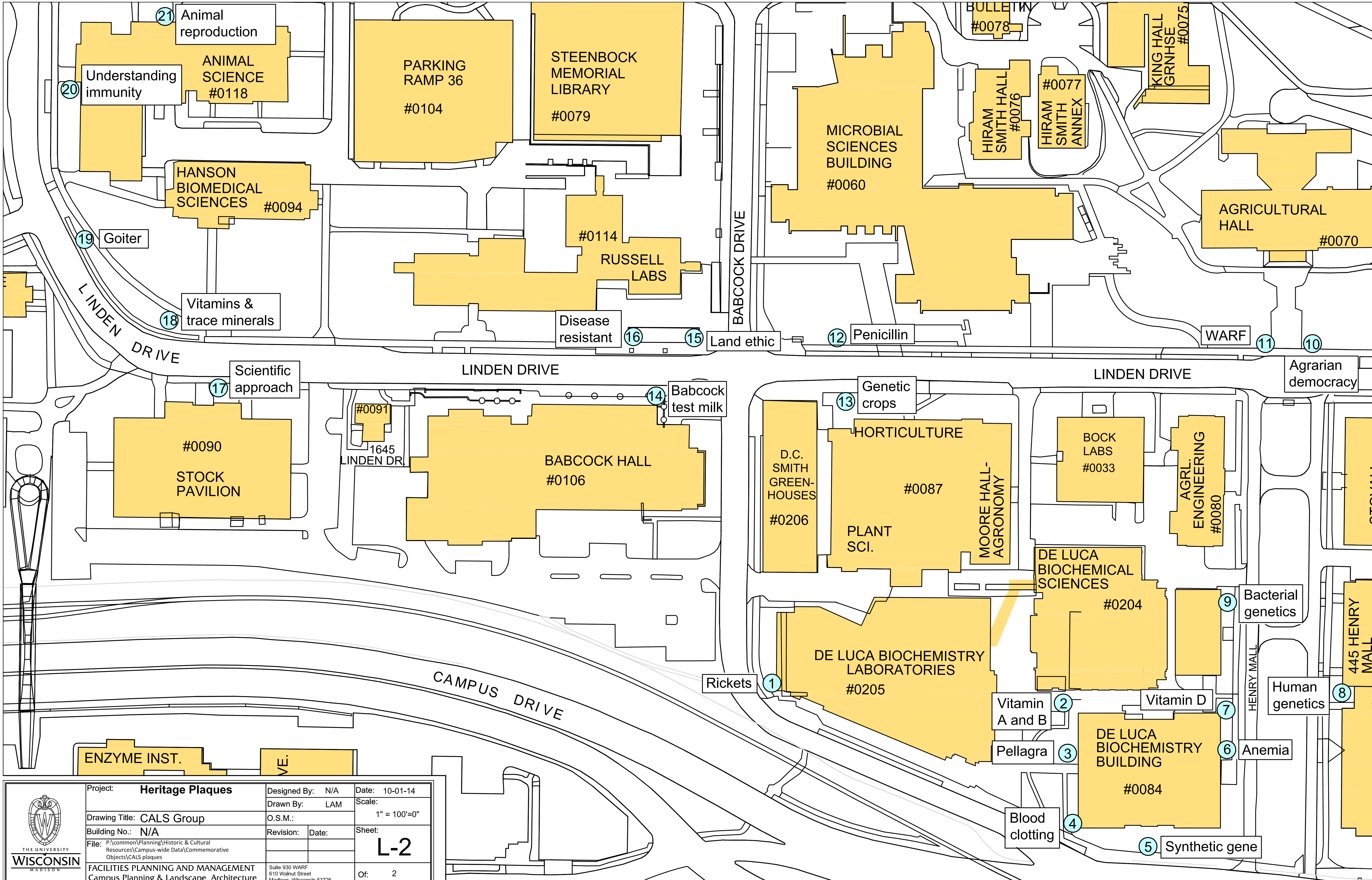

THE UNIVERSITY WISCONSIN MADISON	Project: **Heritage Plaques**	Designed By: N/A	Date: 10-01-14
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	FACILITIES PLANNING AND MANAGEMENT Campus Planning & Landscape Architecture	Suite 930 WARF 610 Walnut Street Madison, Wisconsin 53726	Of: 2

College of Agricultural and Life Sciences Heritage Plaques
March 2016

#	Title	Location	Plaque Text	Send updates to: Daniel Einstein Historic and Cultural Resources Facilities Planning and Mgmt. 265-3417 daniel.einstein@wisc.edu
1	Vitamin D Production Ends Rickets	Southwest corner of Hector F. DeLuca Biochemistry Laboratories (near Babcock Dr. corner)	The discovery of how to produce vitamin D stands as a critical event in the history of vitamin research. In 1924, University of Wisconsin biochemist Harry Steenbock discovered that ultraviolet light converts an inactive material in food to vitamin D. Application of this discovery virtually eliminated rickets, a debilitating bone disease once common among children. Steenbock used the proceeds from his invention to originate and fund the Wisconsin Alumni Research Foundation.	**Harry Steenbock, 1924, irridation and vitamin D, rickets. WARF origins.**
2	Discovery of Vitamins A and B	Southwest of Hector F. DeLuca Biochemical Sciences, (near stairs)	In 1913 University of Wisconsin biochemist Elmer V. McCollum and associates used rats to conduct nutritional studies that led to the discovery of vitamin A in butterfat and cod liver oil. In 1917 his group discovered the vitamin B complex in milk whey. Scientists first named these "fat-soluble factor A" and "water-soluble factor B." Incorporating C. Funk's term of "vital amine," McCollum later named them "vitamin" A and "vitamin" B. This opened the field of nutrition for the identification of all the vitamins, a search completed in the 1940s.	**Elmer McCollum,1913, vitamin A and in butterfat and cod liver oil. 1917 vitamin B in milk whey.**
3	Eliminating Pellagra	West entrance to Hector F. DeLuca Biochemistry Building	Pellagra once was a widespread and often fatal disease that was particularly common where corn was a dietary staple. In 1938, University of Wisconsin biochemists Conrad Elvehjem and Frank Strong isolated and identified the B vitamin, niacin, and demonstrated that pellagra was caused by niacin deficiency. The application of this discovery eliminated pellagra as a significant health problem.	**Conrad Elvehjem and Frank Strong,1938, niacin, pellagra,**
4	Controlling Blood Clotting	Southwest of Hector F. DeLuca Biochemistry, Building (near Babcock Drive)	Through the misfortune of a Wisconsin farmer, biochemist Karl Paul Link and his University of Wisconsin associates were handed the keys to discovery of anticlotting factors. Farmer Ed Carlson in February 1933 brought to Link sweet clover hay that he thought might be involved in the death of his cattle from uncontrollable bleeding. Link and students isolated and identified dicumarol as the anticlotting agent in the spoiled hay. Link, and biochemists Mark Stahmann and M. Ikawa, then synthesized comparable compounds including Warfarin, which is widely used to treat thrombosis and other clotting disorders. It also proved to be a highly effective rodenticide.	**Karl Paul Link, Mark Stahmann and M. Ikawa,1933, anti-clotting, Warfarin. Farmer Ed Carlson provided the sweet clover sample.**

5	First Chemical Synthesis of a Gene	South side of Hector F. DeLuca Biochemistry Building, (near University Drive)	Biochemist Har Gobind Khorana shared the Nobel Prize in Physiology and Medicine in 1968 for research that was essential to understanding how DNA is translated into proteins. His work at the Institute for Enzyme Research completed the puzzle of which particular nucleic acid sequences code for each of the twenty-one amino acids that make up all proteins. He was also the first person to synthesize a gene chemically.	**Har Gobind Khorana shared the Nobel Prize in Physiology and Medicine, 1968. Researched how DNA is translated into proteins and synthesize a gene chemically. Institute for Enzyme Research.**
6	Treatment of Iron Deficiency Anemia	East side of Hector F. DeLuca Biochemistry Building (on Henry Mall)	Biochemists in the 1920s conducted studies leading to improved understanding of the roles of minerals in animal and human diets. University of Wisconsin biochemists E.B. Hart, C.A. Elvehjem, and Harry Steenbock discovered that copper, in addition to iron, is necessary for making hemoglobin, a component of blood that carries oxygen from the lungs to tissues, and carbon dioxide from tissues to lungs. This led to the use of copper to treat iron deficiency anemia.	**E.B. Hart, C.A. Elvehjem, and Harry Steenbock, 1920s, minerals and nutrition, copper and iron to treat anemia,**
7	Living the Wisconsin Idea through Vitamin D	Between Hector F. DeLuca Biochemistry Building and Hector F. DeLuca Biochemical Sciences (on Henry Mall)	Living the Wisconsin Idea through Vitamin D Hector F. DeLuca Biochemical Sciences Complex Early in his career, Hector DeLuca made the landmark discovery that vitamin D is converted to a hormone in the liver and the kidney. His subsequent research on chemical derivatives of hormonal vitamin D generated treatment for multiple diseases as well as substantial support through WARF for research at the University of Wisconsin. As department chair for 30 years, DeLuca worked tirelessly to build one of the strongest Biochemistry departments in the world. His achievements have greatly contributed to the worldwide standing of the University of Wisconsin-Madison in science and medicine.	**Hector DeLuca, vitamin D, achievements, WARF.** The original set of CALS historical markers were installed spring 2001. This plaque was added in 2014.
8	Pioneering Human Genetics	West side 445 Henry Mall/Genetics-Biotechnology Center (on Henry Mall)	While a University of Wisconsin genetics professor from 1960 to 1988, Oliver Smithies pioneered the targeted genetic modification of mouse embryonic stem cells. This discovery led to the development of "knockout" mice, which became an indispensable tool for studying the function of mammalian genes and understanding the root causes of human diseases. His earlier invention of gel electrophoresis also led to numerous molecular biology discoveries, including the sequencing of the human genome. Smithies shared the 2007 Nobel Prize in Physiology and Medicine	**Oliver Smithies, 1960-1988, mammalian genes, sequencing of the human genome. Smithies shared the 2007 Nobel Prize.** The original set of CALS historical markers were installed spring 2001. This plaque was added in 2008.
9	Pioneering Bacterial Genetics	Northeast of Hector F. DeLuca Biochemical Sciences (on Henry Mall)	Geneticist Joshua Lederberg was the first University of Wisconsin faculty member to receive the Nobel Prize. His discovery of conjugation in bacterial cells was a milestone in biology and ushered in the new field of bacterial genetics. Soon, the genetics of the bacterium Escherichia coli became better understood than the genetics of all other organisms. Lederberg also discovered, with graduate student Norton Zinder, that a virus can carry genes from one bacterium to another through a process called "transduction." A man of wide knowledge and many scholarly interests, Lederberg later became president of Rockefeller University.	**Joshua Lederberg first faculty member awarded Nobel Prize, for discovery of conjugation in bacterial cells. New field of bacterial genetics. With graduate student Norton Zinder, discovered virus can carry genes from one bacterium to another.**

10	Forging Agrarian Democracy	Southeast of Ag Hall main stairs (on Linden Dr.)	The modern discipline of agricultural and applied economics owes much to University of Wisconsin scholars Henry C. Taylor and Benjamin H. Hibbard for their seminal work on the economic, political, and social meaning of land ownership. Agricultural economists Kenneth H. Parsons and Raymond J. Penn continued and deepened Wisconsin's commitment to the traditions of land and institutional economics, emphasizing land-use planning and resource policy, public interest in private land, and the role of the family farm. After World War II the philosophies of these agricultural economists helped guide and democratize agrarian and land-tenure policies around the world.	**Henry C. Taylor and Benjamin H. Hibbard. Kenneth H. Parsons and Raymond J. Penn. Agricultural and applied economics. Land-use planning and resource policy.**
11	Wisconsin Alumni Research Foundation	Southwest of Ag Hall main stairs (on Linden Dr.)	The Wisconsin Alumni Research Foundation, incorporated in 1925, was created to make the discoveries of University of Wisconsin scientists available to the public. WARF patents return royalties to the University to support new research. The idea to create WARF came from UW biochemist Harry Steenbock, who had discovered a year earlier that the irradiation of food products would create vitamin D components thus preventing rickets and other bone diseases. Since that time, WARF has returned hundreds of millions of dollars of royalties and investment income to the University for research in all fields. Many academic institutions have now adopted the WARF model for technology transfer.	**Harry Steenbock 1925, creation of WARF. Patents and royalties from irradiation of food products to create vitamin D.**
12	Mass Production of Penicillin	Southeast of Microbial Sciences, Linden Dr. (under swamp white oak tree)	During World War II countless lives were saved through the use of the antibiotic penicillin, a natural product of a mold. However, the drug became widely available only after a method was developed to mass-produce it from a selected and genetically altered strain of the mold. University of Wisconsin bacteriologist Kenneth B. Raper isolated a productive organism, botanist John F. Stauffer genetically modified it, and biochemists William H. Peterson and Marvin Johnson developed submerged fermentation techniques to produce penicillin in quantity. The early wholesale cost of 100,000 units dropped from twenty dollars to three cents by the end of the war.	**Kenneth B. Raper (bacteriologist), John F. Stauffer (botanist), William H. Peterson and Marvin Johnson (biochemists), create method to mass produce penicillin.**
13	Genetically Superior Crops	Northwest of Plant Sciences, (on Linden Drive)	University of Wisconsin geneticist R.A. Brink brought hybrid corn to Wisconsin, releasing the state's first hybrid for production in 1933. Eight years later ninety percent of Wisconsin corn was hybrid. Soon the yield per acre was tripled. Brink also developed a strain of alfalfa that could survive freezing weather. This strain, Vernal, soon became the leading variety in the nation. Throughout his career, Brink remained involved in basic research. His best-known efforts focused on transposable genetic elements, bits of DNA that move from one chromosomal site to another and add to genetic diversity.	**R.A. Brink, 1933, hybrid corn and alfalfa, triples yield/acre.**
14	First Reliable Test of Milk Quality	Northeast of Babcock Hall main entrance on Linden Dr.	A milestone in modern dairying was the development of a simple and accurate measure of the butterfat content of milk. University of Wisconsin biochemist Stephen M. Babcock in 1890 developed the test that made him internationally famous and revolutionized milk production and marketing. The test provided a rational basis of milk evaluation, and prompted better breeding, feeding, and milk production practices. Babcock instructed dairy farmers in the use of the test, which led to the start of the nation's first dairy manufacturing short course.	**Stephen M. Babcock, 1890, butterfat content of milk, biochemist.**
15	The Land Ethic	Southeast of Russell Labs, corner of Babcock and Linden Drives	The ideas of University of Wisconsin ecologist Aldo Leopold provided the intellectual and philosophical foundation for the discipline of wildlife ecology. His 1948 book of essays, A Sand County Almanac, gave form and voice to the land ethic that undergirds modern concepts of environmental sustainability. He fostered the idea that land is more than a commodity, that nature is a human trust, and that there is inherent value in wilderness and wild things. Through his land ethic and by advocating wilderness preservation, Leopold developed a philosophical blueprint for bringing human affairs into greater harmony with the natural world.	**Aldo Leopold, 1948, publishes A Sand County Almanac. Land ethic and wildlife ecology.**

16	Disease-Resistant Plants	South of the main entrance to Russell Labs, on Linden Drive	At the end of the 19th century, a fungal infection called cabbage yellows threatened the entire Wisconsin cabbage crop. University of Wisconsin plant pathologist John C. Walker solved the problem by developing strains of cabbage resistant to the fungus. This was the first of many successful research efforts that later developed disease resistance in onions, potatoes, beans, peas, and cucumbers. Fifty-two of his 101 years of life were devoted to studying plant diseases at the University of Wisconsin.	**John C. Walker (pathologist).late 1800s, cabbage yellows, plant disease resistance.**
17	Scientific Approach to Agriculture	Northeast of Stock Pavilion entry on Linden Drive	In 1893 the College of Agriculture's emerging science-based approach to agriculture was emphatically demonstrated to farmers and Wisconsin citizens by the postmortem verification of a tuberculosis test for cattle. Organized by University of Wisconsin bacteriologist Harry L. Russell, the slaughter of the exceptionally fine University dairy herd verified the accuracy of the test to a doubting audience. Acceptance of the test helped pave the way to control of tuberculosis in animals and humans. Russell, who succeeded William A. Henry as dean in 1907, was known as the "Science Dean" because of his emphasis on research.	**Harry L. Russel (bacteriologist) 1893, tuberculosis test for cattle demonstrated. As dean he emphasized research in ag.**
18	Discovering Vitamins and Trace Minerals	Southwest of Robert P. Hanson Biomedical Sciences Laboratories, near Linden Drive (plant bed)	By feeding diets of single grains to sixteen dairy heifers, University of Wisconsin scientists under the direction of biochemist E.B. Hart in 1907 set the stage for the discovery of vitamins and essential trace minerals. These feeding experiments revealed that micro-components other than fats, proteins, carbohydrates, and salts were necessary for life and reproduction. These missing components were later shown to be vitamins and essential minerals such as iron, copper, and iodine. The single-grain experiments, inspired by biochemist Stephen M. Babcock, changed forever the way scientists viewed diet and nutrition in animals and humans.	**E.B. Hart (biochemist), 1907, single grain experiment, set stage for discovery of vitamins and essential trace minerals. Stephen Babcock inspired experiments.**
19	Preventing Endemic Goiter	Southwest of Robert P. Hanson Biomedical Sciences Laboratories, on Linden Dr. curve	In regions distant from the oceans, goiter once was a common disease of humans and animals. Goiter, manifested through an enlarged thyroid gland, is caused by a deficiency of iodine in the diet. University of Wisconsin biochemists Edwin B. Hart and Harry Steenbock in 1917 confirmed the cause of goiter. In 1939, Hart and his associates developed a process to stabilize added iodine in table salt. This provided an inexpensive and universal means to prevent goiter.	**Edwin B. Hart and Harry Steenbock (biochemists), 1917, identify dietary deficiency of iodine leads to goiter. 1939 Hart and others develop process to add iodine to table salt.**
20	Understanding Immunity	West entrance to Animal Science Building on Linden Dr.	In the mid-1940s University of Wisconsin geneticist Ray Owen noticed a surprising fact about non-identical cattle twins. Each twin had two kinds of blood cells, its own and those of its twin. In ordinary transfusions, such mixing of blood cells often leads to severe immunological reaction. Owen realized that when bloods are exchanged early in development, each twin somehow learns to tolerate the other's cells. This discovery of "immune tolerance" helped to explain how an organism can tell its own cells from foreign ones, and fueled a revolution in immunology. The nature of immune tolerance is central to studies of organ transplantation, cancer, and autoimmune diseases.	**Ray Owen (geneticist), mid-1940s, immune tolerance is central to studies of organ transplantation, cancer, and autoimmune diseases.**
21	Revolutionizing Animal Reproduction	North entrance to Animal Science Building on Observatory Dr.	Techniques of assisted reproduction, particularly of cattle, have revolutionized animal breeding practices worldwide. University of Wisconsin biochemists Henry Lardy and Paul Phillips developed methods for dilution and long-term preservation of sperm. Reproductive biologist Lester E. Casida pioneered studies leading to control of the estrous cycle, ovulation, and oocyte maturation, and conducted the first embryo transfer that resulted in the birth of a calf. This work, conducted from the 1930s to the 1970s, laid the foundation for in-vitro embryo production, cloning, and transgenic production widely used today.	**Henry Lardy and Paul Phillips (biochemists), Lester E. Casida reproductive biologist) work spans 1930-70s. Preservation of sperm, In-vitro embryo production, cloning, and transgenic production.**