang, D. R.	New Zealand	Hansel	An. phys.	MS	1959	Factors affecting nutrient utilization with special reference to calcium
Layhe, W.	Scotland	Turk	An. husb.	MS	1958	Sexual dimorphism in three somatic tissues of cattle
Lister, E. E.	Canada	Reid	An. nut.	PhD	1960	Growth response of dairy calves fed dried rumen organisms and orotic acid plus methionine
Liu, C. H.	China	McCay	An. nut.	PhD	1952	Effect of short-chain fatty acids on heat production of cattle
Lopez, J.	Argentina	McCay	An. nut.	MS	1957	Calcium metabolism of dogs
Louw, G. N.	S. Africa	Loosli	An. nut.	PhD	1960	Effect of moderate heat treatment upon the nutritive value of fats
						Growth promoting properties of diethylstilbestrol

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1951-1960 (cont.)</b>						
Lovejoy, S.	Yale	Schultz	Dairy husb.	MS	1955	Value of molasses and urea as supplements to hay for dairy heifers
Lunsford, W.	Marshall	McCay	An. nut.	MS	1960	Parabiosis as a method for studying the effects of aging in rats
Lupien, P. J.	Canada	McCay	An. nut.	PhD	1960	Thermic contraction and elasticity in the chinchilla and ruminant tendon fiber as influenced by age
Madamba, J. C.	Philippines	Miller	An. husb.	MS	1960	Factors affecting salt consumption by cattle
Maplesden, D. C.	Canada	Loosli	An. nut.	PhD	1959	Nutritional muscular dystrophy in cattle
Martin, A.	Scotland	Miller	An. husb.	MS	1959	Performance testing of beef bulls and heritability estimates in selection
Martin, C. M.	Ky.	Reid/Morrison	An. husb.	PhD	1952	Season changes in the physical and chemical composition of pasture herbage
Mathieu, L. G.	Canada	Smith	An. nut.	MS	1958	Protein requirement of growing and fattening rabbits
Merrill, W. G.	Md.	Loosli	An. nut.	PhD	1960	Phosphorus requirement of growing rabbits
				PhD	1959	Effects of foliar application of urea on the nutritive value of some grass hays

Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1951-1960 (cont.)</b>						
Nicholson, J. W. G.	Canada	Loosli	An. nut.	MS	1956	Dried distillers' molasses solubles as a source of unidentified factors for ruminants
Noland, P. R.	Ill.	Willman/ Morrison	An. husb.	PhD	1959	Relationships among intrarumen factors and their influence on digestion
Norman, R.	Cornell	Willman	An. husb.	MS	1951	Vitamin and mineral supplements for growing and fattening pigs
					1953	Value of trace minerals and antibiotics in rations of pigs
					1955	Effect of supplementary fat in rations of lactating sows
O'Donovan, D. J.	Ireland	Loosli/Smith	An. nut.	MS	1960	Effects of diet on fat percentage and composition of cow's milk
Ortiz-Lugo, M. S.	Puerto Rico	Miller	An. husb.	MS	1956	Improving cattle production in Puerto Rico by use of better nutritional practices
Panaretto, B. A.	Australia	Reid	An. nut.	PhD	1960	Methods for the estimation of body water and gut water in living ruminants
Park, R. L.	Brigham Young	McCay	An. nut.	MS	1958	Effects of low level administration of fluorine to albino rats from conception to old age
		Miller	An. husb.	PhD	1962	Value of hay pellets for beef cattle

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1951-1960 (cont.)</b>						
Paterno, T. T.	Philippines	Footé	An. breed.	MS	1957	Beef cattle improvement in the Philippines with special emphasis on testing and selection
Payne, I. R.	Colo. St.	McCay	An. nut.	PhD	1959	Renal filtration and reabsorption of Ca and P in healthy rats and rats with calcified kidneys
Pelissier, C. L.	Calif. (Davis)	Slack	An. husb.	MS	1952	Effect of cud inoculation and antibiotics on growth of dairy calves
Pierce, E. A.	S. Dak. St.	Miller	An. husb.	PhD	1955	Relative value of corn, oats, and hominy when fed with molasses to fattening yearling steers on pasture
Pierce, W. W.	Vt.	Turk	Tech. ag. (an. husb.)	MS	1953	No thesis
Pinkos, J. A.	Ill.	McCay	An. nut.	PhD	1952	Calcium and phosphorus metabolism in Great Dane dogs
Pou, J. W.	N.C. St.	Henderson	An. breed.	PhD	1951	Inheritance of breeding efficiency in the Beltsville dairy herd
Proctor, J. F.	Tex. A&M	Smith	An. nut.	MS	1958	Influence of an antibiotic and protein level upon the carcass quality of swine
Putnam, P. A.	Vt.	Loosli	An. nut.	PhD	1960	Selenium in its relation to muscular dystrophy and dietary liver necrosis
				PhD	1957	Effect of feeding different ratios of roughage to concentrate



Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1951-1960 (cont.)</b>						
Rakes, A. H.	Va. Poly.	Reid	An. nut.	PhD	1960	Effects of feeding equilized intakes to mature and immature sheep at different frequencies
Ramseyer, W. R.	Okla. A&M	McCay	An. nut.	PhD	1956	Effects of low levels of fluoride fed to albino rats from conception until old age
Rashwan, M. E.	India	Bratton	An. breed.	MS	1953	Semen criteria interrelationships and their relation to fertility in dairy bulls
Rechcigl, M., Jr.	Cornell	Loosli	An. nut.	PhD	1958	Metabolism of nonessential amino acids and D-amino acids in the rat
Reddy, J. C.	India	Henderson	An. breed.	MS	1954	Breeding structure and genetic changes in a N. Y. dairy herd
Robertson, G. M.	Scotland	Smith	An. nut.	MS	1957	Role of magnesium in grass staggers in cattle
Runcie, K. V.	Scotland	Turk	Dairy husb.	MS	1954	Influence of different levels of nutrition during the rearing period on subsequent growth and reproduction of dairy heifers
Salman, A. A.	Lebanon	Schmidt	Dairy husb.	MS	1960	Effect of climate on dairy cattle
Sambhavaphol, P.	Thailand	McCay	An. nut.	PhD	1957	Effects upon the kidneys of long-time feeding of milk and sodium bicarbonate to rats and hamsters

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1951-1960 (cont.)</b>						
Sander, E. G.	Minn.	Warner	An. nut.	MS	1959	Effect of several chemical compounds on development of forestomach tissue in dairy calves
Schmidt, G. H.	Iowa St.	Schultz	Dairy husb.	MS	1956	Effect of sodium propionate feeding on milk production and hay consumption
				PhD	1958	Three levels of grain feeding during dry period on incidence of ketosis, udder edema, and subsequent milk production
Searle, S. R.	New Zealand	Henderson	An. breed.	PhD	1959	Age correcting dairy records according to the level of herd production
Sewell, R. F.	Fla.	Loosli	An. nut.	PhD	1953	Threonine and protein requirements of suckling pigs
Skipitaris, C. N.	Greece	Loosli	An. nut.	PhD	1956	Effect of added soluble carbohydrate upon the digestibility of protein and fiber in swine rations
Slack, S. T.	Md.	Turk	An. husb.	MS	1949	Nutritive value of distillers' dried solubles in calf rations
				PhD	1951	Nutritive value of distillers' dried solubles as determined by feeding, digestion, and palatability trials

Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1951-1960 (cont.)</b>						
Smith, A. M.	Maine	Reid	An. Nut.	MS	1955	Chromic oxide and plant chromogens for determining the intake of pasture herbage
				PhD	1956	Influence of environmental conditions and botanical composition upon the nutritive value of rotationally grazed pastures
Sorensen, A. M., Jr.	Texas A&M	Asdell	Rep. phys.	MS	1951	Study of uterine smears of the cow
		Hansel	Rep. phys.	PhD	1953	Growth and sexual development of Holstein heifers as influenced by three levels of nutrition
Stevens, R. L.	Md.	Turk	An. husb.	MS	1954	Problem of solids-not-fat content of milk
Stewart, D. G.	Cornell	Warner	An. nut.	PhD	1959	Continuous culture for studying rumen fermentation
Stewart, W. E.	Cornell	Schultz	Dairy husb.	MS	1956	Rate of machine milking of dairy cows
				PhD	1957	Volatile fatty acid production in the bovine rumen
Stone, J. B.	Canada	Trimberger	Dairy husb.	PhD	1959	Roughage intake and efficiency of feed utilization in dairy cattle
Stubbs, O. J.	S. Africa	Miller	An. husb.	MS	1957	Phenothiazine as a bovine anthelmintic and factors affecting its palatability
				PhD	1959	Preferences of cattle for certain flavors and their effect on palatability of salt mixtures

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1951-1960 (cont.)</b>						
Thacker, E. J.	Mass. St.	Maynard	An. nut.	PhD	1954	Effect of dietary fat levels on the nutrition of the rabbit
Thorndyke, W. M.	Okla. St.	Miller	An. husb.	MS	1951	Effect of age, level of winter feeding, and time of grain feeding on steers fattened on pasture
Turkheimer, R. A.	Long Is. U.	Foote	An. breed.	MS	1957	Onset and level of semen production in young boars
Udall, R. H.	Cornell	McCay	An. nut.	PhD	1951	Food value of fresh bones
Ulrich, H. E.	Rochester	McCay	An. Nut.	PhD	1957	Species differences in gastrointestinal secretion
Van Vleck, L. D.	Nebr.	Henderson	An. breed.	PhD	1960	Value of part lactation records in selection
Waldo, D. R.	Mich. St.	Schultz	Dairy husb.	MS	1955	Lactic acid production in the rumen
		Loosli/Schultz	Dairy nut.	PhD	1957	Blood and rumen changes following administration of glycologenic materials
Wallentine, M. V.	Utah St.	Miller	An. husb.	MS	1956	Effects of adding diethylstilbestrol to a fattening ration for steer calves
Wanner, R. L.	St. Bonaventure	McCay	An. nut.	PhD	1955	Pelleted roughages for fattening beef cattle; ultrasonics in the estimation of ribeye area in live beef cattle
Warner, R. G.	Ohio St.	Maynard/Loosli	An. nut.	PhD	1951	Calcium metabolism in dogs, with respect to age and exercise Metabolism of intravenously administered carotene in the dairy calf

Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
1951-1960 (cont.)						
Wasserman, R. H.	Cornell	Loosli	An. nut.	PhD	1953	<i>In vitro</i> studies with rumen microorganisms
Wayman, O.	Utah St.	Asdell	An. phys.	PhD	1951	Physiology of nymphomania in dairy cattle
Wearden, S.	St. Louis U.	Henderson/ Bratton	An. breed.	PhD	1957	Testing of beef sires to determine genetic values for production of feeder calves
Wells, C. F.	Jamaica	Smith	An. nut.	MS	1954	Digestibility in young dogs and pigs
Wentworth, R. A.	Mass. U.	Smith	An. nut.	MS	1960	Availability of phosphorus in various sources for dairy calves
Wise, M. B.	N.C. St.	Smith	An. nut.	PhD	1961	Calcium requirements of dairy calves
Wittwer, L. S.	Mich. St.	Trimberger	Dairy husb.	PhD	1957	Requirements and availability of various sources of phosphorus for calves
				MS	1954	Effects of preservatives upon feeding value of unwilted hay-crop silage
				PhD	1956	Effects of storage methods upon nutrient losses and feeding value of ensiled legumes and grasses
Young, D. C.	Cornell	Foote	An. breed.	MS	1958	Sperm production and preservation, heat detection, and artificial insemination
Zervas, N. P.	Greece	Turk	An. husb.	MS	1954	Heritability and repeatability of fat test in Cornell dairy herd

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
			1961-1963			
Bishop, S. E.	Utah St.	Loosli	An. nut.	MS	1962	Effect of pelleting and varying grain intakes on milk yield and composition
Campbell, T. C.	Penn St.	Warner	An. nut.	MS	1957	Increasing crude fiber digestion coefficient by the use of bacterial transfer
		McCay	An. nut.	PhD	1962	Biuret and bicarbonate in rations of ruminants
Carrillo, B. J.	Argentina	Pond	An. husb.	MS	1961	Magnesium, protein, and potassium interrelationships in rats and calves
Chatterton, R. T., Jr.	Cornell	Schmidt	Dairy husb.	PhD	1963	Estrogen and progesterone parameters associated with mammary gland growth in the rabbit
Cunningham, E. P.	Ireland	Henderson	An. breed.	PhD	1962	Estimation of genetic and phenotypic parameters in a beef cattle population
Davenport, D. G.	Mass.	Reid	Dairy husb.	MS	1962	Analysis of NY DHIA and OS feeding records
				PhD	1964	Methods for estimating forage consumption; influence of grazing system on animal and plant performance
Doornenbal, H.	Canada	Asdell	An. phys.	PhD	1961	Relationship between chromium-51 determined red cell volume and lean body mass in rats and pigs
Drouliscos, N. J.	Greece	Loosli	An. nut.	MS	1954	Vitamin A requirement in the baby pig
				PhD	1962	High fat milk replacers for veal production

Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1961-1963 (cont.)</b>						
Ekern, A.	Norway	Reid	An. nut.	MS	1963	Rumen fermentation and efficiency of energy utilization in young steers ingesting diets supplemented with lactic acid
Faulkner, L. C.	Colo. St.	Hansel	Rep. phys.	PhD	1963	Hypothalamic substances in adenohipophyseal function
Gardner, R. W.	Utah St.	Hogue	An. husb.	MS	1962	Energy requirements of the ewe during gestation and lactation
				PhD	1964	Efficiency of milk production of ewes and growth of suckling lambs
Harrison, H. N.	Calif. (Davis)	Warner	An. nut.	MS	1959	Stomach development of young dairy heifers fed varying proportions of hay and concentrate
				PhD	1962	Relationships between physical form of the feed, rumen capacity, and appetite of dairy cattle
Heidhues, T. H.	Germany	Henderson	An. breed.	PhD	1961	Accuracy of the selection index method in samples from populations with unknown parameters
Hintz, H. F.	Ohio St.	Loosli	An. nut.	MS	1961	Effect of autoclaving on the nutritive value and composition of hay
				PhD	1964	Toxic and antivitamin E factors in raw kidney beans
Jainudeen, R. M.	Ceylon	Hansel	An. phys.	PhD	1964	Effects of nitrate ingestion during pregnancy in dairy cows

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1961-1963 (cont.)</b>						
Jones, J. R.	Ky.	Hogue	An. husb.	PhD	1961	Influence of date and method of harvesting of hay on lamb performance
Joshi, S. R.	India	Asdell	An. phys.	MS	1963	Relationships of testosterone to growth in rats
Kotby, A. R.	Egypt	Turk	An. husb.	PhD	1965	Pharmacology of the rabbit oviduct
				MS	1963	Effect of exposure to light during examination on the motility of stored bovine semen
Lowery, R. S., Jr.	Ga.	Loosli	An. nut.	PhD	1962	Effect of calorie-protein ratio upon ration digestibility, performance, and carcass composition of young swine
Lynch, G. P.	Mass.	Wellington	An. husb.	PhD	1963	Predicting whole body composition of living hogs
Manalo, C. M.	Philippines	McCay	An. nut.	MS	1961	Metabolism of strontium in the rat
Maner, J. H.	Ga.	Pond	An. nut.	PhD	1961	Utilization of isolated soybean protein by young rats and pigs
Marcum, J. B.	Mo.	Stouffer	An. husb. (meats)	MS	1961	Pork loin indices as related to lean cuts
McFee, A. F.	Tenn.	Bratton	An. breed.	PhD	1963	Testicular morphology and reproductive capacity of rabbits after gamma radiation
Mowat, D. N.	Canada	Warner	An. nut.	PhD	1963	Rumen capacity and the physical inhibition of feed intake



## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1961-1963 (cont.)</b>						
Paladines, O. L.	Ecuador	Reid	An. nut.	PhD	1963	Energy utilization by sheep as influenced by physical form, composition, and level of intake
Pavey, R. L.	Purdue	Miller	An. husb.	PhD	1963	Nutritional and physiological effects of feeding pelleted hay to ruminants
Reynolds, P. J.	Purdue	Warner	An. nut.	PhD	1961	Effects of ration on glucose metabolism in calves
Scott, J. E.	England	Miller	An. husb.	MS	1961	Methimazole in the ration of fattening steers
Simmons, K. R.	Maine	Hansel	An. phys.	PhD	1963	Nature of the luteotropic hormone in the bovine
Staples, R. E.	Canada	Hansel	An. breed.	PhD	1961	Luteal inhibition of oxytocin injections on embryo survival in the bovine
Steinbach, J.	Germany	Foote	An. phys.	MS	1963	Media and methods for freezing bovine semen
Stroud, J. W.	Fla.	Reid	An. nut.	PhD	1961	Indirect methods for estimation of chemical composition and energy value of living cattle
Swierstra, E. E.	Netherlands	Foote	An. phys.	PhD	1962	Cytology and kinetics of spermatogenesis in the rabbit
Van Blake, H. E.	N.C. A&T	Hansel	An. phys.	MS	1962	Synchronization of the estrous cycle of dairy and beef cattle
Van Niekerk, B. D. H.	S. Africa	Reid	An. nut.	PhD	1962	Relation of creatinine to body composition

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>1961-1963 (cont.)</b>						
Wagner, D. G.	Ohio St.	Loosli	An. nut.	MS	1962	Purified diets for ruminants
				PhD	1965	Energy requirements of high-producing dairy cows
Yopo, B.	Chile	Hogue	An. husb.	MS	1961	Ram semen production and storage in various extenders
<b>Graduate students who enrolled before July 1, 1963, and completed degrees later</b>						
Acosta, L. A.	Colombia	Reid	An. nut.	MS	1965	Effect of adding several materials to the rumino-reticulum on voluntary feed intake
Allaire, F. R., Jr.	Mass.	Henderson	An. breed.	PhD	1965	Efficiency of selection among dairy cows with respect to production and type appraisal traits
Bowman, A. L.	Canada	Warner	An. husb.	MS	1965	Nutritional components of milk replacers for veal production
				PhD	1967	Vitamin B <sub>6</sub> requirement of mink
Bredderman, P. J.	Cornell	Foote	An. breed.	MS	1967	Effects of ions, inhibitors, fructose, and albumin on cell volume stability and motility of bovine spermatozoa at high semen dilution

Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>Graduate students who enrolled before July 1, 1963, and completed degrees later (cont.)</b>						
Breuer, L. H.	Mo.	Loosli	An. nut.	PhD	1964	Role of asparagine and other dispensable amino acids in the nutrition of the rat
Brunner, M. A.	Wis.	Hansel	An. phys.	PhD	1968	Factors affecting luteal function in hysterectomized cattle
Bui, Tro Van	Philippines	Trimberger	Dairy husb.	MS	1964	Effects of frequency of feeding forage to lactating cows
				PhD	1966	Digestibility and feeding value of long, ground and pelleted early and late-cut hay
Cameron, C. W.	Penn St.	Hogue	An. husb.	PhD	1966	Effect on growth and depot of corn oil in the diet of lambs
Chapin, R. E.	Oreg. St.	Smith	An. nut.	PhD	1965	Nutrient requirements of the domestic rabbit
Chichaibelu, B.	Ethiopia	Smith	An. husb.	MS	1965	Biological evaluation of the protein quality of teff ( <i>Eragrostis abyssinica</i> )
Donaldson, L. E.	Australia	Asdell	An. phys.	PhD	1964	Luteotropic hormone and action of oxytocin in altering luteal function in the cow
Fisher, L. J.	Canada	Loosli	An. nut.	PhD	1966	Effect of intravenous infusion of propionate or glucose on milk and blood composition of the bovine
Gallo C. J. T.	Colombia	Pond	An. nut.	PhD	1965	Tryptophan requirement of baby pigs

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>Graduate students who enrolled before July 1, 1963, and completed degrees later (cont.)</b>						
Gray, H. G.	Tenn.	Trimberger	An. husb.	MS	1964	Forage consumption and efficiency of feed utilization in lactating dairy cows
				PhD	1966	Repeatability and heritability of forage DM intake and efficiency of feed utilization in dairy cattle
Han, I. K.	S. Korea	Reid	An. nut.	PhD	1965	Physiological effects of feeding frequency on sheep and rats ingesting diets of equal amounts
Harville, D. A.	Iowa St.	Henderson	An. breed.	MS	1964	Interrelationships among age, body weight, and production traits in cattle
				PhD	1965	Adjustment of N. Y. S. AI dairy sire proofs for environmental and genetic trends
Hopcraft, D.	Kenya	Reid	An. Sci.	MS	1965	Grassland livestock and game in the life of Kenya
				PhD	1975	Productivity comparison between Thompson's gazelle and cattle and their relation to ecosystem in Kenya
Johnson, W. L.	N.H.	Trimberger	Dairy husb.	MS	1964	Voluntary intake of forage by lactating and nonlactating Holstein cattle
				PhD	1965	Nutritive value of <i>Panicum maximum</i> for cattle and water buffaloes in the tropics
Koh, Y. O.	S. Korea	Henderson	An. breed.	PhD	1967	Reevaluation of age correction factors for N. Y. Holstein dairy records

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>Graduate students who enrolled before July 1, 1963, and completed degrees later (cont.)</b>						
Kroening, G. H.	S. Ill.	Pond	An. nut.	PhD	1965	Sulfur amino acid requirement of the baby pig as affected by protein, choline, and threonine levels
Lee, A. J.	Canada	Henderson	An. breed.	PhD	1966	Components of genetic variance in dairy cattle production records and their use in selection indexes
Malven, P. V.	Ill.	Hansel	An. Phys.	PhD	1964	Factors controlling luteal regression in rats and cattle
Mathias, M. M.	Purdue	Loosli	An. nut.	MS	1964	Biological activity of selenium in bovine milk for the rat and chick
				PhD	1967	Relationship between vitamin B <sub>12</sub> and propionate metabolism with specific reference to stress of lactation
McCarthy, B.	Ireland	Warner	An. nut.	PhD	1964	Pantothenic acid requirement and the histopathology of pantothenic acid deficiency in the mink
McIlroy, D. L., Jr.	N. Dak. St.	Miller	An. husb.	PhD	1965	Fattening beef cattle on pasture and high-silage rations
Moe, P. W.	Iowa St.	Reid	An. nut.	PhD	1964	Effects of level of intake on the utilization of diets by dairy cattle
Myers, G. S.	Colo. St.	Loosli	An. nut.	PhD	1966	Effects of roughage levels, heated concentrates, and bicarbonate on digestion and milk yield and composition

## Graduate Majors (cont.)

<i>Name</i>	<i>From</i>	<i>Major professor</i>	<i>Major field</i>	<i>Degree</i>	<i>Date</i>	<i>Thesis</i>
<b>Graduate students who enrolled before July 1, 1963, and completed degrees later (cont.)</b>						
Perez, C. B., Jr.	Philippines	Warner	An. nut.	PhD	1965	Urea-phosphate as a source of nitrogen and phosphorus for ruminants
Sod-Moriah, U. A.	Israel	Schmidt	An. phys.	PhD	1966	Deoxyribonucleic acid content and proliferation pattern of the epithelial cells in mammary glands of the rabbit
Tyrrel, H. F.	Iowa St.	Reid	An. nut.	MS	1964	Utilization by fattening steers of the energy in forage harvested at different stages of maturity
Veum, T. L.	Wis.	Pond	An. nut.	PhD	1966	Effect of method of forage preservation on energetic efficiency of lactating cows
				MS	1965	Effect of ferrous fumarate in the lactation diet on sow milk iron, pig hemoglobin, and weight gain
				PhD	1968	Effect of feeding frequency of performance, carcass measurements, blood components, body metabolism, and body composition of swine
Yamdagni, S.	India	Loosli	An. nut.	PhD	1966	Effects of nutrition on the production and composition of milk and efficiency of energy utilization by dairy cows
Yassen, A. M.	Egypt	Foote	An. phys.	PhD	1966	Effect of electrolyte concentration, method of glycerolation, and aging period on the freezability of bull semen extended with tris-buffered egg-yolk extender

## APPENDIX 3

### Grants, Contracts, Agreements, and Gifts

As research in the Department of Animal Husbandry gradually expanded during the administration of Professors Wing, Morrison, and Turk, some funds were provided by grants and contracts from farmers' organizations and industrial concerns for studies of specific animal problems. Records of the earlier grants, however, are not available until 1926-27. Those beginning at that time up through 1963 are summarized in the pages that follow.

This summary has been made up primarily of those grants, contracts, agreements, and gifts recorded in the annual reports of the college. A few were compiled from records in the departmental files. It is possible that some omissions have been made in this compilation, but the main purpose is to show the wide variety of sources of support and the gradual increase in the number and amount of external funds that have contributed to the programs of the department over the years.

Policies always were to accept grants and contracts only if they would support research on problems that were important to livestock farmers and consumers and for which no other state, federal, or income funds were available. On a number of occasions grant funds offered to the department were not accepted because of certain restrictions of potential donors.

A summary at the end of this appendix illustrates the growth of research grants after 1926.

### Grants, Contracts, Agreements, and Gifts

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*1926-27*

**Charles Pfizer & Co. Inc.** - Usefulness of calcium citrate in the feeding of animals      \$ 1,200

**American Dry Milk Institute, Inc.** - Usefulness of dry skim milk in animal feeding      1,200

*1927-28*

**American Dry Milk Institute, Inc.** - Continued fellowship for investigation of the value of dry skim milk in feeding calves      2,000

**International Agricultural Corporation** - Usefulness of phosphatic limestone and of treble superphosphate in the calcium and phosphorous nutrition of animals      3,200

*1928-29*

**Cooperative Grange League Federation Exchange, Inc. and the Dairymen's League Cooperative Association** - Effect of different planes of protein intake upon milk production      15,000

*1929-30*

**Corn Products Refining Company** - Effect of dextrose sugar in the ration of growing calves      600

**International Agricultural Corporation of New York** - Usefulness of phosphatic limestone in the calcium and phosphorous nutrition of farm animals      2,400

*1930-31*

No new grants

*1931-32*

**Sylvania Industrial Corporation** - Cellulose in the diet of higher animals, especially in its effect on the digestion and absorption of nutrients      2,000

**American Cyanamid Company** - Feeding value for dairy cows of timothy hay cut at an early stage of maturity and from land well fertilized, especially with nitrogen, as compared with legume hay      4,000



**Grants, Contracts, Agreements, and Gifts (cont.)**

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**1932-33**

<b>American Dry Milk Institute, Inc.</b> – Effect of manufacture upon the vitamin-G content of dried skim milk	\$ 1,500
<b>Kraft-Phenix Corporation</b> – Relative nutritive properties of Kraco milk-sugar feed (dried whey) and dried skim milk	2,000

**1933-34**

Grants from the <b>American Dry Milk Institute</b> and the <b>Kraft-Phenix Corporation</b> were each continued for another year	3,500
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**1934-35**

<b>Kraft-Phenix Corporation</b> renewed the Kraco fellowship	2,000
<b>Health Products Corporation</b> – Possible relations of various oils and vitamin A-D concentrates to the production of muscle lesions in herbivora	2,300

**1935-36**

<b>Rockefeller Foundation</b> – Studies over a period of 6 years on optimum nutrition for the longest possible productive life	42,500
<b>Anheuser-Busch, Inc.</b> – Value of live dried yeast and killed dried yeast in the ration of calves	2,100
<b>Kraft-Phenix Cheese Corporation</b> – Further studies of the Kraco milk-sugar feed (dried whey)	2,000

**1936-37**

<b>Anheuser-Busch</b> fellowship continued on the value of live dried yeast and killed dried yeast in rations of calves	2,100
<b>Freeport Sulfur Company</b> – Effect of sulfur, in the form of sulfur dioxide, or other forms, on vegetation as measured by changes in feeding value	5,000
<b>United States Industrial Alcohol Company</b> – Usefulness of molasses-yeast feed as an ingredient in calf starters	1,290

**Grants, Contracts, Agreements, and Gifts (cont.)**

**1937-38**

<b>United States Industrial Alcohol Company and the Cooperative Grange League Federation Exchange, Inc.</b> each contributed to a temporary fellowship to study the role of yeast vitamins in the nutrition of herbivora, primarily dairy cattle, and a study of the usefulness of Vactone (a yeast-and-molasses by-product) as a source of these vitamins for dairy cattle	<b>\$ 2,500</b>
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**1938-39**

<b>Anheuser-Busch, Inc.</b> – Value of live dried yeast and killed dried yeast in the rations of calves	3,000
<b>Charcoal Foundation</b> – Value of adding charcoal to well-balanced rations for growing and fattening pigs	2,160
<b>New York Farmers, Inc.</b> established the New York Farmers pasture research fellowship	3,000
<b>Victor Chemical Company</b> – Cause and prevention of acetonemia, with special reference to any nutrition factors involved	800

**1939-40**

<b>Beacon Milling Company</b> – Cause and prevention of acetonemia, with special reference to any nutrition factors involved	1,000
<b>Cooperative Grange League Federation, Inc.</b> – Nutritive value of feeds for lactating cows and for calves	4,000

**1940-41**

<b>Cooperative GLF, Inc.</b> – Continuation of studies on nutritive values of feeds for lactating cows and calves	2,000
<b>Rockefeller Foundation</b> – Degenerative diseases and age changes	60,000

**1941-42**

<b>Cooperative GLF, Inc.</b> – Dairy cattle-feed investigatorship	2,000
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**1942-43**

<b>Cooperative GLF, Inc.</b> – Dairy cattle-feed investigatorship	3,000
<b>Cooperative GLF, Inc.</b> – Dairy cattle fellowship	2,000

**Grants, Contracts, Agreements, and Gifts (cont.)**

*1942-43 (cont.)*

**Near East Foundation** - Livestock rehabilitation and improvement program in Greece \$ 2,500

**New York Farmers, Inc.** - The most economical methods of feeding and management of beef cattle under conditions in the northeastern states 1,000

*1943-44*

**Aviation Corporation** - Improved production and storage of hay (part of grant allocated to Animal Husbandry) 15,000

*1944-45*

**GLF Dairy Cattle Vitamin Research** - Vitamin supplements for dairy calves raised under practical farm conditions, and on the nutritive requirements of the newborn calf 3,500

**GLF Meat Research** (cooperative with School of Nutrition) - Effect of different tenderizing procedures on the quality of dairy beef; the aging of beef for freezing preparation; personalized meat cutting for locker room patrons; effect of feeding on the quality of beef; and the preparation of a bulletin on the slaughtering and freezing of meat 3,000

**New York Farmers Beef Cattle Research** grant was renewed 1,000

**Swift and Company Livestock Sterility** - Research on the physiological basis of sterility in livestock 13,800

*1945-46*

**GLF Dairy Cattle Research** grant was renewed 2,000

**New York Farmers** - Fattening beef calves and yearling steers 1,000

*1946-47*

**Herman Frasch Foundation** grant to the Department of Biochemistry for research on amino acid nutrition of farm animals for work to be conducted cooperatively by the Departments of Biochemistry and Animal Husbandry 10,000

**Cooperative GLF Exchange, Inc.** - Improvement of feed for dogs 2,500

**National Biscuit Company** - Improvement of feed for dogs 6,000

**Grants, Contracts, Agreements, and Gifts (cont.)**

*1946-47 (cont.)*

<b>New York Artificial Breeders' Cooperative, Inc.</b> – Expansion of the herd analysis program to find superior dairy cattle inheritance, to expand facilities for measuring the results and progress of dairy cattle breeding projects, and to facilitate the selection of sires for use in such cooperative projects	\$ 6,000
<b>Ortho Research Foundation</b> – Study of the blood of swine to determine whether baby pig mortality may be due to the factors similar to the Rh factor in human blood	600
A memorandum of understanding was entered into with <b>Standard Brands, Inc.</b> for research on the value of vitamins A and D in feeding dairy cattle	5,000

*1947-48*

<b>American Meat Institute</b> – Series of consumer-demand studies of meat	1,200
<b>Dri-Food Products, Inc.</b> – Influence of "Synerjol", a high-fat product, on the production of milk and butterfat by dairy cows	800
<b>New York Farmers</b> – continued the Beef Cattle Research Grant	1,000
<b>United States Public Health Service</b> – Research work being conducted by C. M. McCay on aging in relation to diet	29,109
<b>Hiram Walker and Sons, Inc.</b> – Value of distillers' solubles as a source of B-complex vitamins and high-quality protein in dairy calf starters	9,000

*1948-49*

<b>Cerophyl Laboratories</b> – Nutritive value of cereal grass and other green, leafy plants, and products	3,000
<b>Cooperative GLF Exchange, Inc.</b> renewed the Dairy Calf Vitamin Research Grant	3,500
<b>Craine Silo Company</b> , Norwich, N.Y. – Two Korak silos at the main dairy barn	1,600
<b>New York Artificial Breeders' Cooperative, Inc.</b> – Expansion of research on sterility and breeding difficulties in dairy herds on New York farms	6,500
The NYABC renewed the Herd Analysis Grant	5,500
<b>Salt Producers Association</b> – Determination of salt requirements, sodium and chlorine, of dairy cattle	7,500

### Grants, Contracts, Agreements, and Gifts (cont.)

#### 1948-49 (cont.)

**Salt Producers Association** continued support of these studies with annual grants for a period of 4 years \$ 30,000

The Cornell University Agricultural Experiment Station entered into a memorandum of understanding with the **Bureau of Animal Industry, Agricultural Research Administration, U.S.D.A.**, relative to nutrition and breeding research with fur animals

#### 1949-50

**Cooperative GLF Exchange, Inc.** renewed the G.L.F. Dairy Calf Vitamin Research grant 2,500

**Distillers' Feed Research Council** - Lactation factors in distillers' dried grains and distillers' dried solubles 5,000

A gift was received from **Professor F. B. Morrison** for the purchase of enlarged photographs of livestock and farm scenes, suitably framed, to be hung in the classrooms and corridors of Wing Hall 650

**New York Artificial Breeders' Cooperative, Inc.** continued the herd analysis grant 6,000

**New York Farm Bureau Federation** - Help finance a new mobile unit for sterility research 500

**Patent Cereals company** - Research on the nutrition of dogs 500

**New York Farmers Beef Cattle Research Grant** was renewed 1,000

A new agreement with the **Bureau of Dairy Industry, U.S.D.A.**, became effective to cover cooperative research on problems in dairy cattle breeding, feeding, and management; the nutrition of dairy cattle and the physiology of production and reproduction; the production and processing of milk and the manufacture of milk products and by-products

#### 1950-51

**Cerophyl Laboratories, Inc.** - Nutritive value of cereal grass and other green, leafy plants was continued 3,000

**De Laval Separator Company** - A milking research grant to determine (1) the variation between cows in required milking time and (2) the reasons for slowness of milking in certain cows 2,500

**Grants, Contracts, Agreements, and Gifts (cont.)**

*1950-51 (cont.)*

<b>Distillers' Feed Research Council, Inc.</b> – Influence of distillers' feeds on milk production	\$ 5,000
<b>Distillers' Feed Research Council, Inc.</b> – Investigations to determine the differentiation, isolation, and identification of unknown members of the B group of vitamins and the effects of a deficiency of each	3,000
<b>Drackett Company</b> – Special products as feed ingredients for improving the nutrition of dogs	6,600
<b>Cooperative GLF Exchange, Inc.</b> – Energy value and digestibility of cane molasses in rations for dairy cattle, the influence of molasses on the digestibility of other nutrients in the ration, and the value of urea as a source of protein when fed with molasses	3,500
A gift was received from Mrs. Lee Ella Waite of <b>Loch Lee Jersey Farms</b> , Williamsville, N.Y., to finance the production of a 4-H culb local leaders' handbook	3,000
Morrison Fellowship in livestock feeding was established by <b>Professor F. B. Morrison</b> with a gift of securities, the income to provide an annual fellowship to assist worthy and well-qualified graduate students	12,352
<b>Morrison Publishing Company</b> gave to the Department of Animal Husbandry 50 Koenig Ration Calculators for use in the livestock feeding course	475
<b>New York Artificial Breeders' Cooperative</b> – Herd analysis	10,000
<b>New York Farmers Beef Cattle Research Grant</b> was renewed	1,000

*1951-52*

<b>Cerophyl Laboratories</b> – Nutritive value of cereal grass and other green, leafy plants	3,000
<b>Commercial Solvents Corporation</b> – Usefulness of typical antibiotics, bacitracin, and 1-ephedrine penicillin G in the diet of dogs	2,400
<b>GLF Molasses Research</b> – Studies on the value of molasses and urea in the rations of dairy cattle	3,500
<b>Herman Frasch Foundation</b> – Chemical and biological evaluation of nitrogenous requirements of animals	10,000

**Grants, Contracts, Agreements, and Gifts (cont.)**

*1951-52 (cont.)*

<b>Distillers' Feed Research Council</b> – For differentiation, isolation, and identification of unknown members of the B group of vitamins and the effects of a deficiency of each; influence of distillers' feed on milk production	\$ 8,000
<b>Dow Chemical Company</b> – Usefulness of methionine in improving feeds for dogs	3,600
<b>Lederle Laboratories Division of the American Cyanamid Company</b> – Value of aureomycin in the rations of dairy cattle	2,000
<b>New York Artificial Breeders' Cooperative</b> – Herd analysis	22,000
<b>New York Farmers</b> – Beef cattle research	1,000
<b>Quaker Oats Company</b> – Digestibility and utilization of nitrogen, carbohydrates, and total energy of several ammoniated feedstuffs; comparative value of these products with urea and standard protein supplements and possible influence of specific factors, such as minerals, molasses, and sugar, on the utilization of the nitrogen and fiber of the feeds	3,500
<b>Dr. Roberts Laboratories</b> – Utilization of fishery products in feeds for dogs	3,600
<b>Salt Producers Association grant</b> – Salt requirements of dairy cattle	7,500
<b>Hiram Walker Dairy Calf Research grant</b> was renewed	3,000
An informal memorandum of understanding was entered into with the <b>Sea Board Supply Company</b> , the <b>Eastern Regional Research Laboratory</b> , and the <b>Bureau of Agricultural and Industrial Chemistry</b> covering the testing of tomato cannery waste for animal feeding	
The memorandum of understanding with the <b>Bureau of Animal Industry</b> USDA relative to research in the nutrition and breeding of fur animals was amended and renewed.	

*1952-53*

<b>Cerophyl Laboratories</b> – Nutritive value of cereal grass and other green, leafy plants	3,500
<b>GLF Molasses Research grant</b> was renewed	3,000
<b>Distillers' Feed Research Council grant</b> was renewed	3,000
<b>E. I. du Pont de Nemours and Company</b> – Use of propionates in the treatment of ketosis in dairy cattle	11,000

**Grants, Contracts, Agreements, and Gifts (cont.)**

*1952-53 (cont.)*

<b>Merck &amp; Company</b> – Usefulness of streptomycin in increasing the rate of growth and reducing the incidence of scours in young dairy calves	\$ 2,000
<b>New York Artificial Breeders' Cooperative</b> – Herd analysis studies; methods of freezing and preserving the fertility of semen	28,851
<b>New York Farmers</b> – Pasture problems of northeastern agriculture	1,000
<b>Pabst Brewing Company</b> – Antibiotics in rations for dairy calves and mink	3,500
<b>U.S. Public Health Service</b> – Dr. C. M. McCay for research on aging	23,598
<b>Publicker Industries</b> – Nutrient requirements of rumen bacteria and possible influence of molasses solubles and similar products upon the activity of rumen bacteria	3,500
<b>Quaker Oats Company</b> – Minimum practical amount of animal protein that can be used in commercial dog foods	3,800
<b>Western Condensing Company</b> – Nutritional requirements of baby pigs	2,000

*1953-54*

<b>Lederle Laboratories Division of the American Cyanamid Company</b> – Value of aureomycin in the rations of dairy cows; effects of aureomycin on the carcass quality of pigs as related to breed	4,500
<b>American Dairy Association</b> – Metabolism of butterfat during advancing age and for studies on soft tissue calcification, using rats as experimental animals	4,400
<b>Cerophyl Laboratories</b> – Nutritive value of cereal grass	3,500
<b>Cooperative GLF Exchange, Inc.</b> – Value of silage preservatives and measures of fermentation losses in early cut silage	4,000
<b>Cooperative GLF Exchange, Inc.</b> – Feeding value and nutritive losses with different methods of harvesting and storage of hay and silage crops	15,000
<b>Distillers' Feed Research Council</b> – Replacement value of distillers' by-products for lactation and possible lactation factors in the by-products	5,000
<b>Dow Chemical Company</b> – Use of methionine in dog foods	3,800
<b>Moorman Manufacturing Company</b> – Factors concerned with bloat and overfeeding disorders of ruminants	9,600



**Grants, Contracts, Agreements, and Gifts (cont.)**

*1953-54 (cont.)*

<b>New York Artificial Breeders' Cooperative</b>	
- For expansion of laboratory facilities for basic and applied research in freezing and preserving fertility of semen	\$ 12,000
- For continuation of research on methods of freezing and preserving semen	15,000
- To continue herd analysis studies	2,300
<b>Pabst Brewing Company – Antibiotics for dairy cattle</b>	500
<b>Patent Cereals Company – Dry diets for mink and cats</b>	4,000
<b>Charles Pfizer &amp; Co., Inc. – Influence of antibiotics on the volatile fatty acids in the rumen of cattle</b>	2,000
<b>Proctor and Gamble, Inc. – Evaluation of copra meal for milk production</b>	2,000
<b>Publicker Industries, Inc. – Stimulating factors of distillers' dried molasses solubles for ruminant nutrition and cellulose digestion</b>	3,500
<b>U. S. Public Health Service – Research on aging</b>	23,598
<b>Quaker Oats Company – Research on dog foods</b>	3,800
<b>Hiram Walker Company – Use of distillers' by-products in calf feeds</b>	3,000

*1954-55*

<b>American Dairy Association – Metabolism of butterfat during advanced age</b>	4,400
<b>Bristol Laboratories, Inc. – Evaluation of Polycycline as an antibiotic for swine</b>	1,000
<b>Cooperative GLF Exchange, Inc. – Value of certain milk replacements and pelleted calf starters for growing dairy calves</b>	2,000
<b>Cooperative GLF Exchange, Inc. – Silage research</b>	2,500
<b>Distillers' Feed Research Council – Influence of distillers' feeds on milk production</b>	5,000
<b>Lederle Laboratories Division of American Cyanamid Company – Effects of aureomycin chlortetracycline on the carcass quality of pigs</b>	2,500
<b>Oscar Mayer Company – Body composition of farm animals in vivo; heritability of meat type in the university swine herd</b>	1,500

### Grants, Contracts, Agreements, and Gifts (cont.)

#### 1954-55 (cont.)

<b>National Association of Artificial Breeders</b> – To determine whether fertility of dairy cows is altered by hastening ovulation by the administration of hormones	\$ 4,500
<b>New York Artificial Breeders' Cooperative</b> – Herd analysis grant	4,000
<b>New York Farmers, Inc.</b> – Pasture and forage crops	1,000
<b>Nitrogen Division of Allied Chemical &amp; Dye Corporation</b> – Use of urea as a source of nitrogen for dairy cattle	2,000
<b>U.S. Public Health Service</b>	
- Dr. S. A. Asdell for research on the hormonal control of the oviduct	4,722
- Dr. C. M. McCay for further research on aging	23,598
<b>Publicker Industries, Inc.</b> – Stimulating factors of distillers' dried molasses solubles for rumen nutrition and increased cellulose digestion	3,500
<b>Quaker Oats Company</b> – Dog research	3,800

#### 1955-56

<b>American Cyanamid Company</b> – Effects of aureomycin chlortetracycline on the health and milk production of cows	3,500
<b>Cooperative GLF Exchange</b>	
- Availability of phosphorus from various commonly used phosphorus supplements for dairy cattle	2,500
- Value of certain milk replacements and pelleted calf starters for dairy calves	2,000
- Energy value of molasses and its influence on digestibility of other nutrients in dairy cattle rations	3,500
<b>Distillation Products Industries</b> – Role of vitamin E in the nutrition of the dairy calf	2,000
<b>Distillers' Feed Research Council</b> – Influence of distillers' feeds on milk production	5,000
<b>Distillers' Feed Research Council</b> – Possible usefulness of distillers' solubles in practical feed mixtures for dogs	6,536

# Grants, Contracts, Agreements, and Gifts (cont.)

## 1955-56 (cont.)

### New York Artificial Breeders' Cooperative

- Herd analysis studies	\$ 28,732
- Semen freezing and preservation	13,400
- National Association of Animal Breeders' grant	1,000

### U.S. Public Health Service

- Dr. S. A. Asdell - Physiology of the oviduct	4,093
- Dr. C. M. McCay - Aging	25,128

## 1956-57

The nationally known **McDonald Farms, Cortland, N.Y.**, with its outstanding herd of Guernsey cattle, were bequeathed to Cornell University for the use of the Department of Animal Husbandry and the College of Agriculture under the will of the late J. M. McDonald. The gift included 1,700 acres of land and buildings appraised at \$338,450; 400 head of registered Guernseys appraised at \$341,000; and farm equipment appraised at \$56,681, with a total of 731,131

### Other gifts of livestock during the year

- Part interest in a Hereford bull, <b>Wyoming Hereford Ranch</b> , Cheyenne, Wyoming	5,000
- Part interest in an Aberdeen-Angus bull, <b>Ankony Farm</b> , Rhinebeck, N.Y., and <b>Ess Kay Farm</b> , East Aurora, N.Y.	10,000
- Seventeen Hereford heifers, <b>Northern Pump Company</b> , Minneapolis, Minnesota	17,000
- A Hereford bull, <b>E.R. Hurt</b> , Gaithersburg, Maryland	10,000
- An Aberdeen-Angus heifer, <b>Monroe Babcock</b> , Ithaca, N.Y.	300

**Brewer's Yeast Council, Inc.** - Special nutritive value of brewer's dried yeast in calf starters and milk replacement formulas 3,000

**Cooperative GLF Exchange, Inc.** - Formulation of a special feed mixture for laboratory mice and rats known to be free of estrogenic activity based on biological assay 4,000

**Distillers' Feed Research Council, Inc.** - Value of distillers' feeds for milk production 3,000

**Dow Chemical Company** - Residues in the milk of dairy cows fed known quantities of Dalapon 7,000

**Grants, Contracts, Agreements, and Gifts (cont.)**

*1956-57 (cont.)*

<b>Esso Research and Engineering Corporation</b> – Influence of various carbohydrates on the utilization of urea and molasses by growing dairy cattle	\$ 3,000
<b>International Salt Company, Inc.</b> – Palatability for beef cattle of feed salt mixtures containing phenothiazine	1,000
<b>Moorman Manufacturing Company</b> – Factors concerned with bloat and overfeeding disorders in ruminants	2,000
<b>National Association of Artificial Breeders</b> – Research in artificial breeding	1,500
<b>The New York Artificial Breeders' Cooperative</b>	
- Semen freezing and preservation	10,000
- Herd analysis	35,586
- National Association of Artificial Breeders' grant	1,000
<b>U.S. Public Health Service</b>	
- S. A. Asdell – Physiology of the oviduct	3,501
- C. M. McCay – Aging	39,315
<b>Quaker Oats Company</b> – Dog foods	4,000

*1957-58*

<b>Cooperative GLF Exchange, Inc.</b>	
- Hay research	5,000
- Silage research; feed utilization and forage consumption in dairy cattle	4,000
- Availability of phosphorus for common supplements	2,500
<b>Distillers' Feed Research Council, Inc.</b> – Value of distillers' feeds for milk production and for research on feed mixtures for dogs	5,000
<b>Hoffman-La roche Company</b> – Factors affecting carcass quality in hogs	2,000
<b>International Salt Company, Inc.</b> – Palatability for beef cattle of feed salt mixtures containing phenothiazine	1,200
<b>Mink Farmers' Research Foundation</b> – Toxicity of frozen fish when used as feed for mink and on the causes, prevention, and cure of gray diarrhea	2,200
<b>Professor F. B. Morrison</b> – Additional gift to the endowment of the Morrison Fellowship	2,500

**Grants, Contracts, Agreements, and Gifts (cont.)**

*1957-58 (cont.)*

<b>National Research Council</b> - Relationship between embryonic mortality and sex ratios	1,500
<b>National Soybean Processors Association</b> - Metabolizable energy value of soybean products	\$ 2,500
<b>New York Artificial Breeders' Cooperative</b>	
- Semen freezing and preservation	2,300
- Herd analysis research	40,678
- National Association of Artificial Breeders' grant	1,500
<b>New York Farmers</b> - Research in animal husbandry	1,000
<b>Upjohn Company</b> - Possibility of preventing estrus in dogs with synthetic hormonelike substances	4,000
<b>U.S. Public Health Service</b>	
- S. A. Asdell and D. L. Black - Physiology of the oviduct	3,501
- C. M. McCay and L. L. Barnes - Aging	43,297
<b>Sir William Farm</b> - Technique of artificial insemination in swine, improvement of artificial insemination in swine, and improvement of extending media for preserving boar sperm for artificial insemination	2,500
A cooperative agreement was entered into between Cornell University and the <b>Agricultural Research Service, Animal Husbandry Research Division, U.S.D.A.</b> , relative to a survey on effects of jet aircraft sound on milk production	
A supplement to the memorandum of understanding with the <b>Agricultural Research Service, U.S.D.A.</b> , became effective for investigation of physiological reactions of sheep and other ruminants in relation to metabolic disorders	

*1958-59*

<b>CIBA Pharmaceutical Products, Inc.</b> - Effect of addition of reserpine to the rations of growing swine in dry lot	1,200
<b>Dr. Henry A. Fennimore Cooper</b> - Animal Husbandry Building Sculpture Fund	200
<b>Cooperative GLF Exchange, Inc.</b>	
- Feeding dairy calves	3,000
- Hay research	2,500
- Phosphorus utilization	2,500

**Grants, Contracts, Agreements, and Gifts (cont.)**

*1958-59 (cont.)*

<b>Distillers' Feed Research Council, Inc.</b>	
- Value of distillers' feeds for milk production	\$ 3,000
- Continuing research on dog feeds	3,500
<b>E. I. duPont de Nemours &amp; Company, Inc.</b> – Evaluation of urea and biuret by ruminants	3,000
<b>W. R. Grace and Company</b> – Comparison of the availability of the nitrogen in urea and biuret	2,500
<b>International Salt Company</b> – Use of salt in feeding programs of beef and dairy cattle	2,500
<b>Kordite Company</b> – Factors affecting quality and acceptability of prepackaged, self-service, retail cuts of meat	1,500
<b>Mink Farmers' Research Foundation</b> – Menhaden and other fish products in mink feed	1,500
<b>Mr. Albert K. Mitchell</b> , Tequesquite Ranch, Albert, New Mexico, donated a Hereford bull calf to serve as a future herd sire	
<b>National Association of Artificial Breeders</b> – Preservation of bovine semen	1,500
<b>National Science Foundation</b> – Estimation of genetic parameters from multiple classification data	35,000
<b>National Soybean Processors Association</b> – Metabolizable energy value of soybean products	2,000
<b>New York Artificial Breeders' Cooperative</b>	
- Semen freezing and preservation	5,450
- Herd analysis	34,000
<b>New York State Mink Farmers' Association</b> – Nutritional requirements of mink	1,000
<b>Sir William Farm</b> – Techniques of artificial insemination in swine and preservation of boar semen	2,500
<b>Smith Kline &amp; French Laboratories</b> – Effects of continuous addition of tranquilizers to the rations of growing swine in dry lot	2,450
<b>Titanium Alloy Manufacturing Division, National Lead Company</b>	500
- Evaluation of several zirconium compounds as silage preservatives	

### Grants, Contracts, Agreements, and Gifts (cont.)

#### 1958-59 (cont.)

<b>U.S. Public Health Service</b> – C. M. McCay for continuing research on aging	\$ 41,803
<b>Upjohn Company</b> – Preventing estrus in dogs with synthetic hormonelike substances	4,000
<b>U.S. Office of Naval Research</b> – Nutritional factors that might be responsible for deterioration of teeth and teeth-supporting structures	6,852

#### 1959-60

<b>American Cyanamid Company</b>	
- Causes of ketosis	1,000
- Mechanisms regulating ovarian function	1,500
<b>Armour &amp; Company</b> – Methods of ultrasonic measurements of the amount of lean and fat in live animals and carcasses	5,000
<b>Beef Cattle Research Foundation, Inc.</b> – Use of ultrasonic probes on beef cattle	900
<b>Central Soya Company, Inc.</b> – Measurement for nutritive value of soybean flakes in milking rations for dairy cows and for determination of digestibility of soybean flakes by steers	2,500
<b>Chemagro Corporation</b> – Determine whether forage treated with the insecticide Guthion produces residues in milk	800
<b>Comision de Fomento Nacional, Havana, Cuba</b> – Feeding value of dried sugar cane juice for dairy cattle and swine	13,200
<b>The Cooperative GLF Exchange, Inc.</b>	
- Feeding dairy calves	3,000
- Feed utilization	2,000
- Milking machine studies	5,000
- Hay research	5,000
<b>E. I. dupont de Nemours &amp; Company, Inc.</b> – Investigations with urea and biuret in ruminant feeding	3,000
<b>Distillers' Feed Research Council, Inc.</b>	
- Distillers' feeds in rations for dogs and fur-bearing animals	3,000
- Value of distillers' feeds for milk production	3,000

**Grants, Contracts, Agreements, and Gifts (cont.)**

*1959-60 (cont.)*

<b>W. R. Grace &amp; Company</b> – Availability of nitrogen in urea and biuret	\$ 2,500
<b>International Salt Company</b> – Use of salt in rations for beef and dairy cattle	2,500
<b>Lalor Foundation</b> – Quantitative determination of changes in DNA content of nuclei in critical stages of spermatogenesis and effects of extracts of bovine hypothalamic and endometrial tissues on ovarian function and estrous cycle length in laboratory animals	11,500
<b>National Association of Artificial Breeders</b> – Factors that regulate the bovine estrous cycle	1,500
<b>National Soybean Processors Association</b> – Metabolizable energy values of soybean products	2,000
<b>New York Artificial Breeders' Cooperative</b>	
- Estrous control	2,500
- Herd analysis	25,000
- Semen freezing and preservation	7,000
<b>Oscar Mayer and Company</b> – Methods of ultrasonic measurements of the amount of fat and lean in live animals and carcasses	5,000
<b>Smith Kline &amp; French laboratories</b> – Effects of narrow-spectrum antibiotics on performance of swine in the presence or absence of lysine	3,000
<b>Union Carbide Chemicals Company</b> – Milk residues following feeding of Sevin and A-naphthol to dairy cattle	1,200
<b>U.S. Public Health Service</b>	
- S. A. Asdell – Sex hormones upon longevity in rats	14,437
- C. M. McCay – Research on aging	36,628
- J. T. Reid – Measurements of chemical composition of live animals	28,119
Cooperative agreements between the Cornell University Agricultural Experiment Station and the United States Department of Agriculture were entered into:	
Agricultural Research Service, Animal Husbandry Research Division, for investigations of humane slaughter methods in animals and for animal husbandry investigations, particularly on fur-farming problems of breeding, feeding, management, and housing of minks	
<b>U.S. Army Medical Research and Development Command</b> – Research on ionized radiated meats	35,884



**Grants, Contracts, Agreements, and Gifts (cont.)**

*1960-61*

<b>Armour and Company</b> – Ultrasonic measurements of fat and lean in live animals	\$ 2,500
<b>Branson Instruments, Inc.</b> loaned special ultrasonic equipment for meats research	
<b>Oscar Mayer and Company</b> – Ultrasonic methods	1,100
<b>Commercial Solvents, Inc.</b> – Value of zinc-bacitracin as a feed additive for growing mink	1,000
<b>Distillers' Feed Research Council, Inc.</b>	
- Nutrition work with dogs	3,500
- Value of distillers' feeds for milk production	3,000
<b>Cooperative GLF Exchange, Inc.</b>	
- Calf feeding	3,000
- Dairy cattle feeding	3,500
- Hay research	5,000
- Mink nutrition	1,000
<b>E. I. dePont de Nemours &amp; Company, Inc.</b> – Effects of propionate and related compounds in treating ketosis in dairy cows	3,500
<b>General Mills, Inc., and Pacific Oil Corporation</b> – Nutritive value of safflower oilmeals and hulls	1,200
<b>W. R. Grace and Company</b> – Comparative value of urea and biuret for ruminants	2,500
<b>Hoffman-La Roche, Inc.</b> – Influence of supplemental vitamin A on the health and performance of dairy cattle	3,500
<b>International Salt Company</b> – Use of salt in feeding beef and dairy cattle	2,500
<b>H.M. Kieckhefer</b> presented 28 Hereford cattle (herd sire, 13 cows, and 14 young stock) as an addition to the university herd	
<b>Lalor Foundation</b>	
- Changes in DNA in spermatogenesis	5,000
- Effects of bovine hypothalamic and endometrial tissues on ovarian function and estrous cycle length in laboratory animals	300
<b>J. M. McDonald Foundation, Inc.</b> – Assist in maintenance and operation of the McDonald Farms	15,000

**Grants, Contracts, Agreements, and Gifts (cont.)**

**1960-61 (cont.)**

<b>Mink Farmers' Research Foundation</b> – Nutrition requirements of mink using the purified diet technique; purified diets and protein requirements	\$ 5,600
<b>National Association of Artificial Breeders</b> – Estrous cycle regulation in cattle	1,500
<b>National Flaxseed Processors Association</b> – Comparative value of linseed oil meal, urea, and other high-protein feeds in dairy cattle rations	3,000
<b>National Soybean Processors Association</b> – Metabolizable energy value of soybean products	2,000
<b>New York Artificial Breeders' Cooperative</b>	
- Estrous control	2,500
- Herd analysis	30,000
- Semen freezing and preservation	7,500
<b>Quaker Oats Company</b> – Canine nutrition	3,600
<b>Sears-Roebuck Foundation</b> – 4-H dairy and livestock program	1,192
<b>Theobald Industries</b> – Development of a milk replacer suitable for production of high-quality veal calves	3,000
<b>U.S. Public Health Service</b>	
- S. A. Asdell – Effect of sex hormones upon longevity in rat	13,800
- William Hansel and Lloyd C. Faulkner – Hypothalamic substances in adenohipophyseal function	500
- C. M. McCay – Research upon aging	25,242
- J. Thomas Reid – Chemical composition of living animals	21,778

Cooperative agreements were entered into with the Agricultural Research Service, Animal Husbandry Division, USDA, for investigations in three areas: (1) humane slaughter methods in animals; (2) metabolism of radiocontaminants; and (3) breeding, feeding, management, and housing of minks

**1961-62**

<b>Cooperative GLF Exchange, Inc.</b>	
- Calf feeding	3,000
- Dairy cattle feeding	5,000
- Utilization of phosphorus	1,500

### Grants, Contracts, Agreements, and Gifts (cont.)

1961-62 (cont.)

<b>Curtiss-Wright Corporation</b> loaned special equipment for ultrasonic measurements in meats research	
<b>Distillers' Feed Research Council, Inc.</b>	
- Nutrition work with dogs	\$ 3,500
- Value of distillers' feeds for milk production	3,000
<b>E. I. duPont de Nemours &amp; Company, Inc.</b> - Propionates in nutrition and metabolism of farm animals	3,500
<b>Eli Lilly &amp; Company</b> - Reproductive performances of cattle, sheep, and swine after estrous cycle synchronization	2,500
<b>Esso Research and Engineering Company</b> - Amino acids and related compounds in rations for livestock	10,000
<b>International Salt Company</b> - Use of salt in rations of beef and dairy cattle	2,500
<b>Seymour H. Knox</b> gave 10 purebred Angus cows and one-half interest in the bull Ankonian to be added to the department's herd for teaching and research purposes	
<b>J. M. McDonald Foundation, Inc.</b> - Support of operations at McDonald Farms	15,000
<b>National Association of Artificial Breeders</b> - Regulation of the estrous cycle in cattle	1,500
<b>National Flaxseed Processors Association</b> - Comparative value of linseed oil meal, urea, and other high-protein feeds in the rations of lactating dairy cows	3,000
<b>National Soybean Processors Association</b> - Metabolizable energy values of soybean products and their nutritive values in practical feeding	2,000
<b>New York Artificial Breeders' Cooperative Inc.</b>	
- Estrous control	3,500
- Herd analysis	30,000
- Semen freezing and preservation	7,500
<b>Nopco Chemical Company, Inc.</b> - Effect of enzymes on milk production of dairy cows and on digestibility of feed by ruminants	3,500
<b>Sears-Roebuck Foundation</b> - 4-H dairy and livestock program	1,070
<b>Theobald Industries</b> - Development of a milk replacer suitable for production of high-quality veal calves	3,000

**Grants, Contracts, Agreements, and Gifts (cont.)**

**1961-62 (cont.)**

**U.S. Public Health Service**

- S. A. Asdell - Effect of sex hormones upon longevity in rats	\$ 13,800
- William Hansel and Lloyd C. Faulkner - Relation of hypothalamic substances to adenohypophyseal function	500
- Douglas E. Hogue - Factors contributing to muscular dystrophy in lambs	20,084
- C. M. McCay - Research on aging	24,725
- J. Thomas Reid - Chemical composition of living animals	25,530

**United States Army Medical Research and Development Command - Components of ionized radiated meats injurious to reproduction**

42,397

**United States Office of Naval Research - Relation of protein structure to the catalytic properties of the enzyme trypsin**

11,000

**1962-63**

<b>Beacon Feeds</b> - Effects of nutrition of cows on milk yield and composition	2,000
<b>Commercial Solvents Corporation</b> - Toxicity of urea phosphate and its value for ruminants	1,000
<b>Cooperative GLF Exchange, Inc.</b> - Mink nutrition	1,000
<b>Distillers' Feed Research Council</b> - Value of distillers' feeds for milk production	3,000
<b>Eastern States Farmers' Exchange, Inc.</b> - TDN requirements and the efficiency of feed utilization of high-producing dairy cows and formulation of feeding standards for high levels of production	3,500
<b>Eli Lilly and Company</b> - Synchronization of estrus and ovulation in cattle and sheep with progestins	2,500
<b>Farmers' Museum, Inc., Cooperstown, N.Y.</b> - Help defray the cost of publication of second edition of the 4-H handbook	4,000
<b>R. T. French Company</b> - Formulation and processing of sausage products	10,000
<b>International Minerals and Chemical Corporation</b> - Phosphorus metabolism in ruminant animals	3,000
<b>International Salt Company</b> - Use of salt in feeding of beef and dairy cattle	2,500

**Grants, Contracts, Agreements, and Gifts (cont.)**

*1962-63 (cont.)*

<b>J. M. McDonald Foundation, Inc.</b> , – Support of operations at McDonald Farms owned by Cornell University	\$ 15,000
<b>Mink Farmers' Research Foundation</b> – Purified diets and protein requirements of mink	1,600
<b>National Association of Artificial Breeders</b> – Regulation of the estrous cycle in cattle	1,500
<b>New York Artificial Breeders' Cooperative</b>	
- Estrous control	4,600
- Herd analysis	29,500
- Semen freezing and preservation	8,000
<b>Northeastern Council of Artificial Breeding Cooperatives</b> – On semen freezing and preservation	2,000
<b>Nopco Chemical Company</b> – Value of enzymes for lactating cows	3,000
<b>Population Council of the Rockefeller Institute</b> – Quantitative cytological analysis and experimental alteration of spermatogenesis in the rabbit and dog	24,516
<b>Sears-Roebuck Foundation</b> – Support of the 4-H dairy and livestock program	1,881
<b>Senior Farm</b> , Danbury, Connecticut, donated a hay cake machine to facilitate studies on the merits of pelleting forage for livestock	
<b>U.S. Public Health Service</b>	
- S. A. Asdell – Effects of sex hormones upon longevity in rats	7,763
- S. A. Asdell – Effects of sex steroid hormones on longevity in the hamster	13,900
- Robert H. Foote – DNA changes during development of aging of gametes	22,516
- D. E. Hogue – Factors contributing to muscular dystrophy in lambs	20,307
- C. M. McCay and J. K. Loosli – Research on aging	24,725
- J. T. Reid – Chemical composition of living animals	42,167
<b>Velsicol Chemical Corporation</b> – Residues in milk of dairy cows fed very low levels of several insecticides	1,000

**Grants, Contracts, Agreements, and Gifts (cont.)**

*1962-63 (cont.)*

**Cooperative agreements between Cornell University and the  
United States Department of Agriculture**

- Humane slaughter methods in animals
- Metabolism of radiocontaminants
- Fur-farming problems of breeding, feeding, management, and housing  
of minks

**United States Office of Naval Research** – Relation of protein structure to the catalytic properties of the enzyme trypsin      \$ 12,155

**United States Air Force** – Physiological chemical systems that are affected in the living animal as a result of exposure to hydrazines      45,100

**Summary of Grants and Gifts**

<i>Period of time</i>	<i>Number</i>	<i>Funds</i>
1927-33	12	\$ 38,600
1934-43	23	163,250
1944-53	90	503,533
1954-63	218	2,297,450
Total	343	3,002,833

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## INDEX OF NAMES

- Abernathy, R. P., 217  
 Ace, R. B., 201  
 Ackerman, E. M., 201  
 Acosta, L. A., 238  
 Adams, Arthur S., 108  
 Adams, Charles Kendall, 6, 10, 13  
 Adolph, W. H., 106, 130, 191, 211, 212  
 Aines, P. D., 217  
 Ainslie, Harry R., 161, 162, 164, 186  
 Albrechtsen, Louise, 169  
 Albrechtsen, Raymond, 94, 95, 106, 141, 144, 165, 169, 186, 202  
 Allaire, F. R., Jr., 238  
 Allen, Charles L., 35, 43, 53, 54, 77, 78, 189, 190, 199  
 Altman, M., 202  
 Anderson, Leroy, 16, 18, 198  
 Anderson, M. J., 217  
 Anderson, R. J., 37  
 Anderson, S. A., 208  
 Andrews, Frederick N., 115  
 Anthony, W. B., 217  
 Appleby, Paul H., 113  
 Arata, D. A., 208  
 Armitage, Alf, 56  
 Armsby, Henry P., 126  
 Armstrong, D. T., 218  
 Arnold, L. B., 8  
 Asdell, Sydney A., 53, 54, 60, 64, 65, 77, 106, 120, 121, 122, 131, 134, 136, 138, 139, 140, 168, 186, 191, 192, 195, 196, 202, 203, 207, 208, 210, 211, 212, 215, 218, 224, 231, 233, 234, 236, 239  
 Asmus, H., 43, 190, 192  
 Atwater, William O., 33  
 Austria, L. L., 218  
 Babcock, Howard E., 37, 65, 182  
 Babcock, M. J., 208  
 Babcock, S. M., 8, 9, 11, 17  
 Bailey, Liberty Hyde, 10, 12, 14, 19, 21, 22, 23, 26, 27, 29, 31-32, 36, 50  
 Baker, D. W., 88, 101  
 Baker, Thomas A., 33, 34, 189, 202  
 Bardwell, Howard, 70  
 Barnes, Leroy L., 60, 106, 131, 216  
 Barnes, R. H., 129  
 Barrentine, B. F., 209  
 Bassett, Charles F., 61, 130  
 Bayer, G. H., 218  
 Bayley, Ned D., 144  
 Bearden, H. J., 168, 218  
 Beardsley, J. P., 209  
 Beck, G. H., 209  
 Becker, D. E., 209  
 Beiermeister, James, 48  
 Bell, F. J., 202  
 Bell, F. W., 24  
 Bell, J. M., 209  
 Bender, R. C., 53, 202  
 Bensadoun, A., 218  
 Benton, Duane A., 133, 186  
 Bernard, R., 209  
 Bernholdt, H. F., 218  
 Bethlen, F. R., 218  
 Betten, Cornelius, 104  
 Bharucha, R. P., 218  
 Birch, R. R., 43, 192  
 Bishop, S. E., 234  
 Bissell, K., 199  
 Black, D. L., 218  
 Blackwell, R. L., 218  
 Blakely, R. W., 200

- Blakeslee, L. H., 209  
 Blaser, F. R., 209  
 Bogart, R., 202  
 Bohman, V. R., 219  
 Bohstedt, Gustav, 127  
 Bond, Maurice C., 117, 118  
 Bontecou, Fred, 82  
 Boutelle, Clarence A., 35, 39  
 Bower, Madeline, 56, 124  
 Bowman, A. L., 238  
 Bradfield, R. B., 219  
 Bradfield, Richard, 74, 187  
 Bradt, Clarence G., 54, 90, 99, 106, 174, 175  
 Brandt, Graydon W., 95, 106, 165  
 Brannon, Warren F., 179, 180, 186, 219  
 Branton, C., 209  
 Bratton, Robert W., 120, 121, 135, 136, 137, 138, 139, 168, 186, 195, 196, 209, 210, 212, 214, 218, 221, 223, 229, 233, 236  
 Bratzler, J. W., 210  
 Bredderman, P. J., 238  
 Breed, R. S., 37, 38  
 Breuer, L. H., 239  
 Brickman, B., 198  
 Briggs, H. M., 202  
 Briggs, J. E., 210  
 Briggs, J. M., 158  
 Brinegar, M. J., 219  
 Britton, J. W., 88  
 Brooks, H. J., 202  
 Brown, Wayne, 85  
 Brown, William D., 24, 93  
 Brownell, Stanley J., 53, 54, 77, 78, 88, 91, 92, 93, 94, 95, 101, 106, 115, 141, 144, 163, 164, 165, 166, 169  
 Brunner, M. A., 239  
 Buck, C. F., 219  
 Bui, Tro Van, 239  
 Burke, James D., 93, 97, 98, 101, 106, 141, 161, 162, 163, 186, 210  
 Burkitt, W. H., 210  
 Burton, John, 82  
 Busby, A. T., 202  
 Bush, L. F., 219  
 Butler, Edmond, 70  
 Caballero, H., 219  
 Cairns, G. M., 202  
 Caldwell, George C., 4, 8, 9  
 Cameron, C. W., 239  
 Campbell, T. C., 234  
 Card, C. S., 219  
 Carlson, William S., 112, 113  
 Carnes, F. L., 85  
 Carrillo, B. J., 234  
 Carter, H. W., 141, 163, 165, 166, 167, 186  
 Carter, W. R. B., 219  
 Castillo, L. S., 220  
 Chance, Charles M., 171  
 Chang, T. T., 198  
 Chapin, R. E., 239  
 Chatterton, R. T., Jr., 234  
 Chen, S., 202  
 Chen, T. C., 200  
 Chenery, W. W., 6  
 Cheng, P. L., 210  
 Cheng, S. Y. Y., 210  
 Chichaibelu, B., 239  
 Childress, Robert, 127  
 Christy, O. B., 200  
 Clamohoy, L. L., 220  
 Clapp, E. E., Jr., 210  
 Clawson, A. J., 220  
 Clinton, L. A., 19  
 Coker, S. P., Jr., 220  
 Collado, Carlos, 198

- Collins, W. J., 210  
 Comstock, Henry, 7  
 Cornell, Alonzo, 6  
 Cornell, Ezra, 1, 2, 3, 26  
 Cox, R. F., 210  
 Crampton, E. W., 203  
 Crandall, W. Truman, 39, 53, 88, 89, 96, 97, 99, 106, 161, 170, 171  
 Crawford, Charles H., 72, 203  
 Creal, Harold L., 51, 127  
 Crook, R. D., 200  
 Crowe, C. F., 203  
 Crowell, M., 203  
 Cunkleman, John, 85  
 Cunningham, E. P., 234  
 Cunningham, H. M., 220  
 Cupps, P. T., 210  
 Curtin, L. V., 220  
  
 Dahlberg, Arthur C., 38, 75, 76  
 Daniel, L. J., 210  
 Davenport, D. G., 234  
 Davey, R. J., 220  
 Davidson, J. G., 220  
 Davis, G. K., 203  
 Davis, Richard F., 133, 220  
 Day, Edmund Ezra, 104, 116, 126  
 Dean, Paul H., 70, 143, 144  
 deAlba, J., 211  
 DeCosta, L. C., 220  
 deForest, M. D., 200  
 deKiewiet, Cornelius W., 116  
 Dewey, John, 123  
 Dewey, Thomas E., 66, 98, 136  
 Diakov, F. A., 200  
 Dicks, M. W., 221  
 Djemal, N., 203  
 Dju, D. C., 211  
 Dolge, K. L., 221  
 Donaldson, L. E., 239  
  
 Donefer, E., 221  
 Doornenbal, H., 234  
 Douglass, E. L., 203  
 Drain, J. J., 221  
 Drori, D., 221  
 Drouliscos, N. J., 234  
 Dunbar, R. S., Jr., 211  
 Dunn, H. O., 221  
 Dunn, John A., 85, 154  
  
 Earle, J. Stanley, 113  
 Eastman, Edward R., 37  
 Eastman, M. G., 198  
 Eaton, E. M., 211  
 Eaton, H. D., 211  
 Eddins, Sam, 70  
 Egermeier, J. C., 221  
 Eggert, R. G., 222  
 Eisenhower, Dwight D., 151  
 Ekern, A., 235  
 Eldridge, F. E., 211  
 Elliot, F. I., 95, 211  
 Elliot, J. M., 120, 186, 194, 222  
 Elliott, R. F., 211  
 Ellis, Gordon H., 60, 106, 191, 203, 213  
 Elston, R. C., 222  
 Elver, Viola, 56  
 Emasiri, S., 203  
 Embry, L. B., 212  
 Empey, E. L., 222  
 Espe, D. L., 200  
  
 Farrand, Livingston, 104  
 Faulkner, L. C., 235  
 Fenton, Faith, 81  
 Ferguson, J. R., 222  
 Fincher, M. G., 60, 149  
 Fisher, L. J., 239  
 Fisk, G. R., 222

- Flatt, W. P., 222  
 Foord, James A., 18, 19  
 Foote, Robert H., 120, 121, 136, 137, 138, 139, 144, 168, 186, 195, 212, 224, 228, 232, 233, 237, 238, 242  
 Forbes, R. M., 212  
 Forrestel, Eugene P., 111, 113, 115  
 Foster, James, 95  
 Foster, J. E., 203  
 Freeman, A. E., 222  
 Fronda, Francisco M., 41  
 Frost, Wayland P., 35  
 Fung, F. H., 212  
  
 Gall, L. S., 212  
 Gallo C., J. T., 239  
 Galloway, Beverly T., 32, 37  
 Garcia, G. V., 222  
 Gardner, K. E., 203  
 Gardner, R. W., 235  
 Gibson, Anson W., 104, 117  
 Gilbert, Joseph H., 2  
 Gilman, H. L., 138, 194  
 Goldberg, S. A., 41  
 Goodwin, E. E., 212  
 Gormel, B., 203  
 Gortner, W. A., 106  
 Gould, John Stanton, 4  
 Grams, William T., 39, 53, 89, 92, 100, 178  
 Gray, H. G., 240  
 Gray, L. F., 212  
 Gregoire, A. T., 223  
 Gunsalus, I. C., 77  
 Guterman, C. E. F., 74, 104, 117  
 Guthrie, E. S., 126  
  
 Hafs, H. D., 223  
 Hagan, William A., 159  
 Haider, S. M. N., 223  
  
 Haines, George, 35, 189, 198  
 Hall, W. W., 14  
 Ham, Edwin S., 33, 34, 189  
 Hamilton, Harold P., 82  
 Hamilton, Thomas A., 115  
 Hammond, John, 54  
 Han, I. K., 240  
 Hansel, William, 115, 122, 136, 137, 138, 139, 148, 168, 186, 196, 212, 218, 225, 231, 235, 237, 239, 241  
 Hanson, Earl H., 93  
 Hanson, L. E., 204  
 Harding, Harry A., 37, 38  
 Hardison, W. A., 223  
 Harper, Merritt W., 24, 27, 28, 36, 41, 42, 43, 53, 77, 78, 86, 87, 89, 189, 190, 191, 192, 198, 199, 201  
 Harris, Lorin E., 62  
 Harris, S. C., 212  
 Harrison, Edwin S., 42, 43, 53, 55, 68, 69, 70, 71, 72, 73, 74, 89, 191, 192, 193, 201, 202, 204, 205, 206  
 Harrison, H. N., 235  
 Harshbarger, Kenneth E., 121  
 Hart, E. B., 11  
 Hartman, Dennis A., 184, 186  
 Hartwig, H. B., 74  
 Harville, D. A., 240  
 Hauck, Hazel, 191  
 Hawley, John B., 150  
 Haynes, E. H., 223  
 Heidhues, T. H., 235  
 Heinicke, A. J., 104  
 Hemken, R. W., 223  
 Henderson, Charles R., 115, 121, 140-42, 144, 166, 167, 186, 195, 211, 218, 220, 222, 223, 224, 228, 229, 230, 232, 233, 234, 235, 238, 240, 241  
 Henry, W. A., 11, 13, 50, 127  
 Heuser, Gustav F., 41, 98  
 Hickman, C. G., 223

- Hill, Forrest F., 127  
 Hillier, Thomas, 85  
 Hilton, James H., 115  
 Hinman, R. B., 39, 43, 53, 77, 78, 79, 80, 81, 89, 100, 120, 151, 189, 191, 192, 193, 200, 201, 202, 206  
 Hintz, H. F., 132, 159, 235  
 Hobbs, Charles S., 80, 102, 106, 175, 180, 204  
 Hodson, A. Z., 204  
 Hogue, D. E., 120, 121, 155, 156, 186, 194, 223, 235, 236, 238, 239  
 Holley, Hugh, 195  
 Holmes, R. L., 224  
 Holter, J. A., 224  
 Hopcraft, D., 240  
 Hopkins, Gowland, 54  
 Hopper, Herbert A., 29, 30, 35, 53, 88, 96, 97, 126, 190  
 Horrington, E., 224  
 Horvath, D. J., 224  
 Hough, W. H. L., 224  
 Hsu, C. H., 224  
 Hsu, P. C., 213  
 Hucker, George J., 38, 76  
 Hunt, Larry, 84, 154  
 Hunziker, Otto F., 18, 19  
 Hurley, W. C., 204  
 Hurst, R. E., 204  
 Hutt, Frederick B., 64, 192  
 Huyck, F. C., 84  
 Ibbotson, C. F., 224  
 Jabbar, S. A., 204  
 Jainudeen, R. M., 235  
 Jerome, F. N., 224  
 Jones, D. J. C., 224  
 Jones, J. R., 236  
 Johnson, Alvin A., 118  
 Johnson, George R., 102, 106, 176, 178, 179, 180, 181  
 Johnson, Maurice W., 95, 168  
 Johnson, P. E., 204  
 Johnson, W. L., 240  
 Johnstone-Wallace, D. B., 80  
 Jordan, Whitman H., 8-9, 12, 37, 38, 126  
 Joshi, S. R., 236  
 Kendrick, John F., 163  
 Kennedy, W. Keith, 117  
 Kennelly, J. J., 224  
 Kercher, C. J., 225  
 Kerr, R. H. P., 225  
 Khan, N. A., 204  
 Kim, H. J., 225  
 King, Joseph P., 71  
 Klosterman, E. W., 213  
 Knapp, Roland G., 39  
 Knodt, Cloy B., 55, 95, 106, 135  
 Koch, B. A., 225  
 Koh, Y. O., 240  
 Konishi, F., 225  
 Kotby, A. R., 236  
 Kozlowska, M., 205  
 Krauss, William E., 39, 41, 200  
 Krider, J. L., 213  
 Kroening, G. H., 241  
 Krumm, Charles, 168  
 Kunz, Samuel, 87  
 Kuo, H. T., 200  
 Lacy, Myren D., 175, 176, 177, 178, 180, 186  
 Ladd, Carl E., 104  
 Lamb, Leland W., 93  
 Landis, N. E., 205  
 Lang, D. R., 225  
 Law, James, 1, 4, 6, 8, 17

- Lawes, John B., 2  
 Layhe, W., 225  
 Lazenby, W. R., 7, 8  
 Lee, A. J., 241  
 Lehman, Herbert, 103  
 Leinbach, F. H., 205  
 Leonard, H. A., 213  
 Lepard, O. L., 205  
 Lincoln, R. M., 213  
 Linn, James W., 166  
 Lister, E. E., 225  
 Liu, C. H., 225  
 Liu, F. H., 200  
 Lofgren, G. P., 213  
 Loosli, John K., 55, 61, 62, 65, 73,  
     99, 106, 115, 121, 127, 129, 130,  
     131, 132, 133, 138, 145, 146, 148,  
     186, 187, 191, 196, 205, 209, 210,  
     211, 213, 216, 217, 219, 220, 221,  
     222, 223, 224, 225, 226, 227, 228,  
     229, 230, 232, 233, 234, 235, 236,  
     238, 239, 241, 242  
 Lopez, J., 225  
 Lord, L. H., 213  
 Louw, G. N., 225  
 Lovejoy, S., 226  
 Lowery, R. S., Jr., 236  
 Lu, L. K., 205  
 Lucas, H. L., 213  
 Luchsinger, John, 70  
 Lunsford, W., 226  
 Lupien, P. J., 226  
 Lush, Jay L., 140  
 Lynch, G. P., 236  
 Madamba, J. C., 226  
 Maddy, John C., 35  
 Madsen, L. L., 61, 205  
 Malott, Deane W., 115, 116, 151  
 Malven, P. V., 241  
 Manalo, C. M., 236  
 Maner, J. H., 236  
 Mann, Albert R., 32, 49, 104, 111  
 Manning, A. I., 34, 80-81  
 Mapes, Barth E., 124  
 Maplesden, D. C., 226  
 Marcum, J. B., 236  
 Marion, Germain, 123  
 Marshall, F. H. A., 54, 140  
 Martin, A., 226  
 Martin, C. M., 226  
 Martin, Russell D., 166  
 Martins, N. A., 213  
 Mathias, M. M., 241  
 Mathieu, L. G., 226  
 Matrone, G., 213  
 Maury, R., 200  
 Maynard, Leonard A., 33, 34, 35, 36,  
     37, 40, 41, 42, 43, 48, 53, 54, 55,  
     56, 59, 60, 61, 62, 63, 64, 65, 66-  
     67, 73, 106, 115, 121, 127, 129,  
     131, 132, 133, 190, 191, 192, 196,  
     199, 200, 201, 202, 203, 204, 205,  
     206, 207, 208, 209, 210, 212, 213,  
     215, 216, 219, 222, 232  
 Meade, Devoe, 33, 34, 189, 199  
 Meek, A. M., 168, 172, 186  
 Melampy, R. W., 205  
 Melass, V. H., 205  
 Mendel, L. B., 40  
 Mercier, E., 214  
 Merrill, W. G., 172, 186, 227  
 Metzger, Herbert J., 39, 53, 54, 99  
 Miller, G. W., 200  
 Miller, John I., 55, 68, 80, 81, 82,  
     106, 115, 121, 123, 127, 150, 151,  
     152, 153, 177, 178, 186, 191, 192,  
     193, 194, 195, 205, 209, 210, 214,  
     215, 216, 219, 221, 222, 226, 227,  
     228, 231, 232, 237, 241  
 Miller, R. C., 200  
 Mitchell, Albert K., 79, 115, 150  
 Moe, P. W., 241

- Moore, Lane A., 115  
 Moore, V. A., 17, 190  
 Morgan, H., 205  
 Morrill, Justin, 2  
 Morrison, Frank B., 38, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 65, 66, 67, 68, 72, 73, 75, 77, 79, 80, 81, 82, 83, 86, 88, 89, 93, 95, 96, 98, 99, 100, 101, 104, 105, 106, 107, 111, 115, 125, 127-129, 134, 151, 155, 175, 180, 191, 193, 194, 202, 203, 204, 205, 206, 207, 208, 209, 210, 212, 213, 214, 215, 216, 217, 219, 226, 227  
 Morrison, Mrs. F. B., 57, 58, 115, 125, 127, 128  
 Morrison, Roger B., 57, 115  
 Morrison, Spencer H., 57, 115, 125, 128, 214  
 Morton, M. S., 189  
 Mowat, D. N., 236  
 Musgrave, S. D., 214  
 Myers, G. S., 241  
 Myers, William I., 35, 67, 82, 104, 106, 111, 112, 113, 114, 115, 116, 121, 126, 127, 129, 144, 161, 163  
  
 McCandless, Henry, 4  
 McCarthy, B., 241  
 McCay, Clive M., 39, 40, 42, 53, 59, 60, 61, 62, 63, 64, 65, 66, 67, 81, 106, 121, 130, 131, 133, 136, 191, 196, 201, 202, 203, 204, 205, 206, 207, 208, 209, 211, 212, 213, 214, 215, 216, 217, 218, 221, 222, 224, 225, 226, 227, 228, 229, 232, 234, 236  
 McCay, Mrs. Jeanette B., 63, 66  
 McClung, J. M., 198  
 McConnell, James A., 39, 190  
 McDonald, James M., 144, 145  
 McEntee, Kenneth, 136, 138  
 McFee, A. F., 236  
 McGraw, Jennie, 8  
 McGrew, C. D., 214  
 McIlroy, D. L., Jr., 241  
 McJunkin, Eleanor, 145  
 McJunkin, Reed, 145  
 McKellip, I., 199  
 McMillan, W. D., 200  
 McNatt, T. B., 199  
  
 Nauman, H. D., 122, 153, 194  
 Nelson, A. B., 214  
 Nelson, W. L., 214  
 Nesheim, M. C., 129  
 Newlander, J. A., 206  
 Newlin, H. E., 214  
 Newman, L. A., 85  
 Newman, Paul E., 72, 206  
 Nicholson, J. W. G., 227  
 Noland, P. R., 227  
 Norman, R., 227  
 Norris, Leo C., 39, 40, 41, 98, 191, 201  
 Norton, Charles L., 55, 73, 106, 145, 146, 192, 214  
 Noyes, Holton V., 51  
 Nymon, M. C., 215  
  
 O'Donovan, D. J., 227  
 Ortiz-Lugo, M. S., 227  
 Osgood, H. S., 206  
  
 Páje, E., 206  
 Paladines, O. L., 237  
 Palm, Charles E., 113, 115, 116, 117, 118, 187  
 Panaretto, B. A., 227  
 Park, R. L., 227  
 Patel, M. D. J., 201  
 Paterno, T. T., 228  
 Paul, H. E., 206  
 Pavek, M. F., 206

- Pavey, R. L., 237  
 Payne, I. R., 228  
 Pearson, A. M., 215  
 Pearson, Raymond A., 21  
 Pelissier, C. L., 228  
 Penny, James C., 69-70  
 Perce, Charles, 62  
 Perez, C. B., Jr., 242  
 Peterson, Arthur H., 113, 114, 163  
 Pew, William, 50  
 Pico, F., 206  
 Pierce, Ellis A., 180, 181, 182, 183, 186, 228  
 Pierce, W. W., 228  
 Pinkos, J. A., 228  
 Plumb, C. S., 11  
 Pond, W. G., 120, 121, 155, 157, 158, 186, 194, 234, 236, 239, 241, 242  
 Pou, J. W., 228  
 Prentiss, Albert N., 4, 8  
 Preston, Clarence, 85  
 Price, Richard, 71  
 Priestley, M. R., 199  
 Proctor, J. F., 228  
 Putnam, P. A., 228  
  
 Rabild, Helmer, 30  
 Rakes, A. H., 229  
 Ralston, N. P., 215  
 Ramseyer, W. R., 229  
 Rashwan, M. E., 229  
 Rasmussen, E. S., 215  
 Rasmussen, R. A., 206  
 Rechcigl, M., Jr., 229  
 Reddish, R. L., 215  
 Reddy, J. C., 229  
 Reddy, M. K., 201  
 Reid, J. Thomas, 115, 120, 138, 147, 148, 186, 215, 217, 218, 220, 223, 224, 225, 226, 227, 229, 231, 234, 235, 237, 238, 240, 241, 242  
 Reynolds, P. J., 237  
 Rhea, W. A., 199  
 Rhoad, A. O., 201  
 Rice, James E., 13, 17, 18, 21, 23  
 Richards, C. R., 215  
 Roberts, Isaac P., 1, 4-7, 8, 9, 10, 12, 13, 15, 16, 18, 19-20, 27, 50, 198  
 Robertson, E. I., 98  
 Robertson, F. E., 30  
 Robertson, G. M., 229  
 Robinson, O. J., 201  
 Rockefeller, John D., 3d, 82  
 Rockefeller, Nelson A., 115  
 Rogel, I., 215  
 Rogers, L. A., 11-12  
 Rollins, Norman W., 162, 166  
 Roosevelt, Franklin D., 51  
 Rottensten, K. V., 206  
 Rousek, E. J., 215  
 Royce, Charles H., 35, 39, 198  
 Runcie, K. V., 229  
  
 Saint-Pierre, J. M., 206  
 Salisbury, G. W., 54, 57, 72, 73, 77, 78, 87, 95, 106, 108, 120, 135, 136, 140, 158, 191, 192, 206, 209, 210, 211, 212, 214, 216, 217  
 Salman, A. A., 229  
 Sambhavaphol, P., 229  
 Sanchez-Diaz, P. A., 206  
 Sander, E. G., 230  
 Savage, Elmer S., 24, 26, 27, 28, 33, 35, 40, 41, 42, 43, 48, 49, 53, 55, 56, 65, 66, 68, 70, 71, 72, 73, 74-75, 89, 98, 189, 190, 191, 192, 193, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 214, 215  
 Schaible, P. A., 206  
 Schmidt, Glen H., 121, 149-150, 172, 186, 195, 229, 230, 234, 242  
 Schneider, B. H., 206  
 Schreuder, H., 199



- Schultz, Loris H., 121, 149, 195, 219, 220, 226, 230, 231, 232
- Schurman, Jacob Gould, 26, 27, 31
- Schutt, Cecil D., 39, 43, 53, 80, 100, 106, 122, 153, 189, 193, 194, 195
- Schwardt, Herbert, 101
- Schwarte, L. H., 199
- Scott, J. E., 237
- Searle, S. R., 230
- Sears, James, 95
- Sehgal, B. S., 207
- Seidenstein, H. R., 207
- Saulke, Karl J., 33, 34, 39, 79, 189, 190, 198, 199
- Sewell, R. F., 230
- Sheffy, B. E., 120, 155, 156, 157, 194, 220
- Shen, Tung, 207
- Shields, N. R., 198
- Shu, K. T., 201
- Simmons, K. R., 237
- Simons, Lloyd R., 104, 117
- Sims, John A., 171
- Skipitaris, C. N., 230
- Slack, Samuel T., 146, 148, 170, 171, 172, 186, 224, 228, 230
- Slaight, William, 82, 150
- Sly, K. C., 144
- Smith, A. M., 231
- Smith, Clinton D., 17
- Smith, G. A., 14, 37
- Smith, Mark J., 35, 39
- Smith, O. D., 207
- Smith, Paul, 51
- Smith, Sedgwick E., 60, 62, 106, 115, 120, 121, 130, 134, 135, 138, 186, 194, 196, 207, 209, 217, 218, 221, 225, 226, 227, 228, 229, 233, 239
- Smithcors, J. F., 215
- Sod-Moriah, U. A., 242
- Somers, G. F., Jr., 106
- Sorensen, A. M., Jr., 231
- Spalding, Robert W., 141, 166, 171, 186, 187
- Spencer, C. M., 207
- Sperling, Gladys, 60, 136
- Spielman, Arless A., 55, 106, 143, 145, 146, 193, 210, 211, 216
- Stanton, Bernard, 123
- Staples, R. E., 237
- Stefanides, C. S., 215
- Steinbach, J., 237
- Stevens, R. L., 231
- Stewart, D. G., 231
- Stewart, Robert D., 144
- Stewart, W. E., 231
- Stewart, William, 71
- Stiles, W. C., 207
- Stimson, C. R., 207
- Stocking, William A., Jr., 32, 37
- Stone, J. Bruce, 173, 186, 231
- Stone, Walter King, 122
- Stouffer, J. R., 122, 153, 154, 186, 194, 236
- Stroud, J. W., 237
- Stubbs, O. J., 231
- Sumner, James B., 65, 67, 106, 133
- Swierstra, E. E., 237
- Tabet, H. G., 216
- Tailby, G. W., 13
- Tailby, G. W., Jr., 13, 24, 27, 28, 36, 40, 53, 88, 89, 90, 106, 161, 189
- Tanabe, T. Y., 216
- Tarbell, E. J., 198
- Taylor, George, 82
- Taylor, Joseph S., 95, 106, 165, 207
- Teeter, Ruth, 124
- Thacker, E. J., 232
- Thatcher, L. G., 198
- Thatcher, Roscoe W., 38, 49

- Thomas, Henry, 144  
 Thomas, J. W., 216  
 Thomas, W. E., 216  
 Thomson, Walter, 84  
 Thorndyke, W. M., 232  
 Thorne, Oakleigh, 50  
 Tillapaugh, Kenneth, 150, 151  
 Tolle, C. H., 207  
 Toupin, G., 201  
 Treves, G. R., 216  
 Trimmerger, George W., 95, 106,  
     121, 123, 138, 143, 144, 145, 146,  
     148, 149, 165, 186, 187, 195, 218,  
     220, 223, 231, 233, 239, 240  
 Trout, G. Malcolm, 126  
 Troy, Hugh C., 16  
 Tunison, A. V., 207  
 Turk, Bernice F., 122  
 Turk, Kenneth L., 26, 33, 48, 49, 50,  
     55, 56, 57, 63, 67, 68, 73, 92, 97,  
     100, 101, 106, 107, 115, 121, 122,  
     123, 129, 138, 143, 144, 145, 146,  
     151, 159, 163, 175, 176, 182, 185,  
     186, 187, 188, 191, 192, 195, 196,  
     207, 208, 209, 210, 213, 214, 215,  
     217, 221, 223, 224, 225, 228, 229,  
     230, 231, 233, 236  
 Turkheimer, R. A., 232  
 Turner, Jonathan B., 2  
 Tyrrell, H. F., 242  
  
 Udall, R. H., 232  
 Ulrich, H. E., 232  
  
 Van Blake, H. E., 237  
 Van Demark, N. L., 216  
 Van Niekerk, B. D. H., 237  
 Van Slyke, L. L., 12, 37  
 Van Vleck, L. D., 142-43 186, 232  
 Van Wagenen, J., 198  
 Veum, T. L., 242  
 Vial, Edmund E., 39  
  
 Vial, Joseph M., 101  
 Visek, W. J., 216  
 Volz, F. E., 216  
 Von Liebig, J., 2  
 Voris, L., 208  
  
 Wadell, Lyle H., 164  
 Wagner, D. G., 238  
 Wagner, W. C., 194  
 Waldo, D. R., 232  
 Walker, William R., 95, 106, 165  
 Wallace, H. D., 216  
 Wallentine, M. V., 232  
 Wanderstock, J. J., 81, 82, 106, 122,  
     152, 153, 158, 194, 195, 216  
 Wanner, R. L., 232  
 Ward, A. R., 17  
 Warner, Richard G., 120, 121, 130,  
     132, 133, 186, 194, 196, 218, 221,  
     223, 224, 225, 230, 231, 232, 234,  
     235, 236, 237, 238, 241, 242  
 Warren, George F., 42, 50  
 Wasserman, R. H., 233  
 Watkins, Thomas C., 117  
 Watson, George C., 16, 17  
 Watt, Robert M., 87, 158  
 Wayman, O., 233  
 Wearden, S., 233  
 Wellington, George H., 122, 123,  
     152, 153, 154, 181, 182, 186, 195,  
     220, 236  
 Wells, C. F., 233  
 Wentworth, R. A., 233  
 Wheeler, R. H., 82  
 Whetzel, H. H., 185  
 White, Andrew D., 1, 2-3  
 White, H. G., 201  
 White, M. N., 216  
 Whiting, F. W., 217  
 Wickard, Claude, 98  
 Wickham, Don J., 115

- Wiley, Thomas E., 184  
 Will, L. C., 217  
 Willett, E. L., 217  
 Williams, H. H., 131, 208  
 Williams, K. V., 201  
 Williams, W. L., 190  
 Willman, Harold A., 53, 54, 89, 93,  
     101, 102, 103, 106, 183, 186  
 Willman, John P., 39, 46-47, 53, 54,  
     82, 83, 84, 89, 106, 121, 154, 155,  
     156, 157, 180, 191, 192, 193, 194,  
     202, 203, 204, 205, 208, 212, 213,  
     219, 220, 224, 227  
 Wilson, Ronald, 71  
 Wilson, Woodrow, 31  
 Wing, Henry Hiram, 10, 11, 12-13,  
     14, 15, 16-17, 18, 19, 21, 23, 24,  
     25, 27, 28, 29, 30, 33, 35, 36, 41,  
     43, 44, 47, 48, 49, 53, 56, 68, 77,  
     78, 106, 164, 173, 189, 190, 198,  
     199  
 Wing, Mrs. H. H., 24  
 Wise, M. B., 233  
 Wittwer, L. S., 233  
 Wohlwend, I. C., 201  
 Wong, C. M., 208  
 Woodward, J. C., 208  
 Woolfolk, P. G., 217  
 Work, S. H., 208  
 Wright, Theodore P., 116  
 Yamdagni, S., 242  
 Yassen, A. M., 242  
 Yopo, Boris, 238  
 Young, D. C., 233  
 Young, Delmar J., 95, 106, 165  
 Young, Owen D., 48  
 Young, R. J., 120  
 Zelaya, J. A., 217  
 Zervas, N. P., 233

## INDEX OF SUBJECTS

- Administration, relationships with, 116-18
- Administration, role of, 21, 104, 116
- Advanced Registry, 16, 29, 30, 47, 69, 89, 143, 164, 170
- Agricultural Advisory Commission, 51, 52
- Agricultural College Council, 37
- Agriculture, early state of, 2, 3-5
- American Association for the Advancement of Science, 75
- American Dairy Science Association, 29, 41, 57, 75, 76, 78, 92, 125, 126, 132, 163, 164, 169
- American Dry Milk Institute, 42, 66
- American Feed Manufacturers Association, 33, 170
- American Institute of Nutrition, 67
- American Jersey Cattle Club, 38, 184
- American Society of Animal Nutrition, 126
- American Society of Animal Production, 53, 57, 75, 126, 132, 152. *See also* American Society of Animal Science
- American Society of Animal Science, 126-27, 132
- Animal breeding, research in. *See also* Animal physiology; Artificial insemination
  - dairy cattle breeding, new directions in, 140-43
  - fertility in dairy cows, heritability of, 141
  - genetic analysis of dairy records, 141-42
  - sire evaluation, use of part lactation records in, 142
  - value of, 141
  - young-sire sampling programs, 140, 167
- Animal husbandry
  - advisory committee formed, 51 (*see also* Livestock Advisory Council under this entry)
  - animal husbandry buildings, 27, 114-16 (*see also* Morrison Hall; Wing Hall)
  - change in name of department, 124
  - department organized, 21
  - department reorganized, 52-53
  - early reports on, 8
  - five-year program, projected, 113-14
  - income funds, use of, 22
  - Livestock Advisory Council, 111-13, 114, 115, 127
  - livestock inventory, 5, 27
  - major programs in, 58-104, 129-85
  - needs for more staff, space and equipment, 26-27
  - new teaching and research farm, 109, 113, 117
  - operational funds, sources of, 109-10
  - phase I (1868-1903), 1-20
  - phase II (1903-1928), 21-50
  - phase III (1928-1945), 51-106
  - phase IV (1945-1963), 107-88
  - plans for the future, 107-8
  - progress during the twenties, 39-47
  - sales of surplus animals, 25-26, 70, 150-51
  - staff changes, 24, 33-34, 39-40, 54-55, 133, 135-36, 140-42, 145, 147, 149, 153-55, 161, 165-66, 169, 170-71, 173, 181, 184
  - status of department, 23-24, 53, 106, 185-86

special appropriations for, 51-52, 95, 102, 136, 142, 181

Animal husbandry, extension in.  
*See also* Artificial breeding;  
Dairy production; Rural youth;  
Livestock other than dairy  
cattle

correspondence courses, 46

early programs of, 14-16

farmers' institutes, 14-15, 35

extension specialists, changes in  
functions of, 160

extension specialists, increase in,  
169

farm study courses, 184-85

growth of, 14-16, 23, 25, 29-31, 35-36, 45-47, 88-104, 159-85

national extension program  
initiated, 31 (*see also* Smith-  
Lever Act)

training for, 29, 185

trains, use of in extension pro-  
grams, 25, 34, 47, 150

Animal husbandry, instruction in.  
*See also* Appendix 1

courses offered, 13, 23, 43-44, 57,  
64, 71, 77, 80, 81, 82, 86, 112,  
119-22, 152, 153

department seminar, 108

resident instruction, 43, 44, 52-55,  
62-65, 71, 77, 80, 81, 82, 86,  
119-22, 152, 153

special emphasis to, 119-22

students, enrollments of, 7, 13, 23,  
26, 27, 32, 34, 35, 53, 119

winter courses, 13-14

Animal husbandry, research in. *See  
also* Animal breeding; Animal  
nutrition; Animal physiology;  
Artificial insemination; Meats;  
*under different classes of livestock*

early experiments, 8-9, 11-12,  
16-19

early reports, 8-9, 12

grants and contracts for research,  
110 (*see also* Appendix 3)

research expands, 16-19, 27-29,  
35-36, 40-43, 59-63, 71-74, 77-  
81, 83-85, 86, 88, 129-59

tuberculosis in cattle, 18

Animal nutrition, 33, 59-67, 129-33

biochemistry unit transferred to  
animal nutrition, 65

dog farm, 130

laboratory of animal nutrition,  
52, 58, 63

Reed farm, 60, 130

small animal laboratory, 130

work initiated in, 33

Animal nutrition, instruction in, 43,  
62-65, 121. *See also* Appendix 1

history of nutrition, course in, 64,  
121

seminars in, 62-63

text book on animal nutrition, 62

Animal nutrition, research in, 36,  
40-43, 59-62, 129-33

amino acid nutrition, 131

amino acid synthesis in the  
rumen, 131

blood and milk fats, relationships  
between, 42

body composition, factors influ-  
encing, 148, 153

body composition of living  
animals, 148

body water, antipyrine and  
tritium for measuring, 148

calcium and phosphorus utiliza-  
tion with life span studies, 131

cobalt-vitamin B<sub>12</sub> interrelation-  
ships in ruminants, 134

coconut oil meal, nutritive value  
of, 36

cod-liver oil toxicity, 61

coffee and acid beverages, studies  
on, 130-31

- digestive problems in calves, effects of calf meals on, 40-41
  - dog, research with, 130
  - facilities, additional research, 62
  - fat levels, effects on milk secretion, 59
  - fish research, 42-43, 61
  - fluoride metabolism, 131
  - fur animals, 61-62, 130, 133, 134
  - hemoglobin studies on dairy herd, 42
  - ionized radiation, effects on foods, 131
  - lactation, role of fat in, 59, 62
  - lipid changes in blood during lactation, 59
  - milk fat metabolism, 59
  - milk secretion in rats, effects of high protein levels on, 42
  - milk substitutes for calves, 36
  - mineral nutrition, 134-35
  - muscular dystrophy, 61, 132
  - nonprotein nitrogen, utilization of, 41
  - prolongation of productive life (life span studies), 59-60, 130, 131
  - protein metabolism studies, 41
  - relation of vitamins in feed to vitamins in milk, 36
  - synthetic (purified) diets for ruminants, 60-61, 131
  - vitamin B factor, need for in goats and sheep, 61
  - volatile fatty acids in rumen, relationships to milk production efficiency, 132
- Animal physiology, research in. *See also* Artificial insemination
- atropin, effects on ovulation, 137
  - conception rate and ovarian function, effects of progesterone injections on, 149
  - dietary restriction and reproductive performance, 60, 136, 138-39
  - early embryo mortality, effects on fertility, 138
  - estrous cycle regulation, 136, 137
  - fertility in dairy cattle, effects of gonadic and gonadotropic hormones on, 60
  - mammary growth and secretion, roles of ovarian hormones on, 60
  - mobile laboratory, for field studies on reproductive physiology, 138
  - ovulation and ovarian function, factors affecting, 139
  - ovulation, mechanisms of, 136, 137
  - ovulation, time of, 148
  - pituitary luteinizing hormone (LH), effects on ovarian function, 137
  - plane of early nutrition, effects on reproduction in heifers and bulls, 138-39
  - prolactin in mammary growth and secretion, 60
  - reproductive failures in dairy cattle, causes and prevention of, 136, 138-39
- Artificial breeding, extension in, 94-96, 165-69. *See also* New York Artificial Breeders' Cooperative
- artificial insemination and dairy herd improvement, special appropriation for, 95
  - cattle show (NYABC), 167
  - central state association, 94-96
  - Cornell sire summary, 166
  - herdmate and daughters-of-sire comparisons, 168
  - manager-technicians, training schools for, 165, 171
  - Pioneer Artificial Breeding Association, 94-95

- sire selection committees, training schools for, 167
- type appraisal demonstrations, 167
- young-sire sampling program, 167
- Artificial insemination, research in, 77-78, 135-37
  - antibiotics (penicillin, streptomycin, and polymixin), effects of adding to semen extenders, 136-37
  - artificial vagina developed, 77
  - collection and handling of semen, 77
  - containers for shipping of semen, 77
  - dilution rates of bull semen, 78, 135
  - frequency of ejaculation by bulls, effects on sperm output, 137
  - frozen semen, field tests, 137
  - methylene blue reduction test, 78
  - new laboratory for artificial insemination research, 88
  - nutrient requirements for bulls used in artificial insemination, 135
  - quality of protein, effects on semen production, 135
  - semen production and fertility, relationships of nutrition to, 135
  - sexual preparation, effects on sperm output, 137
  - sulfanilamide, use in diluters, 135
  - vitamin A in bull rations, 78, 135
  - wheat germ oil in rations for bulls, 78
  - yolk-citrate diluter, 78, 135
- Babcock test, 15, 25
- Bailey Hall, 7, 31
- Bailey retirement, 31-32
- Bankhead-Jones Act, 110
- Beef cattle
  - American Angus Association, 150
  - American Hereford Association, 151
  - Angus cattle, 23, 79, 150
  - beef cattle barn, 51, 52, 150
  - beef cattle herdsmen, 82
  - college herd, improvement in, 79
  - Hereford cattle, 79, 150
  - national TV publicity for beef cattle program, 151
  - New York Hereford Association, 151, 177
  - regional beef cattle sales, 151
  - state beef cattle sales, 150-51
  - type classification for, 150
- Beef cattle, extension with, 46, 101-102, 176-78
  - beef cattle herdsmen, training schools for, 82
  - Beef Cattlemen's Short Course, 82, 101, 177
  - beef production project, 176-77
  - New York Beef Cattlemen's Association, 177
  - performance testing in, 177
  - special appropriation for research and extension with beef cattle and meats, 181
- Beef cattle, research with
  - beet pulp, feeding value of, 18
  - cabbages for stock feeding, 29
  - corn stalks, nutrients in, for cattle, 9
  - ensilage for cattle, 9, 151
  - fattening of steers, 9, 11, 80, 151
  - forages for wintering rations, effects of stage of maturity on feeding value of, 151
  - improved pastures for beef cattle, 80, 151-52

- molasses, utilization as food for animals, 29
- pasture, maximum use of in fattening of yearling steers, 80, 151
- pelleted forages, feeding value of, 152
- protein requirements of yearling steers, 79, 151
- protein supplements for fattening yearling steers and calves, 80
- stilbestrol, use in fattening rations, 152
- Biochemistry, Department of, 67, 116, 129, 131
- Bovine hyperkeratosis, 137-38, 174.  
*See also* X-disease
- Briarcliff Farms, 50
- Cascadilla Place, 4-5
- Coconut oil meal, 36, 41
- Coliseum, Henry Hiram Wing, 48
- College of Agriculture, 10, 13, 19-20.  
*See also* New York State College of Agriculture
- Computing Center, University, 164
- Comstock Hall, 6
- Conference Board of Farm Organizations, 37
- Cooperative Grange League Federation (G.L.F.), 33, 41, 42, 65, 67, 72, 74, 110, 147, 171, 182
- Cornell Extension Club, 32
- Cornell Feed Service, 98-99
- Cornell formula bread (also triple-rich bread), 66
- Cornell judging teams, 71, 81, 122-24
  - dairy cattle judging teams, 71, 123
  - livestock judging teams, 81, 123
  - meats judging teams, 123-24
- Cornell Nutrition Conference for Feed Manufacturers, 170
- Cornell University
  - endowment fund, 3
  - founding of, 1-3
  - semicentennial of, 36
- Cornell University Agricultural Experiment Station
  - first, 8-10
  - last report of, 9-10
  - new, 12-13, 16-19, 38, 49, 104, 116, 117
- Cow testing associations, 29, 30, 31, 35
- Curwin's Hog Powder, 12
- Dairy building
  - original, 7
  - second, 17, 21
  - new (East Roberts), 21
- Dairy calves, research with
  - antibiotics for calves, 132, 133
  - Blatchford's Calf Meal, 28
  - calf meals, development of, 28, 36, 40-41
  - carotene and vitamin requirements, 145
  - dry calf starters, pelleting of, 72
  - Lactina Suisse, 28
  - limited whole-milk, dry calf-starter method, 72-73, 133, 146
  - milk replacers, 133
  - phosphorus sources, availability of, 134
  - rumen development, 133
  - Schumaker Calf Meal, 28
  - skim milk for calves, 28
  - substitutes for skim milk in raising dairy calves, 36
  - vitamins for calves, 132, 145
- Dairy cattle, college herd of
  - early status of, 5, 6
  - early improvement in, 6, 16, 18, 24



- Cornell Ollie Catherine, 69  
 Cornell Ollie Pride, 69  
 Glista Ernestine, 24  
 Glista family of Holsteins, 24  
 improvements in, 68-71, 143  
 Dairy Cattle Congress, 71  
 Dairy cattle, research with  
   barn-dried hay, feeding value of, 146  
   breeding and development of dairy cows, 29  
   carbohydrate fractions of forages, digestibility, and interrelationships of, 147  
   concentrate mixtures of ground whole grains, 73  
   concentrate mixtures, widely varied ingredients in, 145  
   corn distillers' dried grains, value of for lactation, 133  
   corn distillers' dried solubles, 133  
   cost of milk production, 17  
   dehorning of cattle, 16  
   early and late-cut forages, feeding tests on farms, 146  
   ensilage of cabbage leaves, 9  
   fat (tallow), effect of feeding to cows, 17  
   fat in milk, effects of liberal feeding on, 19  
   feeding standards for, 28  
   grass silages, nutritive value of, 73, 147  
   hay crops, effects of methods of harvesting and storage on nutritive value of, 132, 146-47  
   hay crusher, use of, 146  
   herbage selection by grazing animals, degree of, 147  
   indicator method for determining digestibility and consumption of forages, 147  
   interdepartmental laboratory for forage utilization studies, 147-48  
   ketosis, causes and prevention, 149  
   ketosis, effect of grain feeding level on, 149  
   machine milking methods, 149  
   malt sprouts for milk cows, 9  
   mastitis, effects of milking machine design on, 149  
   milk composition, effects of ration changes on, 9  
   milking rate, factors affecting, 149  
   milk production, effects of unequal milking intervals on, 149  
   nonprotein nitrogen, utilization of, 41  
   oxytocin, effects on rate of milking, 149  
   nutritive value of forages, effects of methods of harvesting and storage on 132, 146-47  
   nutritive value of harvested forages, effects of stage of maturity on, 132, 146  
   plane of early nutrition, effects on lifetime performance in dairy cattle, 132, 138-39, 148  
   protein intake, effect of different levels upon milk production, 42, 71  
   protein levels in grain mixtures, 42, 71-72  
   protein quality in concentrate mixtures, 73  
   protein requirements of lactating cows, 72  
   relation of food to milkfat, 18, 19, 41  
   root crops for milk production, 27-28, 76  
   sodium chloride requirements of dairy cows, 134

- sodium propionate, as treatment for ketosis, 149
- sugar beets as stock foods, 16
- timothy hay (early cut, nitrogen fertilized) compared with alfalfa hay for dairy cows, 72
- udder edema, effects of grain feeding levels on, 149
- vitamin A and carotene in colostrum, factors affecting, 145
- volatile fatty acids in the rumen, production, absorption, and metabolism of, 149
- warming of water for milk cows, 12
- wilting of grass-legume mixtures for silage, effects of, 146-47
- Dairy herd improvement associations (DHIA), 31, 45, 89-91, 97, 161-65, 170
  - county testing laboratories, 161
- Dairy Industry, Department of, 21, 30, 32
- Dairymen's League Cooperative Association, 37, 42
- Dairymen's League News*, 37, 75
- Dairy production, extension in, 14-16, 23, 25, 29-31, 45, 89-100, 159-69
  - brucellosis control program, 99-100, 174
  - The Challenge to New York State Dairymen*, sound color film, 160
  - college dairy commodity committee, 159
  - cooperative bull associations, 35, 91, 166
  - Dairy Barn Management Program, 160
  - dairy cattle breeding, 91-96, 165-69. *See also* Artificial breeding; Artificial insemination; Herd genetic analysis studies
  - dairy cattle feeding, 96-99, 169-72, 173-74
  - dairy herd management, 172-74
  - dairy herd management newsletters, 172
  - dairy records, 15-16, 18, 23, 29-31, 35, 45, 89-91, 161-65, 166. *See also* Cow testing associations; Dairy herd improvement associations; Dairy record club program
  - dairy records processing laboratory (DRPL), 141, 162-65, 166
  - drought conditions, 173-74
  - Emergency Livestock Feed Program, 173-74
  - feed dealers, schools for, 170
  - Full Milk Pail*, 46
  - herd analysis studies, 93-94, 166
  - herd health, extension in, 46, 99-100, 174-75
  - mastitis control program, 100, 174-75
  - More Fall Milk Program, 159-60
  - Project M, 150, 172-73
  - tuberculosis eradication program, 99
  - TV feeding schools, 171-72
- Dairy record clubs, 89, 90-91
- Department of Agriculture (Cornell), 4, 5, 7, 10, 15, 20
- Department of Agriculture (New York State), 15, 30, 31, 35. *See also* New York State Department of Agriculture and Markets
- Eastern Artificial Insemination Cooperative (EAIC), 169
- Eastern States Exposition, 69
- East Roberts Hall, 21-22
- Economic Seed Manure, 12
- Extension Service Advisory Council, State, 118
- Extension Service Associations, county, 118

- Extension veterinarian, 39, 46
- Faculty in agriculture, growth in, 32
- Faculty status to extension professors, 58-59
- Farm and Home Bureau Associations, 88, 90, 117
- Farmers' Institutes, 14
  - initiation of, 15
  - transfer of, to College of Agriculture, 15, 35
- Farmers' Week, 15, 25, 26, 35
  - Agriculture Progress Days, 25
  - Farm and Home Week, 25, 70
- Federal Regional Research Fund, 110
- Feeds and Feeding*, 11, 50, 57, 105, 125, 127, 128, 129, 151
- Fish and Wildlife Service, 61
- Foremost Guernsey Association, 69
- Fur animals, research on, 61-62, 130, 133, 134
- G.L.F. calf meal, 41
- Goldwin Smith Hall, 17
- Graduate students. *See also* Appendix 2
  - graduate assistants, 57, 122
  - increase in numbers of, 56-57, 119
  - instruction of, 44, 57, 62-63, 64, 119-22
- Harrison-Trimberger-Slack Fund, 148, 172
- Hatch Act
  - research funds provided by, 10-11, 23-24
- Herd genetic analysis studies, 93-94, 166
- Herd Improvement Registry, 89, 143, 162, 164, 170
- Herdsmen, role of, 55
- Holstein-Friesian Association of America, 16, 48, 164
- Home Economics, College of, 53, 81, 181
- Ho-Nun-De-Kah, 152
- Horses
  - barn constructed, 27
  - barn destroyed by fire, 87
  - barn, new, 88, 150
  - herd sold, 158
  - new foundation animals—Belgians and Percherons, 87
  - pulling contests, 47, 101
- Horses, research with
  - breeding experiments, 28
  - carrots for horses, 9
  - equine nutrition, proposal for, 159
  - Equine Research Center, 159
  - feeding experiments, 28, 42
  - hay for work horses, value of chaffing or grinding, 28
  - iodine and vitamins, effects of in rations of pregnant mares, 87
  - oats and corn for horses, relative value of, 28
  - protein requirements of mature work horses, 87
  - strongyles in horses, control of, 88
- International Agricultural Development, Program in, 187
  - Cornell-Los Baños program, 185, 187
- International dimension at Cornell, 185, 187
  - Cornell-China program, 185
- International Livestock Show, 53
- Ithaca Farmers' Club, 15
- Journal of Animal Science*, 152
- Kenwood Sheep Farm, 84-85

- Lacy-Miller Scholarship Fund, 178
- Land Grant Act, 1-3, 10. *See also* Morrill Act
- Large animal research laboratory, 108
- Library for Agriculture and Home Economics (Albert R. Mann), 111
- Livestock barns, 6-7, 27, 51, 52, 83, 87, 88, 150  
dairy barn, 27, 143
- Livestock entomology, program in, 101
- Livestock other than dairy cattle, extension with, 45-47, 100-102, 175-83. *See also different classes of animals*  
state appropriations for new positions, 101-102
- Livestock feeding, division of, 134-35
- Livestock pavilion, 27, 114
- Mangels, 9, 27-28, 76
- Meats, extension with, 100-101, 181-83  
carcass competitions, 182  
meat cutting demonstrations, 100-101, 182  
Frozen Food Locker Association, 181  
frozen-food locker plants, 182
- Meats, instruction with, 27, 34, 43-44, 80-81, 153-54
- Meats, research with, 81-82, 152-54  
aging of beef for freezing, 153  
carcass composition and meat quality, factors affecting, 153  
carcass grades and dressing percentage, effect of grain on, 81  
collagen cross-linking, effects on tenderness in beef, 153-54  
color of beef, 81  
humane slaughter of animals, 153  
live animal and carcass evaluation, 154  
marbling of beef, influences on tenderness and juiciness, 153  
quality of beef produced by steers with and without pasture, 81  
quality of frozen beef, factors affecting, 153  
quality of meat, effects of treatments and wraps before freezing, 153  
smoked salt in curing of hams, 81  
steroid hormones, effect on meat production and quality, 153  
storing cured pork products, methods of, without refrigeration, 153  
ultrasonic techniques in live animal evaluation, 153-54
- Meat salesroom, 34, 80-81, 154
- Model barn, 6-7
- Morrill Act, 1-3, 10. *See also* Land Grant Act
- Morrill Hall, 12, 47
- Morrison Award, American Society of Animal Science, 125
- Morrison feeding standards, 28
- Morrison grants and fellowships, 125
- Morrison Hall, Frank B., 114-16, 127, 130, 135, 154, 162  
dedication of, 115  
dedication symposium, 115-16
- Morrison honorary degrees, 128
- Morrison portraits  
in Saddle and Sirloin Club, 57  
at Cornell, 127
- Morrison retirement, 127-29  
as department head, 105
- Morrison succeeds Wing, 49-50
- McDonald Farms, gift of, 144-45  
advisory committee for, 144

- endowment fund for, 144
- McDonald Foundation, 144, 145
- research projects at, 144
- Mt. Pleasant Farm, 74, 143
- systems of grassland farming, 74
- National Academy of Sciences, 66-67, 136
- National Block and Bridle Club, 24
- National Dairy Show, 24, 48, 69, 71
- National Livestock and Meat Board, 100
- National Milk and Dairy Farm Exposition, 34
- National Research Council, 66-67, 151, 156
- National Science Foundation, 110, 142
- Nature study leaflets, 15, 25
- New York Angus Association, 82
- New York Artificial Breeders' Cooperative (NYABC), 77, 78, 94-96, 110, 135, 137, 142, 162, 163, 166, 167, 168-69
- New York Dairy Herd Improvement Cooperative (NYDHIC), 161-62, 163-64, 166
- New York Dairymen's Association, 6, 14, 38
- New York Farmers, 50
- New York Feed Dealers' Association, 170
- New York Hereford Association, 177
- New York Jersey Cattle Club, 38
- New York State Agricultural Experiment Station (Geneva), 11-12, 37-38, 75-76
  - animal husbandry research at, 37-38
  - early research at, 11-12
  - establishment of, 11-12
  - input-output investigations, 76
  - mastitis, causes, control, and prevention, 76
  - milking machines, effects on milk production, 76
  - relationships with College of Agriculture, 37
  - research in dairying continued until 1943, 75-76
  - supplemental vitamins and minerals in calf-feeding experiments, 76
- New York State Agricultural Society, 4, 15
- New York State Bankers' Association, 95
- New York State College of Agriculture
  - Appropriation Act of 1906, 22
  - college administration, role of, 104
  - established, 21-22
  - name change to Agriculture and Life Sciences, 117
  - relationships with college administration, 116-18
  - staff and programs, growth in, 24-27
- New York State Defense Council, 66
- New York State Department of Agriculture and Markets, 115, 174, 179
- New York State Emergency Feed Committee, 98
- New York State Emergency Food Commission, 66
- New York State Fair, 1, 69, 75, 82, 87, 88, 103, 143, 150, 151, 158, 177, 182
- New York State Food Supply Commission, 34
- New York State Holstein Association, 24, 93
- New York State Veterinary College, 1, 21, 46, 83, 86, 99, 108, 174
- New York World's Fair, 149

- Open-formula feeds, 33
- Patterns of Mammalian Reproduction*, 139
- Postwar building program, 108
- Poultry Husbandry, Department of, 21
- Poultry husbandry, early courses in, 13
- Program priorities, 113-14
- Protein quality for ruminants, 67-68, 73
  - nitrogen metabolism studies, 67-68
  - urea, utilization of, 68
- Public health, relationship of disease among farm animals to, 17
- Public sales of surplus animals, 25-26, 70, 150-51
- Purebred Dairy Cattle Association, 164
- Purnell Act, 39
- Reading courses in animal husbandry, 25
- Reed farm, 62, 130
- Research and Marketing Act, 110
- Roberts barn, 6
- Roberts Hall, 22, 188
- Rockefeller Foundation, 59, 60
- Round-Up Club, 24, 52, 152
- Rural youth (4-H livestock programs), extension with, 39, 46-47, 102-4, 183-84
  - dairy judging teams, 183, 184
  - dog care and training project, 184
  - educational programs with 4-H club members, 103, 183, 184
  - enrollments in 4-H animal projects, 183
  - 4-H Club Associations, 88, 117
  - 4-H Club Handbook*, 183
  - light horse project, 184
  - livestock judging teams, 183
  - New York 4-H Federation, 103
  - war effort, contributions to by 4-H club members, 103
- Saddle and Sirloin Club, 57
- Salary Classification Act, 109
  - salary adjustments, 109
- Salary scales, 36
- Savage, E. S., contributions of, 74-75
- Savage feed service, 75
- Savage feeding standards, 28
- Savage Hall, 75
- School of Nutrition, 65-66, 75, 129
  - home for, 67 (*see also* Savage Hall)
- School of Hotel Administration, 53
- Secretarial and clerical staff, contributions of, 56
- Sheep
  - breeding flock, improvement in, 25, 83
  - lamb feeders' banquet, 84
  - management, 8, 19
  - new foundation animals, 83
  - nutritive requirements of, 151
  - sheep barn, 35, 51, 52, 83
  - sheep husbandry, role of, 19
- Sheep, extension with, 34-35, 45-46, 100, 102, 178-80
  - creep-feeding trials, 179
  - Empire Shepherds' Club, 179
  - graded lamb markets, 179
  - lamb-grading and marketing project, 102, 178
  - lamb-feeding demonstrations, 46
  - purebred sheep improvement project, 102, 178
  - Sheep Fold*, 46
  - wool-grading schools, 179
  - wool-marketing cooperatives, 179

- wool pools, 45, 179
- Sheep, research with. *See also*
  - Kenwood Sheep Farm
  - apoplexy in lambs, 25
  - corn silage for fattening lambs, 84
  - digestibility by sheep of clover hay and ensilage, 12
  - early cut hay, value for lambs, 156
  - energy intake, effects on milk yield and production efficiency in lactating ewes, 156
  - fattening western lambs, 84
  - frequent-lambing sheep-management systems, 156
  - hothouse lambs, 8, 28
  - internal parasites, 155
  - lamb-feeding experiments, 17, 18, 84
  - lean meat production studies, 11, 12, 16
  - nitrogenous and carbonaceous feeds for sheep, effects of, 12
  - protein requirements for fattening lambs, 155
  - protein supplements for feeder lambs, 84
  - selenium, effective in preventing muscular dystrophy, 155-56
  - stiff lamb disease, 46, 54, 83-84, 155-56
  - stiff lamb disease, effect of vitamin E on, 83, 155-56
  - stiff lamb disease, effect of wheat bran and wheat germ meal on, 83
  - urea nitrogen for lambs, 84
- Smith-Lever Act, 14, 31
- Soja bean (soybean), 9
- Stable manures, 9, 16
- Staff employment, policy changes on, 118-19
- State Farm Bureau Federation, 37
- State Grange, 37
- State Institution Farms, 112
- State Retirement System, 118
- State University of New York, 110, 114, 115
  - Board of Trustees, 110
- Stocking Hall, 53, 114
- Stone Hall, 22, 111
- Strathglass Farms, 70
- Student Army Training Corps, 35
- Sumner Nobel Prize in chemistry, 65
- Swine
  - Cheshire swine, 24
  - swine barn, 51, 52
  - swine breeding herd, 85
- Swine, extension with, 101-2, 180-81
  - annual field day, 180
  - cooperative feeder-pig sale, 181
  - garbage feeding, 180
  - market-hog pool, 181
  - pig feeding projects, 35
  - sow-testing program, 180
  - Swine Facts*, 46
  - Swine Improvement Group, 180, 181
- Swine, research with
  - anemia in pigs, methods of preventing, 85, 156
  - antibiotics in pig rations, 157
  - atropic rhinitis in swine herd, 157
  - baby pigs, nutritive requirements of, 156-57
  - brood sows, supplements to winter rations for, 86
  - buckwheat middlings, value of, for pigs on pasture, 36
  - cod-liver oil, addition of, to rations for fattening pigs, 86
  - cod-liver oil concentrate in rations for brood sows, 86
  - corn gluten feed for pigs, 17

- enzymes, role of in swine rations, 157
- fish scrap as swine feed, 36
- iodized salt in rations for brood sows, 86
- meat scrap for pigs, 17
- mortality in swine, causes and remedy, 17
- posterior paralysis in swine, 41
- protein-calorie malnutrition in baby pigs, 157
- protein supplements, 36
- rations for fattening, improvements in, 86
- skimmed milk, utilization of in pork production, 18, 19, 29
- sprouted corn, value of, 19
- sun-cured-alfalfa hay, value of in pig rations, 86
- trace minerals, value of, 156
- trio-mixture, modifications of, 86
- zinc requirement for growing pigs, 158
  
- Tompkins County Breeders Association, 75
- Tragedy strikes the department, 56
- Trimberger Scholarship, 148
- Trustees, Board of, 3, 22, 37, 58, 65, 71, 115
- Turk succeeds Morrison, 106
  
- Universal Barn (Roberts Barn), 6
- United States Department of Agriculture, 32, 34, 175
- U. S. Plant, Soil, and Nutrition Laboratory, 62, 65, 66
- U. S. Public Health Service, 110, 148
- University farm, given by Ezra Cornell, 1
  - inventory of property, 5
  - objectives of, 4-5
  
- Warren dairy cattle experimental farm, 42, 52, 69, 71, 109, 143
- Warren Hall, 111
- Western New York Horticultural Society, 37
- Western Union Telegraph Company, 2
- Willard Straight Hall, 32
- Willman 4-H Dairy and Livestock Fund, 183
- Willman, J. P., retirement, 157
- Wing Hall, 27, 40, 47, 48, 52, 53, 56, 80, 96, 108, 114, 116, 125, 127, 162
  - annex to, 114
  - chemistry laboratory in, 27
  - facilities for meats teaching and research, 27
- Wing portrait, 48
- Wing retirement, 47-49
- World War I affects college activities, 34-39
  - needs for increased food production, 34
- World War II adjustments, 98
  - Dairy Feed Mobilization Program, 98
  - Food for Victory Programs, 98
  
- X-disease in cattle, 137-38, 174. *See also* Bovine hyperkeratosis