

**City of Madison Landmarks Commission
LANDMARKS AND LANDMARK SITES NOMINATION FORM (1)**

Name of Building or Site

Common Name

University of Wisconsin Dairy Barn

Historic Name (if applicable)

Same

Location

Street Address

1915 Linden Drive
Madison, Wisconsin, 53711

Aldermanic District

5
Robbie Webber

Classification

Type of Property (building, monument, park, etc.)

Building

Zoning District

R5

Present Use

Education

Current Owner of Property (available at City Assessor's Office)

Name(s)

University of Wisconsin Regents

Street Address

1860 Van Hise Hall
1220 Linden Drive
Madison, Wisconsin 53706-1557

Telephone Number

608.262.2324

Legal Description (available at City Assessor's Office)

Parcel Number

709-153-701-5

Legal Description

T7N R9E, Part of SW ¼, Sec 22 Part N ½

A parcel of land belonging to the University of Wisconsin bounded by Linden Dr. on the N, Willow Creek on the W, Railroad Row on the S, Babcock Dr. on the E

Condition of Property

Physical Condition (excellent, good, fair, deteriorated, ruins)

Excellent

Altered or Unaltered?

Altered

Moved or Original Site?

Original Site

Wall Construction

Wood

City of Madison

LANDMARKS AND LANDMARK SITES NOMINATION FORM (2)

Historical Data

Original Owner

University of Wisconsin

Original Use

Education, Research Facility

Architect or Builder

J. T. W. Jennings
Arthur Peabody

Architectural Style

Late Victorian

Date of Construction

1897-98

Indigenous Materials Used

Stone, Wood, Brick

List of Bibliographical References Used

National Historic Landmarks Nomination, October 24, 2001

Prepared by: Elizabeth L. Miller, Historic Preservation Consultant, Madison, Wisconsin

Edited by: National Park Service, National Historic Landmarks Survey,
Washington, DC

Form Prepared By

Name and Title

John W. Henley, Director-at-Large, Wisconsin Trust for Historic Preservation
Chairman, Rural Preservation Committee, Barns N.O.W!

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Organization Represented (if any)

Rural Preservation Committee, Barns N.O.W!, Wisconsin Trust for Historic Preservation

Madison Trust for Historic Preservation

Address

Wisconsin Trust for Historic Preservation

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Madison, Wisconsin 53701-2288

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608.225.0348

Madison Trust for Historic Preservation

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Madison, Wisconsin 53701-0296

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Date Nomination Form Was Prepared

June 7, 2005

Landmarks Commission

LANDMARKS AND LANDMARK SITES NOMINATION FORM (3)

Describe Present and Original Physical Construction and Appearance.

See, enclosed:

National Historic Landmark Nomination

City of Madison Landmarks Commission

LANDMARKS AND LANDMARK SITES NOMINATION FORM (4)

Significance of Nominated Property and Conformance to Designation Criteria.

See, enclosed:

National Historic Landmark Nomination





NATIONAL HISTORIC LANDMARK NOMINATION

NPS Form 10-900

USDI/NPS NRHP Registration Form (Rev. 8-86)

OMB No. 1024-0018

United States Department of the Interior, National Park Service

National Register of Historic Places Registration Form

1. NAME OF PROPERTY

Historic Name: University of Wisconsin Dairy Barn

Other Name/Site Number: N/A

2. LOCATION

Street & Number: 1915 Linden Drive

Not for publication:

City/Town: City of Madison

Vicinity:

State: Wisconsin County: Dane Code: 025 Zip Code: 53711

3. CLASSIFICATION

Ownership of Property
Private: ___
Public-Local: ___
Public-State: _x_
Public-Federal: ___

Category of Property
Building(s): _x_
District:
Site:
Structure:
Object:

Number of Resources within Property
Contributing
1
0
0
0
1

Noncontributing
0 buildings
0 sites
0 structures
0 objects
0 Total

Number of Contributing Resources Previously Listed in the National Register: 0

Name of Related Multiple Property Listing: N/A

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4. STATE/FEDERAL AGENCY CERTIFICATION

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this x nomination request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property x meets does not meet the National Register Criteria.

Signature of Certifying Official

Date

State or Federal Agency and Bureau

In my opinion, the property meets does not meet the National Register criteria.

Signature of Commenting or Other Official

Date

State or Federal Agency and Bureau

5. NATIONAL PARK SERVICE CERTIFICATION

I hereby certify that this property is:

- Entered in the National Register
- Determined eligible for the National Register
- Determined not eligible for the National Register
- Removed from the National Register
- Other (explain):

Signature of Keeper

Date of Action

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6. FUNCTION OR USE

Historic: Education

Sub: Research Facility

Current: Education

Sub: Education-related



7. DESCRIPTION

Architectural Classification: Other: French Provincial Revival

Materials:

Foundation: STONE

Walls: Weatherboard

Roof: ASPHALT

Other: N/A

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Describe Present and Historic Physical Appearance.**INTRODUCTION**

The University of Wisconsin Dairy Barn (hereafter, Dairy Barn) is located on the campus of the University of Wisconsin in Madison at 1915 Linden Drive. It was erected in three sections (see attached site plan). The original section consists of the three-story, side-gambrelled main barn that dominates the front of the structure (see photo 1); the round, brick silo with its flared, tent roof; the two, front-gambrelled livestock barns set perpendicular and attached to the rear of the main barn; and the front-gabled classroom/stock judging arena wedged between the two livestock barns. The original section was designed by J. T. W. Jennings, then an architect in private practice in Chicago, and built in 1897-98.¹ Elements of the building demonstrate that Jennings was inspired by the rural architecture of Normandy, in northwestern France,² in his design for the Dairy Barn, although the structure is not a fully-developed example of the French Provincial Revival style.

A one and one-half story, side-gambrelled milk house and a front-gambrelled, livestock barn are appended to the east end of the main barn and were constructed in 1916-17 (see photo 2). The plans for these additions, which match the original sections in finish and details, were produced by the office of the State Architect of Wisconsin. At the time, Arthur Peabody was the State Architect. West of the original section is a front-gambrelled litter shed dating to 1909 and designed by Arthur Peabody, then supervising architect of the University of Wisconsin (see photo 3).³ A side-gabled, enclosed passageway joins it to the original section and was erected sometime between 1942 and 1955.⁴

All the livestock barns open into fenced pens behind the complex. The original section and the milk house addition rest on fieldstone rubble foundations. The litter shed and livestock barn additions are set on concrete foundations. All sections are finished with dropped siding; wood shingles appear in the gambrel and gable ends. The roofs are all clad with asphalt shingles, although the 1897-98 section was covered with slate originally.⁵

DESCRIPTION

The Dairy Barn stands south of Linden Drive, overlooking the Dairy Forage Research Center. The Dairy Cattle Instruction and Research Center stands to the east of the Dairy Barn. The Veterinary Medicine Building lies to the west. The tracks of the Chicago, Milwaukee and St. Paul Railroad run just south (to the rear) of the stock pens. Campus Drive, a four-lane divided roadway built c. 1975, lies south of the railroad tracks.

The main barn measures 86 feet (east-west) by 50 feet. Attached to the rear of the main barn are the young livestock barn (west), which measures 70 feet (north-south) by 30 feet; the cow barn (east), 70 feet (north-

¹ W. L. Carlyle, "Description of the New Dairy Barn and Stock-Judging Building," University of Wisconsin, *Fifteenth Annual Report of the Agricultural Experiment Station of the University of Wisconsin*, (Madison: n. p., 1898), p. 269.

² Ibid.

³ Arthur Peabody Papers, Wisconsin Historical Society, Madison, Wisconsin, cited in Holly E. Smith, Susan Haswell and Arnold R. Alanen, "Architecture and Science Associated with the Dairy Barn at the University of Wisconsin-Madison," Prepared for the University of Wisconsin-Madison, 2001, p. 13.

⁴ *Map of Madison*, (Pelham, New York: Sanborn Publishing Company, 1942); and Office of the State Architect, "The Old Dairy Barn," 1955, State of Wisconsin Building Files, Madison, Wisconsin, reproduced in Smith et al, p. 13.

⁵ Jim Feldman, *The Buildings of the University of Wisconsin*, (Madison: University Archives, 1998), p. 86.

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south) by 40 feet; and the classroom/stock judging arena (center), measuring 70 feet (north-south) by 40 feet. The litter shed is 60 feet (north-south) by 35 feet. The milk house measures 40 feet (east-west) by 20 feet. The 1916-17 livestock barn is 70 feet (north-south) by 35 feet.

Exterior

The Dairy Barn faces north. The main barn dominates the north-facing façade (see photo 1). The first story is finished with dropped siding. The second story flares slightly above the first and appears to rest on ornamental projecting beams. The second story is surfaced with wood shingles, arranged in horizontal bands. Above, dropped siding forms a broad cornice. Exposed rafters peek out from beneath the eaves of the side gambrel roof. Originally, a broad, double-gabled dormer, flanked by hip-roofed dormers, perched on the north slope on the roof.⁶ The dormers were removed sometime after 1929.⁷

A front-gabled portico is centered on the north-facing (front) façade of the main barn. The portico exhibits grouped, square posts and is set on a fieldstone rubble base. It is enlivened with carved beams and exposed rafters. Stucco with applied half-timbering, drawn from the rural architecture of Normandy, appears in the gable end. The portico shelters a wagon entrance, now used a loading dock. Originally, a group of three, 9/9, double-hung sash windows appeared at each of the first and second floors on either side of the portico.⁸ East of the portico, the original configuration has been preserved, except that the westernmost first-floor window has been converted into a door. West of the portico, a group of three, small, three-pane windows appear at the first story and no openings are found at the second story. There are no other three-pane windows anywhere in the building and the configuration suggests these windows date from Craftsman era, perhaps c. 1925. Six-pane awning windows can be seen in the basement.

The tall, round, cream brick silo is attached to the northeast corner of the main barn (see photo 2). The silo is set on a fieldstone rubble foundation and topped with an octagonal water tank. The need to include a silo may have inspired Jennings to incorporate elements of the architecture of Normandy; the silo resembles a Norman tower. The silo is that part of the Dairy Barn that shows the greatest Norman influence, with decorative brickwork in contrasting red, windows in the silo and the water tank, the water tank's stucco and applied half-timbering, and the flared, tent roof with exposed rafters. The silo is intact, except that the windows have been boarded up.

Set toward the back of the main barn, but still visible when looking at the north-facing (front) façade, are the 1916-17 milk house and the 1916-17 livestock barn (both to the east), and the 1909 litter shed (to the west). The milk house is clad with dropped siding up to a point just slightly above the first floor windows; wood shingles appear above (see photo 3). The north-facing (front) façade of the milk house displays paired and single, 1/1, double-hung sash symmetrically-place about a central door on the first floor. A broad, shed-roofed wall dormer centered above the door also exhibits a symmetrical pattern of single and paired, 1/1 windows. Three metal vent stacks sit on the roof ridge. Originally, all the first-story windows were full-length; four of the six windows have been reduced.⁹ Also, the door was originally set off-center; the original opening has been converted to hold a window, and a window opening enlarged for the existing door.

⁶ Photograph, 1898, University of Wisconsin Archives, Series 9/3, Madison, Wisconsin.

⁷ Photograph, 1929, University of Wisconsin Archives.

⁸ Photograph, 1898, University of Wisconsin Archives.

⁹ Office of the State Architect, "The Experimental Dairy, University of Wisconsin, Madison, Wisconsin," 1916, State of Wisconsin Building Files, Madison, Wisconsin, reproduced in Smith et al, p. 15.

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On the north-facing (front) façade of the Dairy Barn just west of the milk house, a gabled portico is attached to the main barn. It is partially enclosed with dropped siding and displays a 6/6 window, which originally lighted the bathroom. In 1898, this portico resembled the front-façade portico.¹⁰ The original posts have been removed but the stucco with half-timbering and decorative bargeboard in this portico's gable end can still be seen.

East of the milk house, a small, side-gabled passage connects the milk house to the 1916-17 livestock barn. This passage was part of the 1916-17 addition. The north-facing (front) façade of the passage is finished with dropped siding and shows a pair of 1/1, double-hung sash windows. A door is centered on the first story of the livestock barn, flanked by regularly-distributed, nine-pane hopper windows. Originally, this façade had no door, but rather, a pair of windows was placed in the middle of the first story.¹¹ In the shingled, gambrel end, the original fenestration pattern has been preserved. It consists of two ventilated openings and two, 6/6, double-hung sash windows.

The south-facing (rear) façade of the Dairy Barn consists, moving east to west, of the 1916-17 livestock barn, the milk house, the cow barn, the classroom/stock-judging arena, the young livestock barn and the litter shed. Each is finished with dropped siding at the first story and displays wood shingling above. The 1916-17 livestock barn exhibits three pairs of doors at the first story, a single door and two vented openings in the lower part of the gambrel end, and a pair of doors into the hayloft in the peak of the gambrel end (see photo 4). This is very close to the original configuration, except that two of the three first-floor openings held single doors.¹²

The south-facing (rear) façade of the milk house retains its original appearance (see photo 5).¹³ Two pairs of 1/1 windows appear at the first story. Above, the broad, shed-roofed wall dormer displays a 1/1 window flanked by paired 1/1 windows. The side-gabled passage that joins the milk house with the 1916-17 livestock barn exhibits a pair of 1/1 windows.

On the south-facing (rear) façade of the cow barn, a pair of doors is centered on the first floor (see photo 6). On either side are found a pair of windows and a door. In the gambrel end, hayloft doors are flanked by diminutive, 2/2 windows. The fenestration pattern on this façade is original, but two of the door openings have been reduced and one window has been boarded up.¹⁴

The south-facing (rear) façade of the classroom/stock-judging arena displays a centrally-placed double door flanked on either side by a pair of 8-pane windows (see photo 6). In the lower part of the gable end, a band of six, 12-pane windows appear. In 1898, there were six more multipane windows in the peak of the gable end.¹⁵ These were removed sometime after 1940.¹⁶ Originally, there was a valley between the gable roof of the classroom/stock-judging arena and the barns on either side. The valleys were roofed over sometime after 1940.

The young livestock barn exhibits a centrally-placed door flanked on either side by two window openings on the first floor of its south-facing (rear) façade (see photo 6). Hayloft doors with a small, 2/2 window on either side are found in the gambrel end. This fenestration pattern is original, except that the first floor windows have been boarded up.

¹⁰ Photograph, 1898, University of Wisconsin Archives.

¹¹ Office of the State Architect, "The Experimental Dairy."

¹² Photograph, 1929, University of Wisconsin Archives, Series 9/3.

¹³ Office of the State Architect, "The Experimental Dairy."

¹⁴ Photograph, 1898, University of Wisconsin Archives.

¹⁵ Ibid.

¹⁶ Postcard, c. 1940, University of Wisconsin Archives, Series 9/3.

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The south-facing façade of the litter shed shows two, evenly-spaced garage doors at the first story, and a pair of hayloft doors flanked by diminutive, 1/1 windows in the gambrel end (see photo 6). When the litter shed was completed in 1909, the south- and east-facing facades were open at the first floor.¹⁷ Sometime between 1942 and 1955, those facades were enclosed with dropped siding and a side-gabled, drop-sided passageway constructed between the litter shed and the young livestock barn.¹⁸ A door can be seen on the south-facing façade of this passageway.

The east-facing façade of the main barn displays an irregular fenestration pattern (see photo 2). A door, a loading dock that gives access to an elevator, and a 6/6 window are found at the first story. Four levels of windows appear in the gambrel end; some are 6/6 and others are 8/8 double-hung sash. This configuration is original, except that there was a window where the loading dock is now. The main barn also had a carved bargeboard, which has been removed.

On the east-facing façade of the milk house, a door is set off-center at the first story (see photo 2). A 1/1 and a smaller, 2-pane window are set south of the door. In the gambrel end, a pair of 1/1 windows, a metal door opening onto a fire escape, and another 1/1 window can be seen. A carved bargeboard appears in the gambrel end. The only alterations to this façade are the fire escape and the second-floor door, installed where there once was a window.¹⁹

The east-facing façade of the 1916-17 livestock barn is intact and features a series of regularly-distributed, 9-pane hopper windows (see photo 2). Two, shed-roofed dormers with 8-pane hopper windows sit on the roof. Two metal vent stacks perch on the roof ridge.

A series of evenly-spaced, 4-pane windows, each surmounted by a 2-pane hopper transom are found on the east-facing façade of the cow barn. Originally, each window opening was taller, accommodating a second 4-pane window beneath the first, but the lower windows were removed sometime after 1929.²⁰ When the cow barn was finished in 1898, three shed-roofed dormers perched on the east-facing slope of the roof and a tall, polygonal cupola with a flaring tent roof sat on a shingled base on the roof ridge. This cupola was an ornamental vent stack. Sometime after c. 1940, the dormers were removed and the cupola was replaced with a small metal vent stack.²¹ The shingled base remains.

The west-facing façade of the main barn exhibits a central, double-door entrance flanked by 6/6, double-hung sash at basement level (see photo 3). At the first story, a door surmounted by a 3-pane transom appears at the south end of the façade. A 4-pane window is placed just north of the door. A pair of 9/9 and a pair of 4/4 double-hung sash are irregularly spaced north of the door. A pair of 9/9 windows are centered at the second story. In the gambrel end, broad hayloft doors are flanked on either side by a 12/12 double-hung window. A pair of 9/9 windows are set above the doors. A wide, wood-floored ramp resting on steel and timber trestles originally rose to the hayloft doors. It was rebuilt in concrete and steel in 1923, but removed sometime before 1942.²² A decorative bargeboard enlivened this façade when the main barn was completed in 1898; it was

¹⁷ Postcard, c. 1940, University of Wisconsin Archives.

¹⁸ *Map of Madison*; and Office of the State Architect, "The Old Dairy Barn."

¹⁹ Office of the State Architect, "The Experimental Dairy, University of Wisconsin, Madison."

²⁰ Photograph, 1929, University of Wisconsin Archives.

²¹ Postcard, c. 1940, University of Wisconsin Archives.

²² Office of the State Architect, "Driveway to Dairy Barn," 1923, State of Wisconsin Building Files, Madison, Wisconsin; and *Map of Madison*.

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removed sometime after 1929.²³ The fenestration pattern on the west-facing façade of the main barn is intact, except that the 4/4 windows at the first story are not a part of the original design.

An off-center door and three, small, windows are evenly-spaced on the west-facing façade of the litter shed (see photo 3).

On the west-facing façade of the young livestock barn, 4-pane windows surmounted by 2-pane transoms are regularly distributed. The shed-roofed, enclosed passageway dating from between 1942 and 1955 connects the young livestock barn to the litter shed toward the north end of the façade. This façade originally matched the east-facing façade of the cow barn: a second 4-pane window was found beneath each of the existing 4-pane windows; three shed-roofed dormers rested on the west-facing slope of the roof; and an ornamental vent stack in the form of a tall cupola perched on the shingled base on the roof ridge. The current, small metal vent stack replaced the cupola and the dormers were removed after c. 1940; the bottom windows were taken out sometime after 1929.²⁴ Interestingly, the two bays north of the enclosed passageway retain their bottom windows (see photo 3).

The west-facing façade of the 1916-17 livestock barn is intact and nearly identical to the east-facing façade (see photo 4). A series of 9-pane hopper windows are regularly-distributed along the first story. A door at the south end of the façade opens into the pen. Two shed-roofed dormers with 8-pane hopper windows appear above.

Interior

The Dairy Barn is primarily used for storage at present, although livestock is kept in some of the barns and in the basement. On the interior of main barn, the first floor plan consists of a wide central corridor running north-south, with rooms arranged around it (see attached current floor plans). Originally, a broad hallway running east-west intersected this one (see attached original floor plans). Wagons and livestock could be driven through the corridors. The original, monumental, metal-clad sliding door at the south end of the north-south corridor still provides access into the old classroom/stock-judging arena beyond. Fire doors now separate the east-west corridor from the north-south corridor. In the southwest corner of the north-south corridor, a straight wood staircase in an enclosed stair hall rises to the second floor. Another enclosed stair hall on the east side of the north-south corridor holds a straight wood staircase that descends to the basement. East of the north-south corridor, the plan of the main barn is relatively intact, except that an elevator (installed pre-1955) has been constructed just south of the silo. West of the silo are two small rooms. Originally, these were an office and a bedroom for the herdsman. On the south wall of this section was the feed room. The feedroom has been partitioned into two smaller spaces. In the southeast corner of the main barn were the original milk room and a bathroom; the wall between the two rooms was removed to create an operating room sometime prior to 1955.²⁵

West of the central corridor, the plan of the main barn is also fairly intact. The east-west corridor has been narrowed with partitions that create two additional rooms. A larger room at the south end of this section is intact; it was the hay mow. Another hallway runs south from the east-west corridor, along the west wall of the main barn, and into what was the young stock barn. North of the east-west corridor in the west section, there were three stalls for sick cows; the easternmost of these has been subdivided.

²³ Photograph, 1929, University of Wisconsin Archives.

²⁴ Photograph, 1929, University of Wisconsin Archives; and Postcard, c. 1940, University of Wisconsin Archives.

²⁵ Office of the State Architect, "The Old Dairy Barn."

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The upper floors of the main barn appear to be intact, with a few storage rooms (most designed to hold grain or hay) on the second floor. The basement is divided into two rooms, with stalls in the west end, as it was by the early twentieth century. Sheep currently occupy the basement.

The interiors of the litter shed, the classroom/stock-judging arena, the cow barn and the 1916-17 livestock barn are open, as they were originally. The two barns still house cattle and retain their original stall layouts. The lofts of these barns are also open. Prior to 1955, the young livestock barn was divided into two spaces, as it currently is. A genetics laboratory occupied the north end and animal stalls remained in the south end. The genetics laboratory may have been the site of important advances in cattle breeding.

The layout of the milk house addition is intact. Rooms that were used for weighing, separating and dispensing milk are still in place on the first floor. Six small bedrooms (for students) are arranged along a narrow corridor on the second floor. A straight wood staircase in an enclosed stair hall rises to the second floor along the west wall of the milk house.

The Dairy Barn retains many of its original finishes. In the main barn, wood floors are found throughout, except in the basement, where there is poured concrete. The first floor of the main barn exhibits horizontal board walls, vertical board walls and metal panels on the ceiling. New partitions appear to be drywall or plaster. Above the first floor and in the basement, the walls and ceilings are exposed. Storage rooms above the first floor are enclosed with horizontal boards. The third floor retains the original trap doors through which grain was dropped to the storage rooms.

The 1916-17 livestock barn, the cow barn, the litter shed, the young livestock barn (stall section) and the classroom/stock-judging arena all have concrete floors. The three barns have original metal panels on the walls and ceilings, and the stalls are made of concrete with metal-pipe dividers (see photo 7, interior of the cow barn). The classroom/stock-judging arena has horizontal board walls and an exposed ceiling (see photo 8).

The milk house addition displays terrazzo and brick on the first floor and board flooring above. Plaster coats the walls and ceilings throughout this addition.

ALTERATIONS

The exterior of the Dairy Barn has been altered with the loss of the ramp that led to the third floor, the cupola vent stacks, the dormers, the posts on the main barn's east-facing portico and the main barn's decorative bargeboards. A number of window and door openings have been altered; others have been boarded up. The south and west walls of the litter shed were enclosed, and an enclosed passageway built connecting it to the young livestock barn after 1942. On the interior, the first floor of the main barn has been changed with the installation of fire doors and an elevator and the construction of partitions to create four additional rooms. The first floor of the young livestock barn was divided into two to accommodate a genetics laboratory prior to 1955. All the other floors in the main barn, the second floor (hay loft) of the young livestock barn, and all the other barns and sections of the complex retain the original layout.

Most of the exterior alterations to the Dairy Barn are cosmetic, representing a loss of architectural detail, while the interior changes are confined to the first floor of the main barn and the first floor of the young livestock barn. The Dairy Barn looks very much as it did during the period of significance, 1898-1951, and the significant spaces inside the building, which are the basement, the classroom/stock-judging arena, the genetics laboratory, the young livestock barn, the cow barn and the 1916-17 livestock barn, are intact.

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8. STATEMENT OF SIGNIFICANCE

Certifying official has considered the significance of this property in relation to other properties:
Nationally: X Statewide: Locally:

Applicable National Register Criteria: A X B C D

Criteria Considerations (Exceptions): A B C D E F G

NHL Criteria: 1

NHL Theme(s): VI. Expanding Science and Technology

Areas of Significance: Science

Period(s) of Significance: 1898-1951

Significant Dates: 1897-98, 1909, 1916-17

Significant Person(s): N/A

Cultural Affiliation: N/A

Architect/Builder: Jennings, J. T. W. and Peabody, Arthur

Historic Contexts:

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State Significance of Property, and Justify Criteria, Criteria Considerations, and Areas and Periods of Significance Noted Above.**STATEMENT OF SIGNIFICANCE: SUMMARY**

The University of Wisconsin Dairy Barn is eligible for designation as a National Historic Landmark under Criterion 1, theme VI. Expanding Science and Technology. The Dairy Barn is most significant in science as the site of the "single-grain experiment." Carried out from 1907 to 1911, this cattle feeding study reached far beyond livestock, helping to overturn the prevailing German chemical model of evaluating the nutritional value of foods, and lay the foundation for the emergence of the modern science of nutrition.

The Dairy Barn is also significant in science for the many research and outreach projects and teaching demonstrations conducted there between 1898 and 1951. By applying scientific research and methodology to the practical problems of dairy farmers, many discoveries resulted that were applicable to other fields, demonstrating a pattern of events in technology transfer. These efforts fall into two broad categories: breeding and health.

Practical scientific applications researched, tested and/or taught in the Dairy Barn in breeding involved identifying cattle for selective breeding and tracking cattle pedigrees through the Dairy Herd Improvement Association (1916-1951), and artificial insemination technology (1939-1951). The most important application related to health was the demonstration and teaching of testing techniques for bovine tuberculosis (1898-1908), which led to the eradication of bovine tuberculosis in Wisconsin. Because tuberculosis could be transmitted to humans through ingestion of contaminated milk, bovine tuberculosis was a serious threat to public health. Efforts to identify and eradicate bovine tuberculosis extended beyond cattle, to human beings. Other developments included the refinement of a test for Brucellosis (1912), the use of the diagnostic Johnin in identifying Johnes disease and measures for controlling it (1917), and the discovery of the causes of milk fever (1932-1947).

The period of significance extends from 1898 to 1951, beginning with the year the Dairy Barn was completed and ending with the year the Dairy Herd Improvement Association ceased operation and the University of Wisconsin discontinued its bull stud artificial insemination service. The spaces associated with the Dairy Barn's significance in science include the basement, the classroom/stock-judging arena and the livestock barns. These areas retain a high degree of integrity.

BRIEF HISTORY OF THE CITY OF MADISON

The original plat for the Village of Madison was surveyed for James Duane Doty in 1836. Doty named the village in honor of the fourth president of the United States. Madison grew slowly during its first decade. It was incorporated as a village in 1846 with a population of 626. In 1848, Wisconsin became the 30th state and Madison was named the capital. The same year, the University of Wisconsin was founded. Tremendous growth followed, not only in government and at the university, but in the population in general. When Madison was chartered as a city in 1856, its population was 6,864. By that time, the city's character as a center for government and as a college town was well established. Growth stalled during the Civil War, but boomed during the 1870s as excellent train service helped the city to become a regional commercial center. In the 1880s and 1890s, Madison added another dimension, becoming a manufacturing center. At first, agricultural implements and machine tools were produced by such companies as Fuller and Johnson. In the early twentieth century, the French Battery Company (later known as Ray-o-Vac) and Oscar Mayer were established. The development of a vigorous manufacturing sector and the quadrupling of the student body at the University of

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Wisconsin between 1900 and 1925 were major factors spurring Madison's growth from the seventh largest city in the state in 1910 to the third largest by 1930.²⁶

BRIEF HISTORY OF THE UNIVERSITY OF WISCONSIN COLLEGE OF AGRICULTURE

Through the Morrill Act of 1862, the federal government offered to each a state a land grant of 30,000 acres for each member of Congress, with which to endow an agricultural and mechanical college. The Wisconsin legislature accepted in 1863, receiving 240,000 acres, which were sold quickly, if not profitably. In 1866, the Wisconsin legislature created a position for a professor of agriculture at the University of Wisconsin. The professorship proved difficult to fill, but in 1868, the first appointee, William Willard Daniels, took up his post. By that time, the University had also acquired a 200-acre farm just west of the academic buildings on Bascom and Observatory Hills, much of which is still a part of the University campus.²⁷

In keeping with the theoretical curriculum valued in higher education in the mid-nineteenth century, Professor Daniels devised a three-year agricultural course that included classes in trigonometry, physiology, astronomy, political economy, logic, and aesthetics. The theoretical approach attracted precious few students, but pioneers in the developing dairy industry realized that an agricultural college engaged in problem-solving research could benefit the industry tremendously. They pressed for the inclusion of a farmer on the University's Board of Regents. In 1878, Hiram Smith of Sheboygan was appointed. Smith was a well-respected dairy farmer and an active member of the Wisconsin Dairymen's Association (WDA). The WDA, founded by Hiram Smith, Chester Hazen and other Wisconsin dairy farmers in 1872, directed most of its efforts at marketing Wisconsin's cheese. The organization also did promote improved dairying practices through workshops, called "farmers' institutes," and publications, notably *Hoard's Dairyman*, a highly influential magazine.²⁸

Hiram Smith proved an able spokesman for farmers' interests on the Board of Regents. At Smith's urging, William A. Henry became the University's professor of agriculture in 1880. Henry was born and raised on a farm and had worked his way through college, graduating from Cornell University in botany in 1880 at the age of 30.²⁹

Henry began his career at the University by visiting farmers' clubs, firm in the belief that the University of Wisconsin's Agriculture Department should serve farmers.³⁰ Henry worked closely with Hiram Smith, William Dempster Hoard and the WDA to build close ties with Wisconsin farmers and to conduct research that would solve practical farm problems.³¹

A series of initiatives in the 1880s transformed the Agriculture Department, with its single chair, into a bona fide College of Agriculture. In 1883, the University Experimental Farm was designated the "University of Wisconsin Agricultural Experiment Station," (UWAES), relieving the farm from the expectation that it would

²⁶ David V. Mollenhoff, *Madison: A History of the Formative Years*, (Dubuque: Kendall/Hunt Publishing Company, 1982), excerpted from entire book; and Robert C. Nesbit, *Wisconsin: A History*, (Madison: University of Wisconsin Press, 1973), p. 549.

²⁷ Nesbit, pp. 227 and 289; and Wilbur H. Glover, *Farm and College: The College of Agriculture of the University of Wisconsin: A History*, (Madison: University of Wisconsin Press, 1952), pp. 28-31.

²⁸ Glover, pp. 30-31 and 67.

²⁹ Merle Curti and Vernon Carstensen, *The University of Wisconsin: A History 1848-1925*, (Madison: University of Wisconsin Press, 1949), II:376.

³⁰ Glover, p. 94.

³¹ *Ibid.*, p. 95; and Curti and Carstensen, II:385.

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make a profit. An agricultural chemist and horticulturist joined the staff of the station (station members also served as professors in the Agriculture Department). In 1888, a post in agricultural physics was added; it was the first such position in the country. With the establishment of the UWAES, agricultural research began in earnest at the University of Wisconsin.³²

In 1885, the Agriculture Department expanded its education programs with the creation of the Farmers' Institutes and the Short Course. The Farmers' Institutes carried on the work that the Wisconsin State Agricultural Society had begun (and the WDA had emulated), holding workshops around the state, addressing a variety of practical aspects of farming. These were immediately successful, attracting 50,000 farmers in 1886.³³ The Short Course curriculum was limited to the practical agricultural classes the University offered. These classes were taught on campus during the winter months over a two year period. The Short Course was relatively well-attended, although its popularity was eclipsed by the Dairy Course, with its practical curriculum in cheese making, which was organized in 1890. Both courses were influential, serving as models for similar educational outreach efforts around the country.³⁴

In 1889, the University of Wisconsin College of Agriculture was officially established. William A. Henry, who had been named director of the UWAES in 1888, was appointed the first dean of the college.³⁵ He would hold that post until retiring in 1907. His administration represents the pioneering era in the development of the college. During this era, research and extension (outreach to the farming community) were emphasized and the college gained prominence in dairy science, agricultural physics and horticulture. Dean Henry was extremely successful in securing appropriations from the legislature, expanding the staff, overseeing the construction of eight major buildings and the acquisition of the Hill Farm during his tenure. The building campaign moved the College of Agriculture from South Hall and a handful a farm buildings, to its own campus with a heating plant, four buildings with classrooms as well as laboratories and offices, two large animal barns (including the Dairy Barn that is the subject of this nomination), and a residence for the Dean.³⁶

Harry L. Russell served as dean from 1907 until 1930. Through his efforts, the modern College of Agriculture was established. Under his administration, extension was expanded, research diversified and the teaching program grew steadily with the addition of many new subjects and departments and a large increase in the number of students. Additional avenues of research and teaching included poultry husbandry, agricultural economics, agricultural education, plant pathology, genetics (originally called experimental breeding) and agricultural journalism, among others.³⁷ By the end of Dean Russell's administration in 1930, the University of Wisconsin College of Agriculture had emerged as a modern institution and earned an international reputation for excellence in many fields. The college has maintained outstanding programs in research, teaching and extension into the twenty-first century.

The Dairy Barn was the site of numerous research projects and teaching demonstrations intended to support the state's dairy farmers between 1898 and 1954. By the time the Dairy Barn was built, in fact, dairying had

³² Glover, pp. 96-98 and 111; and Curti and Carstensen, II:380-86.

³³ Glover, pp. 106-08.

³⁴ Ibid., p. 105.

³⁵ Ibid., p. 111.

³⁶ Curti and Carstensen, II:379; and Gordon D. Orr, Jr., "Perspectives of a University, A Survey of the Campus Architectural, Historical, Archaeological and Memorial Resources and Recommendations for Preservation," report prepared for the University of Wisconsin Department of Planning and Construction, February 1978, pp. 65-102.

³⁷ Curti and Carstensen, II:408.

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become an industrialized, year-round enterprise employing scientific methods, due in large part to the practical, problem-solving research and educational outreach efforts of the staff of the University of Wisconsin Agricultural Experiment Station (UWAES) and the College of Agriculture.

When William A. Henry was appointed professor of agriculture in 1880, dairying was well on its way to becoming the leading agricultural pursuit in Wisconsin. Cheese and butter making had largely moved from home production on the farm to “associated” manufacturing, in which many farmers would bring milk to a single factory, increasing profits. The Wisconsin Dairymen’s Association (WDA) had been successful in promoting Wisconsin’s cheese, largely through sponsorship of competitive dairy exhibitions at fairs held around the state, and participation in national expositions. By 1880, the export of Wisconsin cheese had become enormously profitable, despite the fact that dairying was seasonal.³⁸ Cows would go dry during the winter due to lack of adequate feed, so farmers were able to milk only seven or eight months each year. Cheese factories were in business no more than six months a year. Dairy leaders believed winter feeding would enable a year-round milking season, which would increase profits, but knew that scientific research was needed.³⁹

In 1881, William Henry tested the butterfat content in Jersey and Holstein milk as one of the first projects he undertook as the new professor of agriculture at the University of Wisconsin. His study was an effort to identify which specialized breeds of dairy cattle would give the highest quality milk, that is, the milk with the highest butterfat content.⁴⁰ At the time, many dairymen favored dual purpose cattle (for milk and beef), such as the Shorthorn. Advocacy of specialized dairy cows by Henry, W. D. Hoard, and others, combined with continued milk butterfat testing, made the black-and-white Holstein the cow favored by dairymen in Wisconsin by the early twentieth century.⁴¹

The most pressing issues for dairymen during the late nineteenth century involved feeding livestock (what and how much?), improving the quantity and quality of milk, and sheltering livestock and fodder through the winter.⁴² Professor Henry immediately began studying these issues.

In 1881, Professor Henry used his first research budget on four short projects: one dealt with ensilage (storing fodder in a silo so that it could be preserved and used during the winter), two involved livestock feeding, and one tested the fat content of Jersey and Holstein milk.⁴³ Further work by Henry and others at the UWAES would soon demonstrate the value of silos in preserving fodder, and technological advances promoted by the station’s agricultural physicist, Franklin H. King, would change the form of silos from earthen pits to square above-ground structures and finally to the round silo that remains a prominent feature of the rural landscape today.⁴⁴ This work would influence the design of the Dairy Barn, which incorporates a round, masonry silo, as

³⁸ Nesbit, p. 290; Glover, p. 67; and Barbara L. Wyatt, editor, *Cultural Resource Management in Wisconsin*, (Madison: State Historical Society of Wisconsin, 1986), II:10-3.

³⁹ Wyatt, II:10-3 and 10-4.

⁴⁰ Glover, p. 169.

⁴¹ “100 Years of Research: Wisconsin’s Agricultural Experiment Station,” Centennial Celebration booklet prepared by the College of Agricultural and Life Sciences, 24 March 1983, p. 74. Popularity of the Holstein increased through the twentieth century. In 1962, for example, 81 percent of dairy cows in the state were Holsteins.

⁴² Wyatt, II:10-3.

⁴³ Glover, p. 95.

⁴⁴ Wyatt, II:10-4.

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well as King's ventilation system, composed of iron shafts built into the wall and vented through a cupola on the roof.⁴⁵

The two livestock feeding studies Henry conducted in 1881 represent his first attempts to answer the question: what is the best feed for livestock? Years of research by Henry and others would follow, involving not only dairy cows but other livestock as well. All this work had a cumulative effect in improving livestock health and thus the quantity and quality of milk of the dairy herds of Wisconsin.

Henry's 1881 testing of the butterfat content in Jersey and Holstein milk marked the beginning of research at the University directed towards improving the dairy herds of Wisconsin. Henry's first study was an effort to identify which specialized breeds of dairy cattle would give the highest quality milk, that is, the milk with the highest butterfat content. Selective breeding, promoted by the Dairy Herd Improvement Association on the basis of its analysis of the butterfat content of the milk of individual cows, improved production of butterfat per cow in the state.

The Dairy Barn played a role in research and education directed at safeguarding the health of Wisconsin's cattle. A prime example of this was the educational campaign to test the cattle of Wisconsin for tuberculosis. Subsequent research in the Dairy Barn would lead to other health initiatives, including the refinement of a test for brucellosis, the use of the diagnostic Johnin in identifying Johnes disease and measures for controlling it, and discovery of the cause of milk fever.

National Significance: Science

During the 1880s and 1890s, William A. Henry carefully and repeatedly tested a variety of feeds, publishing the results in a number of books, culminating in his seminal reference, *Feeds and Feeding* (1898). This text, "quickly became one of the most widely used texts . . . in the English language."⁴⁶

Henry's book was structured in keeping with the accepted theories of the time. Proposed by German chemist Justus von Liebig and other German scientists, these theories posited, first, that the nutritional quality of feed could be determined by analyzing its chemical composition in terms of protein, carbohydrates and fats (this was called proximate analysis); and second, that feeds with equivalent chemical compositions were equally nutritious.⁴⁷ As Paul de Kruif, whose entertaining account of the single-grain experiment and the events leading up to appears in his book, *Hunger Fighters*, succinctly put it:

[The chemists] said it didn't matter where a cow's food came from, so long as she had the protein to take care of her wear and tear, and enough fat, sugar and starch to give her energy.⁴⁸

Although some of Henry's own research suggests that he did not entirely subscribe to this doctrine of animal feeding, it took the inquiring mind of Stephen M. Babcock to set off the chain of events that would lead to break-throughs in the science of nutrition.⁴⁹

⁴⁵ However, the Dairy Barn's was not an early example of either a round silo or King's ventilation system, as the UWAES had been promoting the round silo since 1890 and King's ventilation system since 1889.

⁴⁶ Curti and Carstensen, II:394.

⁴⁷ Aaron J. Ihde, *Chemistry as Viewed from Bascom's Hill: A History of the Chemistry Department at the University of Wisconsin in Madison*, (Madison: University of Wisconsin Department of Chemistry, 1990), p. 330.

⁴⁸ Paul de Kruif, *Hunger Fighters*, (New York: Harcourt, Brace and Company, 1928), p. 272.

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Stephen Moulton Babcock was raised on a farm in Oneida County, New York. He attended Tufts College and Cornell University, and earned a doctorate in organic chemistry from the University in Göttingen, Germany. Babcock returned in 1881, taking up the post of agricultural chemist at the New York Agricultural Experiment Station in Geneva.⁵⁰ His first assignment there was to apply proximate analysis to feed rations for the dairy cattle at the Geneva station. Babcock was then asked to determine how much of the protein, carbohydrate and fat in the rations the cattle had used, by applying proximate analysis to the cattle's droppings. To his surprise, the chemical composition of the droppings, with the exception of the ash content, was nearly the same as that of the feed. As de Kruif gleefully described it: ". . . what went into those excellent cows was exactly the amount that came out of them!"⁵¹

Babcock tested and re-tested, with the same results. He then reviewed published figures for similar digestion experiments that had been made years before by German chemists and discovered that their results coincided with his. Babcock, who was known for his sense of humor, took his two sets of figures to the director of the Geneva station and asked him which set represented the better feed. As Babcock later reported to de Kruif, the director replied, ". . . one ration looks . . . as good as the other." And he was none too pleased when Babcock explained that one set of figures represented what the cows ate while the other was what they had dropped.⁵²

The results of this study suggested to Babcock not that the German chemists were wrong, but rather that their theory was too simple, that any given plant "must have . . . a hundred chemical compounds, as yet unknown."⁵³ Babcock did not yet imagine that there might be trace elements in foods, the absence of which could have ill effects on the health of living creatures. He did think about investigating what would happen to animals fed on a single kind of plant, but it would be twenty years before he got a chance try his idea.⁵⁴

Although Babcock did not challenge the validity of proximate analysis directly, he did make provocative remarks to other animal feeding experts. At a meeting of agricultural chemists, for example, he observed that, according to proximate analysis, coal should be nutritious. Another substance he suggested should make a good feed was ground leather, which is high in nitrogen (protein).⁵⁵ Babcock's was a lone voice, however, and the German model of chemical analysis was otherwise generally accepted until the single-grain experiment.

Babcock became the agricultural chemist at the UWAES and chair of the University's new Department of Agricultural Chemistry in 1888. He immediately began petitioning William Henry, then director of the station, for permission to conduct a feeding experiment on cows. Henry refused, according to Babcock, on the grounds that feeding was not chemistry and Babcock was a chemist.⁵⁶ Babcock devoted his attention to dairy chemistry, creating the Babcock butter fat test (1890) and working with bacteriologist Harry L. Russell to develop the cold-curing process for ripening cheese (1897). The Babcock butter fat test revolutionized the dairy industry worldwide and the cold-curing process made Wisconsin a leading producer of high-quality cheddar cheese in the United States.⁵⁷

⁴⁹ Glover, pp. 112-13.

⁵⁰ Curti and Carstensen, II:386.

⁵¹ De Kruif, p. 275.

⁵² De Kruif, p. 276.

⁵³ De Kruif, p. 277.

⁵⁴ Ibid.

⁵⁵ Ihde, p. 330.

⁵⁶ De Kruif, p. 280.

⁵⁷ Ihde, p. 329.

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Over the years, Babcock continued to ask Henry to let him try his experiment. He also approached the first UWAES animal husbandman, J. A. Craig, but Craig refused. When W. L. Carlyle replaced Craig in 1897, Babcock found the new professor of animal husbandry more willing to entertain his ideas. Carlyle agreed to Babcock's request to test whether salt was required in the dairy cow's diet, as some farmers believed, or merely a taste preference. Eight of the University's dairy cows continued to get salt in their feed, as they always had. Eight others got no salt and after several months, became sick. When one cow died, Carlyle stopped the experiment and returned the seven ill cows to health by dosing them with salt. Although the experiment was not followed to its conclusion, it clearly demonstrated that salt is essential for health.⁵⁸

In 1901, Henry, then dean of the College of Agriculture, finally consented to Babcock's plan for a single-plant study, provided that Babcock agreed that the single-plant rations would have the proper amounts of protein, carbohydrates and fats, in accordance with the German model and Henry's reference book. Babcock agreed. Carlyle allowed Babcock to proceed, but limited the experiment to two of the University's dairy cows (perhaps because of the results of the salt experiment). One cow was given rolled oats and oat straw, the other got corn. Although Babcock proposed to run the experiment for one year, after three months the oat-fed cow died. Professor Carlyle ended the experiment to save the other cow. In retrospect, Babcock realized that no one had noted exactly how much each cow had eaten, so he could not be sure whether the oat-fed cow had simply starved from not having eaten enough. Babcock didn't publish his experiment, but he was firmly convinced that chemical analysis was not the way to evaluate the nutritional value of a given feed.⁵⁹

Although Babcock continued to believe that more single-plant feeding experiments were essential, he did not have the opportunity to follow up on his first attempt until 1907. In 1906, Babcock hired Edwin B. Hart (1874-1953), a chemist educated at the University of Michigan. Hart had worked at the New York Agricultural Experiment Station for several years and had studied physiological chemistry with Albrecht Kossel in Germany before coming to Wisconsin. Babcock quickly convinced Hart that the German model of chemical analysis was suspect. The two worked with George C. Humphrey, who had replaced Carlyle as professor of animal husbandry, to plan a long-term feeding experiment using single-plant rations but chemically-balanced to ensure that the cows got sufficient protein, carbohydrates and fats as the German model dictated. This became known as the "single-grain experiment."

Hart directed the experiment, Babcock provided ideas and Humphrey oversaw the care and feeding of the animals. Harry Steenbock, then a student in the College of Agriculture, assisted on the project. Hart hired Elmer V. McCollum, an organic chemist, to analyze the rations and the droppings. McCollum, then working with T. B. Osborne at the Connecticut Agricultural Experiment Station, had a bachelor's degree from the University of Kansas and a doctorate from Yale, where he had studied with Lafayette Mendel.⁶⁰ The single-grain experiment began in late May 1907 and ended in 1911. The experiment involved four groups, each with four heifer calves. Three groups were raised and carried through two pregnancies while eating feed from a single grain. One group was fed rations from the wheat plant, "bran, middlings, chaff and straw."⁶¹ The second group ate rations from the oat plant, while the corn plant fed the third group. A mix of the three rations was given to the fourth group.⁶²

⁵⁸ Glover, p. 116.

⁵⁹ De Kruif, pp. 282-83; and Ihde, p. 331.

⁶⁰ "100 Years of Research: Wisconsin's Agricultural Experiment Station," p. 23.

⁶¹ Ihde, p. 335.

⁶² Ihde, pp. 334-335.

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Although all four groups ate well and grew, differences had begun to appear by the end of the first year. While the corn-fed group was very healthy, the other groups were not, especially the wheat-fed animals. All four groups were bred in 1908 and the results were startling. The corn-fed group gave birth to healthy calves. The calves of the mixed-feed and wheat-fed cows were born dead or soon died. Of the oat-fed cows, two calves lived, but neither was healthy. By the time the cows were bred again in 1909, two of the wheat-fed animals had died. The results of the second gestation were even worse; only the calves of the corn-fed mothers survived. In May 1910, the corn-fed cows were shifted to wheat rations and the other cows were switched to corn. The cows fed wheat deteriorated, while those eating corn grew healthy. The cows were bred again and in 1911, the corn-fed mothers, formerly in poor health on other rations, all delivered vigorous calves. The experiment was over. It had clearly showed that feeds that were identical in their proximate analysis, and that therefore, according to the accepted German model, should be equally nutritious, were not equivalent at all. As Babcock had suspected, other nutritional factors, as yet undiscovered, were essential for good health.⁶³

In June 1911, Hart, McCollum, Steenbock and Humphrey jointly published the results of the single-grain experiment in Wisconsin Agricultural Experiment Station Bulletin 17, titled *Physiological Effect on Growth and Reproduction of Rations Balanced from Restricted Sources*. This report stimulated scientists in the United States and Europe to search for the other, as yet unidentified, nutritional factors.

As it happened, a few other researchers had made similar, more limited discoveries. Dr. C. Eijkman, working in the Dutch East Indies, had made a connection between polished rice and beriberi, a neurological disorder, in feeding experiments with chickens. In 1901, Eijkman's collaborator, G. Grijns, theorized that beriberi was caused by the lack of something in polished rice that was present in rice hulls. F. G. Hopkins, at the University of Cambridge in England, hypothesized "an unidentified accessory substance in food,"⁶⁴ as early as 1906, but did not publish this theory until 1912. Casimir Funk, in his work at the Lister Institute in Poland in 1910, had also come to suspect the presence of other nutritional factors. In 1912, Funk coined the term, 'vitamines' to describe these trace organic nutrients, although it was not widely known until Funk published a book on nutrition in 1914.⁶⁵ The single-grain experiment was reinforced by the work of Grijns, Hopkins, Funk and a handful of others and caused a shift in the nutritional paradigm of the day, from the German chemical model, to the modern biological model in which vitamins and minerals are known as essential to good health.⁶⁶

In the U. S. during this time, only researchers at the University of Wisconsin and at Yale University (Connecticut) were pursuing similar ideas. At Yale, T. B. Osborne had been comparing the sulfur content of proteins from different sources since 1900. He had discovered that proteins did not have the same sulfur content, nor the same type of sulfur (being either loosely-bound or firmly-bound). Although Osborne apparently speculated that different proteins might have different nutritive values, he concentrated on cataloging the chemical content of proteins until 1909. That year, Osborne and Lafayette Mendel established a rat colony and began three years of experiments on the effect of a purified diet (one made up of protein from a single source, plus starch and sugar) on rats. Unwittingly, their "purified" diet was contaminated with other

⁶³ Ihde, pp. 335-36; de Kruif, pp. 285-293; "100 Years of Research: Wisconsin's Agricultural Experiment Station," p. 24.

⁶⁴ K. Y. Guggenheim, *Basic Issues of the History of Nutrition*, (Jerusalem: Akademia University Press, 1990), p. 110.

⁶⁵ McCollum, *From Kansas Farm Boy to Scientist: The Autobiography of Elmer Verner McCollum*, (Lawrence, Kansas: University of Kansas Press, 1964), p. 131.

⁶⁶ Elmer V. McCollum, *A History of Nutrition*, (Boston: Houghton-Mifflin Company, 1957), pp. 215-217; and K. Y. Guggenheim, pp. 103-13.

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substances, and their rats thrived. As late as 1913, Osborne and Mendel believed their results upheld the earlier chemical model and that Hopkins' and Funk's theory of accessory substances was mistaken.⁶⁷

At the University of Wisconsin, Elmer V. McCollum had begun a series of studies using rats as an adjunct to the single-grain experiment in January 1908.⁶⁸ He had become discouraged working with cattle, a slow process due to their relatively long maturation. In contrast, rats matured quickly and "had little sentimental and no positive economic value."⁶⁹ McCollum had great difficulty convincing Dean Russell to allow him to work with rats; Russell angrily exclaimed, "The rat is a barnyard pest and should be exterminated."⁷⁰ However, with Babcock's support McCollum was able to secure permission from Hart. Working in his office, first in Agriculture Hall and later in the Agricultural Chemistry Building (now Biochemistry), McCollum and his assistants (notably Marguerite Davis) made several discoveries that identified the properties and effects of two of these nutritional factors. The first factor was discovered in 1913, the second in 1915. In 1916, in a paper written with his graduate student, Cornelia Kennedy, McCollum named these two factors "fat-soluble A" and "water-soluble B." Thus McCollum and the University of Wisconsin Department of Agricultural Chemistry gained international acclaim for the discovery of what came to be known as vitamins A and B.⁷¹ Although McCollum left Wisconsin for Johns Hopkins University in Baltimore in 1917, research by Hart, Steenbock and others at the University of Wisconsin would make significant contributions to the modern science of nutrition.

The single-grain experiment had helped lay the foundation for the emergence of the modern science of nutrition. Hart later asserted that the single-grain experiment had "initiat[ed] a new era . . . [in] the field of nutrition."⁷² In contrast, McCollum stated

All we were able to do was to describe the experiment and the effects on the cows of feeding single-plant rations. We were unable to explain why the animals on the different rations contrasted so strongly in physical development and physiological well-being.⁷³

As Aaron J. Ihde notes in his fascinating and well-documented history of chemistry at the University of Wisconsin, "[the single-grain experiment] revealed the importance of biological analysis through use of living animals as analytical tools of great sensitivity."⁷⁴

In the single-grain experiment, it was not the chemical analysis of the feed and the droppings (ably carried out by McCollum) that showed the inadequacy of the German chemical model for determining the nutritional value of feeds, but rather the animals themselves that proved this, by the state of their health. This experiment was carried out on University dairy cows, housed in the Dairy Barn. The 1911 report clearly states that the cows

⁶⁷ McCollum, *A History of Nutrition*, p. 215.

⁶⁸ McCollum, *From Kansas Farm Boy to Scientist: The Autobiography of Elmer Verner McCollum*, pp. 121 and 131-32. McCollum corresponded with Osborne, his former teacher, telling Osborne about his own experiments with rats. McCollum believed that his letters gave Osborne the idea to pursue studies with rats.

⁶⁹ Ihde, p. 336.

⁷⁰ Ihde, p. 337, as told to Ihde by McCollum, Karl Paul Link and Conrad Elvehjem.

⁷¹ Ihde, pp. 339-342.

⁷² E. B. Hart, "Major Accomplishments in Chemistry in the College of Agriculture During the past 40 years," Madison, undated (typewritten), University of Wisconsin Archives, Biochemistry Department file (Series 9/11), p. 1-2, quoted in Smith et al, p. 23.

⁷³ Elmer V. McCollum, *From Kansas Farm Boy to Scientist: The Autobiography of Elmer Verner McCollum*, p. 127, quoted in Smith et al, p. 24.

⁷⁴ Ihde, p. 342.

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. . .were kept in the fairly well lighted basement of the University dairy barn and allowed outdoor exercise in a vegetation-free paddock during all days that the weather would allow.⁷⁵

Summary of National Significance

The Dairy Barn, as the location where the cows were kept (the site of these experiments), is therefore nationally significant and eligible for designation as a National Historic Landmark under criterion 1, theme VI. Expanding Science and Technology.

The significance of the single-grain experiment extends far beyond its application in cattle feeding. Its findings fundamentally changed theories of nutrition and laid the foundation for modern nutritive sciences. The abandonment of the chemical feed analysis led directly to the discovery of vitamins and minerals, thereby revolutionizing its application in both animals and humans. This seminal event has profoundly affected health science, creating a mechanism by which many diseases and disorders caused by nutritive deficiencies could be isolated, studied and their causes eradicated. The University of Wisconsin Dairy Barn is the resource that best represents this revolutionary study and its broad cultural impact.

The basement of the Dairy Barn is very little altered from the time it was built. Originally, it was divided into two spaces: a storage room (west) and a farm workshop (east). The workshop contained the heating plant and an artesian well from which water was pumped into the tank above the silo.⁷⁶ A 1955 drawing shows the basement as having two spaces. The east space is labeled, "rabbit room." The west space contains 20 cow stalls and several box stalls.⁷⁷ These stalls were not original to the structure but at least some of them must have been in place during the single-grain experiment and may even have been built for the 16 heifers used in the study. Today the stall room looks much the same as it appears on the 1955 drawing, except that sheep currently occupy it. The significant space from the time of the single-grain experiment, then, appears to retain a high degree of integrity.

Breeding

The quantity and quality of milk produced by Wisconsin's dairy cattle increased in the twentieth century. This was largely due to two endeavors: selective breeding and artificial insemination. The scientists of the University of Wisconsin College of Agriculture and the UWAES were leaders in both endeavors.

In the early twentieth century, the College of Agriculture worked with the WDA to record the annual butterfat yield for each cow. The goal was to identify those cows with the highest quality milk, so that they could be bred to bulls that had sired high quality milk cows, and delivered of calves that would mature into cows with still higher quality milk. This was called "selective breeding." In this effort, the College of Agriculture analyzed and kept the records, while the WDA worked with dairymen to organize local testing associations.

⁷⁵ E. B. Hart, E. V. McCollum, H. Steenbock and G. C. Humphrey, *Physiological Effect on Growth and Reproduction of Rations Balanced from Restricted Sources*, University of Wisconsin Agricultural Experiment Station Bulletin No. 17, June 1911, p. 139, as quoted in Smith et al, p. 23.

⁷⁶ Carlyle, p. 281; and Map of Madison, (Pelham, New York: Sanborn Publishing Company, 1908).

⁷⁷ "The Old Dairy Barn," 1955, State of Wisconsin Building Files, Madison, Wisconsin, included in Smith et al, p. 13.

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Each testing association would hire a tester, who would travel from farm to farm, conducting milk fat tests. By 1907, there were 15 testing associations in the state. The number of groups expanded rapidly, reaching 39 in 1915. That year, the milk of 19,000 cows was tested. By 1926, 170 associations had been formed, testing 78,000 cows.⁷⁸

The College of Agriculture's Department of Animal Husbandry took over management of the testing associations from the WDA and began teaching a course on testing techniques in 1916.⁷⁹ An office was provided for this program at the University in 1934; it may have been located in the Dairy Barn. The program was called the Dairy Herd Improvement Association and in addition to testing and recording the butterfat content of milk, the Dairy Herd Improvement Association kept detailed records on cattle breeding (such as pedigrees) and promoted selective breeding to improve the quality of milk produced in the state. The Dairy Herd Improvement Association was very successful. Among those farmers who belonged to the cow-testing associations, the average annual amount of butterfat produced per cow increased from 271 pounds in 1925, to 350 pounds in 1937.⁸⁰

Scientists and researchers at the College of Agriculture made contributions to breeding technology that also improved the quality of the milk produced in Wisconsin. In 1910, Dean Russell and W. D. Hoard, then a member of the University of Wisconsin Board of Regents, established the Department of Experimental Breeding, later called the Department of Genetics. The first project the new department was charged with was to research inheritance in cattle.⁸¹

In 1900, Gregor Mendel's records of breeding experiments carried out with plants (especially peas) were rediscovered, inspiring a new area of scientific study: genetics. In the United States, several university agricultural experiment stations surged to the forefront in researching inheritance, hybridization and experimental breeding. With the exception of the UWAES, all the other agricultural experiment stations worked with plants; only the UWAES studied animals.⁸²

Leon J. Cole, a zoologist by training, was the first professor (as well as the chair) of the University of Wisconsin's new Department of Experimental Breeding. Cole's correspondence suggests that he pursued several lines of research simultaneously, working with pigeons, fruit flies and bees, in a search for broad concepts that might be applied to practical breeding problems.⁸³ Cole investigated cattle inheritance, through cross-breeding, in 1912. The cattle used in this study may have been housed in the Dairy Barn. A massive amount of data was apparently generated from Cole's investigation.⁸⁴

⁷⁸ Glover, pp. 189-90.

⁷⁹ Ibid., p. 191.

⁸⁰ Ibid., p. 192.

⁸¹ Ibid., p. 273.

⁸² Barbara Ann Kimmelman, "A Progressive Era Discipline: Genetics at American Agricultural Colleges and Experiment Stations, 1900-1920," (Ph.D. dissertation, University of Pennsylvania, 1987), pp. 79 and 264.

⁸³ L. J. Cole Papers, Series 9/17/3, University of Wisconsin Archives, Madison. Cole corresponded with geneticists all over the country and the letters reveal the astonishing breadth and innovation of the research going on at the time. For example, in a letter written to an official of the United States Department of Agriculture, Cole concludes with best wishes for the official's success in the introduction of the hippopotamus in the United States, and his confidence that ". . . it will prove a worthy animal."

⁸⁴ However, as late as 1949, the data had not been fully analyzed. Curti and Carstensen, II:418.

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The Department of Animal Husbandry began conducting artificial insemination and reproductive studies in the 1930s. Experimentation in the artificial insemination of domestic animals has a long history, dating as far back as the early fourteenth century, when Arab horse breeders are said to have used the technique. However, it was not until the late nineteenth century that systematic, scientific investigations in artificial breeding were undertaken. The pioneer in this type of research was E. I. Ivanov, a Russian scientist in Moscow. Working with horses, cattle and sheep, Ivanov developed practical methods of artificial insemination (AI) with higher rates of conception than so-called natural service.⁸⁵

The earliest reported use of AI with livestock in the U. S. took place at the University of Oklahoma Agricultural Experiment Station in 1906, involving horses, although anecdotal evidence suggests earlier experimentation in Oklahoma. The first cattle insemination in the U. S. is also thought to have taken place in Oklahoma, in 1907, although the first published reports of the use of AI in cattle date to 1926. That year, Thomas C. Webster, manager of the Fort Steilacoom, Washington dairy herd, began using the technique with dairy cows. Webster took charge of the Winnebago State Hospital herd, just north of Oshkosh, in 1930. Webster and Glenn Householder, who managed the state-owned dairy herds (not including those at the University of Wisconsin), artificially inseminated the state herds beginning in 1930. Very shortly thereafter, the manager of the Pabst Farms dairy herd, Howard Clapp, began using AI in that herd. These were the earliest uses of AI in Wisconsin, and among the earliest officially recorded in the U. S.⁸⁶

In 1937, the University of Missouri (Columbia) became the first college of agriculture in U. S. to experiment with AI. Several other agricultural colleges, including the University of Wisconsin, began shortly thereafter. From this point, AI programs developed in many states. The agricultural colleges provided technical expertise and innovative research (particularly with regard to improved AI techniques and higher conception rates) to the farmer-owned artificial breeding cooperatives, while the cooperatives maintained stud bulls and bred cows as a for-profit enterprise. The first such cooperative was established in New Jersey in 1938. There were 84 cooperatives around the country by 1946.⁸⁷

In Wisconsin, the AI program dates from 1939. That year, three small breeding cooperatives were formed: the Rock County Breeders Cooperative, the Langlade County Breeders Cooperative and the Barron County Breeders Cooperative. The Dairy Herd Improvement Association, located at the University of Wisconsin and associated with the Department of Dairy Husbandry (which had been separated from the Department of Animal Husbandry in 1938), tracked the results of AI in the state. The first year, 3 bulls were bred to 2,000 cows through AI. In 1951, the last year of operation of the Dairy Herd Improvement Association, AI was used to breed 691,208 cows.⁸⁸

From 1940 until 1951, the Department of Dairy Husbandry offered bull stud service to dairy herds in Dane and six surrounding counties. In the final year of the service, some 34,400 cows were bred.⁸⁹ During this time period, researchers in the College of Agriculture made a number of significant technical contributions to AI. In 1939, Paul Phillips and Henry Lardy, of the Department of Biochemistry, developed an egg yolk solution in which bull semen could be stored and which extended the life of the semen. This solution greatly expanded the

⁸⁵ Harry A. Herman, Improving Cattle by the Millions: the Development and Worldwide Application of Artificial Insemination, (Columbia, Missouri: The University of Missouri Press, 1981), pp. 2-3.

⁸⁶ *Ibid.*, pp. 5-6.

⁸⁷ *Ibid.*, pp. 6-7.

⁸⁸ *Ibid.*, p. 324.

⁸⁹ *Ibid.*, p. 326.

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range of each stud bull as well as the number of cows that could be bred per bull.⁹⁰ In 1939, some 2,000 cows were bred through AI in Wisconsin. The following year, Chris L. Christensen, then Dean of the University of Wisconsin College of Agriculture, reported

In the short space of a year since this method was developed, it has been adopted by all of Wisconsin's artificial insemination breeding associations, so that it has already served in the breeding of some 15,000 to 20,000 cows.⁹¹

In the same year, in contrast, each stud bull offered for natural service in the U. S. was bred to an average of 34 cows, while each AI stud bull in the U. S. was bred to an average of 318 cows each year. With the egg yolk solution and other advances, the number of cows bred to each AI bull annually reached 3,600 by 1970.⁹² By extending the life of bull semen for use in AI, one stud bull could have thousands of progeny.

Other research conducted by Phillips, Lardy and others in 1939 and 1940 increased the success rate of AI by identifying the appropriate timing for breeding and by isolating causes of sterility (bulls) and infertility (cows). For example, the researchers discovered that injections of vitamin C boosted the fertility of both bulls and cows.⁹³ The vitamin C research used "animals from several farm herds as well as University animals. . ."⁹⁴ These last animals likely were the cows housed in the Dairy Barn.

In 1940, L. E. Casida, A. Nalbandov and W. Wisnicky, of Genetics, worked with W. H. McShan and R. K. Meyer of Zoology in experiments with hormones. The researchers treated dairy cows with gonadotropic hormones, which resulted in multiple eggs and pregnancies with multiple fetuses.⁹⁵ This investigation likely involved cattle kept in the Dairy Barn. Hormonal studies were continued for many years, eventually leading to the first birth of a calf from an embryo transfer in 1951. Two more followed in 1952. These were the first successful embryo transfers in cattle in the world; embryo transfers had been successful in rabbits, mice, rats and sheep before, but not cows. However, the embryo transfers likely took place on the Emmons Blaine Experimental Farm in Lake Mills, where at least part of the University's dairy herd had been kept since 1947, and where ovulation studies of Holsteins were carried out during the same period and by the same researchers that completed the embryo transfers.⁹⁶

⁹⁰ *What's New in Farm Science: Annual Report of the Director of the Agricultural Experiment Station of the University of Wisconsin, Madison*, (Madison: n. p., December 1940), part 2, p. 38.

⁹¹ John W. Jenkins, *A Centennial History: A History of the College of Agricultural and Life Sciences at the University of Wisconsin – Madison*, (Madison: College of Agricultural and Life Sciences of the University of Wisconsin – Madison, 1991), p. 97.

⁹² Herman, p. 8.

⁹³ *What's New in Farm Science: Annual Report of the Director of the Agricultural Experiment Station of the University of Wisconsin, Madison*, (Madison: n. p., December 1940), part 2, pp. 36-38; and "100 Years of Research: Wisconsin's Agricultural Experiment Station," p. 80.

⁹⁴ *What's New in Farm Science: Annual Report of the Director of the Agricultural Experiment Station of the University of Wisconsin, Madison*, p. 38.

⁹⁵ *What's New in Farm Science: Annual Report of the Director of the Agricultural Experiment Station of the University of Wisconsin, Madison*, p. 41.

⁹⁶ *What's New in Farm Science: Annual Report of the Director of the Agricultural Experiment Station of the University of Wisconsin, Madison*, (Madison: n. p., January 1952), part 1, p. 47; L. E. Casida et al, "A Study of Ovulations in Six Families of Holstein-Friesians," *Journal of Dairy Science*, 35(5), May 1952; and E. L. Willett, P. J. Buckner, and G. L. Larson, "Three Successful Transplantations of Fertilized Bovine Eggs," *Journal of Dairy Science*, 36(5) May 1953.

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Nonetheless, both the selective breeding program and the AI investigations were significant. AI improved the quality and quantity of the milk produced in Wisconsin as much or more than selective breeding had. In 1937, the state's dairy cows produced an average of 350 pounds of butterfat each year. In 1981, this figure had reached 462 pounds of butterfat.⁹⁷ The increase nationwide was even greater, rising from 183 pounds of butterfat per cow annually to 412 pounds per cow in 1978.⁹⁸ Some of the laboratory research may have been conducted in the Dairy Barn, as the 1955 drawing of the Dairy Barn shows a "genetics laboratory" had been constructed in the north end of the young livestock/bull barn. Other laboratory research may have taken place in the Biochemistry Building, or in the old barracks (demolished) that stood behind the Stock Pavilion, where the Department of Dairy Husbandry had laboratory space from 1945 to 1951. In 1951, the department moved to laboratory space in the old creamery in Hiram Smith Hall.⁹⁹ It seems likely that testing of the techniques developed in the laboratory involved cows in the University herd, housed in the Dairy Barn. The significant areas of the Dairy Barn associated with innovations in breeding would be the livestock barns and the genetics laboratory; these areas are intact.

Health

Several efforts directed at improving and safeguarding the health of dairy cattle took place in the Dairy Barn. The first of these was the campaign to test the state's dairy cattle for bovine tuberculosis. Testing techniques were demonstrated and taught in the Dairy Barn classroom/stock-judging arena from 1898 until moving to the Stock Pavilion in 1909. This campaign eventually led to the eradication of bovine tuberculosis in Wisconsin.

In Berlin, scientist Robert Koch discovered the tubercle bacillus in 1882 and developed a test to detect its presence in animals in 1892. At that time, bovine tuberculosis was widespread in Europe, but it did not appear to have arrived in the U. S. Bovine tuberculosis spread from cow to cow by contact of bodily fluids. Frighteningly, it could also be transmitted through milk to calves and to humans, under certain conditions.¹⁰⁰ At this time, tuberculosis was an epidemic disease in humans and was the greatest public health concern of the late nineteenth and early twentieth centuries. Tuberculosis was highly contagious and easily spread in humans through contact with the sputum of infected persons. Treatment was rudimentary and largely ineffective, consisting primarily of isolating those who were infected in a "sanitarium" and treatment through a regimen of fresh air and enforced bed rest. The mortality rate was high, and consequently the discovery of tuberculosis in cattle was a matter of grave concern to public health officials. The first use of the bovine tuberculosis test in the U. S. occurred in 1892 at the University of Pennsylvania Agricultural Experiment Station. The station herd reacted positively, tests of other herds followed and within two years, dairy farmers across the country were in a panic.

Harry L. Russell (1866-1954) became assistant professor of bacteriology at the University of Wisconsin, and bacteriologist at the UWAES, in 1893. Russell, who would later become dean of the College of Agriculture, had graduated from the University of Wisconsin in 1888. He then studied bacteriology in Europe under both Robert Koch and French chemist Louis Pasteur. Russell subsequently earned a doctorate from Johns Hopkins University, finishing in 1892.¹⁰¹

⁹⁷ Ibid., p. 74.

⁹⁸ Herman, p. 14.

⁹⁹ Orr, pp. 89 and 96.

¹⁰⁰ H. L. Russell and E. G. Hastings, *Bovine Tuberculosis in Wisconsin*, University of Wisconsin Agricultural Experiment Station, Bulletin No. 84, March 1901, p. 3.

¹⁰¹ Curti and Carstensen, II:387.

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When Russell came back to Wisconsin, he brought samples of the bovine tuberculosis test that he had gotten from Koch.

In 1894, in front of a class, Russell tried the test on two cows from the University's herd. Unexpectedly, both reacted positively. To confirm the results of the test, the cows were slaughtered. The autopsy found both cows were infected. Russell recommended testing the University's remaining 28 cows. Dean Henry reluctantly consented and the results were astonishing: 25 reacted positively. Russell recommended slaughtering the whole herd to verify the results of the test. With much anguish, Dean Henry agreed. The cows that had tested positive were indeed infected, proving the accuracy of the test.¹⁰²

Russell immediately embarked on campaign to educate dairy farmers about the importance of testing. The first step was the publication of *Tuberculosis and the Tuberculosis Test* (July 1894). Next, Henry oversaw testing demonstrations and post-mortems and taught students in the Short Course how to give the test. Between 1898 and 1908, this was done in the classroom/stock-judging arena in the Dairy Barn. It was a campaign that was to last for many years, because farmers were skeptical that cows that appeared healthy could be harboring tuberculosis. Many were afraid to test, for fear they would have to slaughter their prized livestock. As late as 1901, Russell reported, "only a small percentage of the herds in Wisconsin have yet been tested. . ."¹⁰³ Russell also studied methods that would allow infected animals to be quarantined, so that they could be bred and delivered of healthy calves.¹⁰⁴ Eventually, largely due to Russell's efforts, bovine tuberculosis was eradicated in Wisconsin.¹⁰⁵

Tests for two other diseases affecting cattle were improved or developed at the University of Wisconsin in the early twentieth century and likely involved cows sheltered in the Dairy Barn. In 1912, F. B. Hadley and Burr A. Beach of the Department of Veterinary Science improved the test for Brucellosis (contagious abortion, also called Bang's disease), a condition that occurs in cattle and other livestock. The technical research for this test was carried out in what was the Genetics Building (now Agricultural Journalism).¹⁰⁶

Edwin B. Hastings of the Department of Bacteriology, in cooperation with Hadley and Beach, were the first to use a diagnostic material called Johnin in 1917. Johnin was used in identifying Johnes disease, an infectious and incurable bacterial infection of the lower small intestine that especially affects adult cattle and causes wasting. Hastings, Hadley and Beach later developed methods for controlling the condition.¹⁰⁷ The laboratory work for this project was carried out in Agriculture Hall.¹⁰⁸

"Milk fever," a condition that affects dairy cows, causing them to collapse after calving, was studied over a number of years at the University of Wisconsin. In 1932, E. B. Hart demonstrated that milk fever was associated with a drop in calcium and phosphorus in the cow's blood. In the late 1940s, V. R. Smith and others

¹⁰² Glover, pp. 126-28; and H.L. Russell, *Tuberculosis and the Tuberculosis Test*, University of Wisconsin Agricultural Experiment Station Bulletin No. 40, July 1894, p. 2.

¹⁰³ Russell and Hastings, p. 15.

¹⁰⁴ Glover's description of this work suggests that the quarantine studies did not take place in the Dairy Barn. Glover, p. 128.

¹⁰⁵ *Ihde*, pp. 194-95.

¹⁰⁶ Orr, p. 80; and F. B. Hadley and B. A. Beach, *The Diagnosis of Contagious Abortion in Cattle by Means of the Complement Fixation Test*, University of Wisconsin Agricultural Experiment Station Bulletin No. 24, June 1912.

¹⁰⁷ Glover, p. 323.

¹⁰⁸ Orr, p. 81.

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showed that milk fever was connected to the onset of lactation.¹⁰⁹ The laboratory work for these studies probably was not done in the Dairy Barn.

Although research on Brucellosis, Johnes disease and milk fever occurred in buildings other than the Dairy Barn, it is likely that the barn played a role as the most probably site for the field tests necessary to demonstrate the validity of the tests. This further serves to emphasize the pivotal role of the Dairy Barn in the scientific development of the dairy industry and the importance of the practical application of scientific discoveries in the advancement of animal husbandry.

The significant spaces of the Dairy Barn associated with the health of dairy cattle are the classroom/stock-judging arena, where the demonstrations and teaching of testing for bovine tuberculosis took place, and the livestock barns, where the University herd was housed. These spaces retain very good integrity.

Consequently, the Dairy Barn also has significance to the history of health for the important role in the containment of the spread of tuberculosis. Because human tuberculosis could be spread through contact with contaminated milk, the eradication of bovine tuberculosis was essential to reduce the spread of this deadly disease. Through a vigorous program of educating farmers about the treat of bovine tuberculosis, training people to conduct the tests, and demonstrating the efficacy of tests through autopsy of positive cattle, University of Wisconsin scientists used the Dairy Barn as the locus of a successful campaign that eventually led to the eradication of bovine tuberculosis in Wisconsin and the removal of a major public health threat.

¹⁰⁹ "100 Years of Research: Wisconsin's Agricultural Experiment Station," p. 80.

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9. MAJOR BIBLIOGRAPHICAL REFERENCES

Apps, Jerry. *Cheese: The Making of a Wisconsin Tradition*. Amherst, Wisconsin: Amherst Press, 1998.

Curti, Merle and Vernon Carstensen. *The University of Wisconsin: A History, 1848-1925*. Two volumes. Madison: University of Wisconsin Press, 1949.

Daily Cardinal. (Madison) 1897 and 1898.

De Kruif, Paul. *Hunger Fighters*. New York: Harcourt, Brace and Company, 1928.

Feldman, Jim. *The Buildings of the University of Wisconsin*. Madison: State Historical Society of Wisconsin, 1997.

Glover, Wilbur H. *Farm and College: The College of Agriculture of the University of Wisconsin: A History*. Madison: University of Wisconsin Press, 1952.

Guggenheim, K. Y. *Basic Issues of the History of Nutrition*. Jerusalem: Akademia University Press, 1990.

Hadley, F. B. and B. A. Beach. *The Diagnosis of Contagious Abortion in Cattle by Means of the Complement Fixation Test*. University of Wisconsin Agricultural Experiment Station Bulletin No. 24, June 1912.

Hart, E. B. "Major accomplishments in chemistry in the College of Agriculture During the Past 40 Years." Madison, undated. (Typewritten.)

Hart, E. B., E. V. McCollum, H. Steenbock and G. C. Humphrey. *Physiological Effect on Growth and Reproduction of Rations Balanced from Restricted Sources*. University of Wisconsin Agricultural Experiment Station Bulletin No. 17, June 1911.

Herman, Harry A. *Improving Cattle by the Millions: the Development and Worldwide Application of Artificial Insemination*. Columbia, Missouri: University of Missouri Press, 1981.

Ihde, Aaron J. *Chemistry as Viewed from Bascom's Hill: A History of the Chemistry Department of the University of Wisconsin in Madison*. Madison: University of Wisconsin Department of Chemistry, 1990.

Jenkins, John W. *A Centennial History: A History of the College of Agricultural and Life Sciences at the University of Wisconsin - Madison*. Madison: College of Agricultural and Life Sciences of the University of Wisconsin - Madison, 1991.

Journal of Dairy Science. 1952 and 1953.

Kimmelman, Barbara Ann. "A Progressive Era Discipline: Genetics at American Agricultural Colleges and Experiment Stations, 1900-1920." Ph.D. dissertation, University of Pennsylvania, 1987.

King, Franklin H. *The Construction of Silos*. University of Wisconsin Agricultural Research Bulletin No. 28, July 1891.

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Lampard, Eric E. *The Rise of the Dairy Industry in Wisconsin: A Study in Agricultural Change, 1820-1920*. Madison: State Historical Society of Wisconsin, 1963.

Madison, Wisconsin. State Building Files.

Madison, Wisconsin. University of Wisconsin Archives. L. J. Cole Papers.

Madison, Wisconsin. University of Wisconsin Archives. Series 9/3.

Madison, Wisconsin. Wisconsin Historical Society Archives. Arthur Peabody Papers.

Map of Madison. Pelham, New York: Sanborn Publishing Company, 1908 and 1942.

McCollum, Elmer V. *From Kansas Farm Boy to Scientist: The Autobiography of Elmer Verner McCollum*. Lawrence, Kansas: University of Kansas Press, 1964.

Mollenhoff, David V. *Madison: A History of the Formative Years*. Dubuque: Kendall/Hunt Publishing Company, 1982.

Nesbit, Robert C. *Wisconsin: A History*. Madison: University of Wisconsin Press, 1973.

“100 Years of Research: Wisconsin’s Agricultural Experiment Station.” Centennial celebration booklet prepared by the College of Agricultural and Life Sciences, March 24, 1983.

Orr, Gordon D., Jr. “Perspectives of a University, A Survey of the Campus Architectural, Historical, Archaeological and Memorial Resources and Recommendations for Preservation.” Report prepared for the University of Wisconsin Department of Planning and Construction, February 1978.

Russell, H. L. *Tuberculosis and the Tuberculosis Test*. University of Wisconsin Agricultural Experiment Station Bulletin No. 40, July 1894.

Russell, H. L. and E. G. Hastings. *Bovine Tuberculosis in Wisconsin*. University of Wisconsin Agricultural Experiment Station Bulletin No. 84, March 1901.

Smith, Holly E., Susan Haswell and Arnold R. Alanen. “Architecture and Science Associated with the Dairy Barn at the University of Wisconsin–Madison.” Prepared for the University of Wisconsin-Madison, 2001.

Wisconsin, University of. Agricultural Experiment Station. *Fifteenth Annual Report of the Agricultural Experiment Station of the University of Wisconsin*. Madison: n. p., 1898.

Wyatt, Barbara L., editor. *Cultural Resource Management in Wisconsin*. Three volumes. Madison: State Historical Society of Wisconsin, 1986.

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Previous documentation on file (NPS):

- Preliminary Determination of Individual Listing (36 CFR 67) has been requested.
 Previously Listed in the National Register.
 Previously Determined Eligible by the National Register.
 Designated a National Historic Landmark.
 Recorded by Historic American Buildings Survey: #
 Recorded by Historic American Engineering Record: #

Primary Location of Additional Data:

- State Historic Preservation Office
 Other State Agency
 Federal Agency
 Local Government
 University
 Other (Specify Repository): Wisconsin Historical Society

10. GEOGRAPHICAL DATA

Acreage of Property: 1.8

UTM References: **Zone Easting Northing**
 16 303120 4771720

Verbal Boundary Description:

The general area of this parcel is a rectangle, whose boundaries are lines of convenience enclosing the historic resources associated with the University of Wisconsin Dairy Barn. Beginning at the southeast corner of the intersection of the narrow street (formerly and perhaps presently, Linden Drive) that runs along the north (front) façade of the Dairy Barn and the driveway that runs along the west façade of the Dairy Barn; thence southerly along the east edge of the driveway, and the line of the driveway extended, to the fence that separates the Dairy Barn from the railroad tracks, a distance of about 265 feet; thence easterly along the line of the fence approximately 300 feet; thence northerly along the west edge of the driveway (and the line of the driveway extended) that runs along the east end of the Dairy Barn, a distance of about 265 feet; thence westerly along the north edge of the narrow street that runs along the north (front) façade of the Dairy Barn, a distance of approximately 300 feet to the point of beginning. This parcel encompasses about 1.8 acres.

Boundary Justification:

These boundaries enclose the all the remaining resources historically associated with the University of Wisconsin Dairy Barn.

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