Pioneer Science and the Great Plagues

Cheville, Norman F

Published by Purdue University Press

Cheville, Norman F.


Purdue University Press, 2021.

Project MUSE. muse.jhu.edu/book/84018.

For additional information about this book

https://muse.jhu.edu/book/84018
NOTES

PART I. PROLOGUE


3. David H. Fischer, *Champlain’s Dream: The European Founding of North America* (Simon & Schuster, 2008). The plentiful native American tribes of coastal New England had made intimate and often hostile contacts with George Weymouth as he explored and fished in the early 1600s. The French, under Champlain, made three annual trips to New England in 1604–1608. All resulted in hostile skirmishes with dead on both sides and ample opportunity for rats with leptospirosis to move onto land. “Indian disease” appeared soon after these skirmishes and in a few years decimated the tribes in eastern Massachusetts.


The word *veterinary* may have originated from the Latin adjective *veterinarus*; it may have a Celtic origin, from *vieh* (cattle) and *teeren* (to be sick).

6. The first note on a horse in Plymouth was in William Bradford’s *On Plymouth Colony*: On September 8, 1642, sixteen-year-old Thomas Granger, who had been tried and convicted, was hanged for “buggery” with a horse. Invoking Leviticus 20:15, officials killed all the animals and buried them in a pit in the presence of young Tom before he was hanged. It was a brutal time. Fifty years later, the Salem witch trials involved over
two hundred accused of all manner of witchcraft and ended with nineteen executed by hanging and one by being pressed; five died in jail. Some historians have explained the frenetic and agitated behavior of the accused on ergotism—the disease from eating rye and other grains contaminated with a potent fungal toxin that affected the brain.


In the 1700s, books by horse masters appeared in France: *La parfait connaissance des chevaux* by Saunier in 1734; a general anatomy of the horse in 1733 by Captain Sieur de Garsault, horse master to Louis XV; *Le nouveau parfait maréchal* in 1739; and *Elémens de cavalerie* by Guérinière in 1740.


14. Variolation was an ancient procedure reported from India, Turkey, and China (by snorting ground smallpox scabs). Brought to England from Constantinople, it was first recorded in 1721. Variolation was introduced in Boston during the smallpox epidemic of 1721 when the Puritan minister Cotton Mather (who had defended the Salem witch trials) pressed physician Zabdiel Boylston to inoculate people; 287 people received smallpox pustule material and 3 died. Reverend John Williams campaigned against the procedure, citing the Bible (Matthew 9:12 [King James Version]: “They that
be whole need not a physician, but they that are sick”) to support his view that vario-
lolation violated the laws of nature.


16. Edward Jenner was born in 1749 in Berkeley, and at the insistence of his father, the vicar of Berkeley, was variolated as a child. Young Edward was apprenticed at age fourteen to a surgeon in Chipping Sodbury. He earned the MD degree from the University of St. Andrews in 1792.


18. Jenner, *An Inquiry Into the Causes and Effects of the Variolae vaccinæae*, 2, 28, 46, 75. Jenner’s interest in animal diseases did not end with cowpox; he was the first to describe canine distemper and a pox disease of the feet of horses.


Parliament’s Vaccination Act of 1853 mandated compulsory vaccination against smallpox and led to the London Society for the Abolition of Compulsory Vaccination and its journal, the *Vaccination Inquirer*. In 1879, after a visit to New York by England’s leading anti-vaccinationist, the Anti-Vaccination Society of America was founded. Using court battles and demonstrations in state legislatures, anti-vaccinationists succeeded in repealing compulsory vaccination laws in several states, including Illinois, Indiana, Minnesota, and Wisconsin. After smallpox outbreaks in Britain during 1872–1873 and the U.S. in the 1880s, the anti-vaccinationists quietly went underground.

20. O. Charnock Bradley, *History of the Edinburgh Veterinary College* (Edinburgh: Oliver and Boyd, 1923), 14. Christened the Royal (Dick) School of Veterinary Sciences in 1951, Dick’s school is now renowned for its modern academic buildings in the Edinburgh Science Triangle and its ties to cutting-edge science at the Moredun Foundation Laboratories (most recently for the cloning of Dolly the sheep).


22. Dick’s career included an appointment as veterinary surgeon in Scotland for Queen Victoria, serving as editor of a scientific journal, *The Veterinarian*, for twelve years, and providing inspiration for dozens of students. Four other schools arose from the legacy of Professor Dick: James McCall, the first dean at the Glasgow Veterinary
College; Albert E. Mettam, the Royal Veterinary College of Ireland in Dublin; William Williams, the New Veterinary College, a competitor in Edinburgh (that moved to become the veterinary school in Liverpool); and the University of Sydney’s veterinary school through James Douglas Stewart. C. P. Lyman founded the Veterinary Department of Harvard University. Joseph Hughes from the Glasgow Veterinary College with A. H. Baker, a graduate of McGill University, founded the Chicago Veterinary College.

Dick became increasingly cantankerous as he aged, and a ferocious competition with former student John Gamgee led to the establishment of the competitive Edinburgh New Veterinary School. Gamgee was responsible for James Law becoming one of the pioneer veterinarians in the U.S. at Cornell University.


25. Pierre Victor Galtier (1846–1908) was a veterinarian and professor of pathology and infectious diseases at the National Veterinary School of Lyon. He graduated valedictorian of his class in 1873, winning the Grand Prix Bourgelat. Known for his work on immunization of cattle against rabies, Galtier was elected to the Académie Nationale de Médecine in 1901. Asked by the Nobel Prize committee at the Karolinska Institute in Stockholm to submit his records in consideration for nomination for 1908, he died in April and was not nominated.


27. Jean Joseph Henri Toussaint, born in the Vosges area of France, graduated from the Royal Veterinary College in Lyon and accepted a professorship in anatomy, physiology, and zoology at the Toulouse Veterinary School.


30. Adolph Koch (1840–1924), Robert Koch’s older brother, farmed in Keystone, Benton County, Iowa. Educated in agricultural science at the University of Göttingen, he worked as a ranch manager for five years in Uruguay. In 1869 he returned to Germany, then emigrated in 1871 to Iowa, settling on a farm near Luzerne and then in Keystone. Arnold Koch (1847–1922), Robert Koch’s younger brother, lived in St. Louis, Missouri. Mrs. Robert Koch was the actress Hedwig Freiberg and was his second wife.
NOTES TO PART II. FARRIER TO VETERINARIAN

PART II. FARRIER TO VETERINARIAN

1. An act of the Second Continental Congress that created the Continental Army included provision for a quartermaster general to head a department to purchase replacement horses and mules. **Remount** refers to the provision of fresh horses for military purposes to replace those killed or injured in war; the facts were that far more horses died of disease than were killed or injured in battle.


3. The Philadelphia Society for Promoting Agriculture first advocated for veterinary education. Three members, Benjamin Rush, MD, James Mease, MD, and Richard Peters, pursued a formal institution. Judge Peters practiced law and was a reporter for the U.S. Supreme Court. At Belmont, his estate on the Schuylkill River, he entertained Benjamin Franklin and George Washington—both members of the society. Physician Mease published the first record of Texas cattle fever in the U.S., based on his experience with the disease in Pennsylvania. In New England, there were similar moves afoot. The Massachusetts Society for Promoting Agriculture played a role in keeping interest in veterinary science alive.

Robert Jennings, a graduate of the Pennsylvania Medical College, first proposed the idea of a formal veterinary college in Philadelphia and, through the help of two faculty members, secured subscriptions of $40,000. The state legislature of Pennsylvania granted them a charter on April 15, 1852. Jennings, placed at the head of the institution, arranged for a regular course of lectures on veterinary medicine to begin in the fall of 1853. Announcements were circulated, and although inquiries were received, there were no students. In the spring, Jennings accepted the chair of veterinary medicine at the Ohio Agricultural College in Cleveland. When this institution failed in 1857, he returned to Philadelphia and renewed his efforts to establish a veterinary school. For 1859–1860, two students were secured. The Philadelphia Society for Promoting Agriculture granted support and rooms to the Veterinary College of Philadelphia, but the school was suspended in 1866.


10. R. A. Bishop and A. Van Der Valk, “Wetlands,” in *Iowa’s Natural Heritage*, ed. Tom C. Cooper and Nyla S. Hunt (Des Moines: Iowa Natural Heritage Foundation and Iowa Academy of Science, 1982). The tallgrass prairie bridged the Midwest and the Great Plains, extending from northern Illinois through Iowa, Minnesota, and Missouri to the eastern parts of Kansas and Nebraska and down through central Oklahoma to East Texas.


12. Ergot caused ergotism in humans, known as Holy Fire or St. Anthony’s Fire from the burning sensations in the skin in the early stages of gangrene. Hospitals to treat this single disease began in France; Europe had three hundred of these specialty St. Anthony hospitals that operated until 1777. Pharmaceutical companies developed the ergot toxins as arterial constrictors to treat postpartum hemorrhage in humans. In 1918 Arthur Stoll with Sandoz Pharmaceuticals isolated ergotamine, which was effective in treating migraine headaches.


15. F. C. Madison, communicated by K. F. Hensinger, “An Epidemic Among Horses at Fort Randall, Nebraska, 1856,” translated from *Deutsch Zeitschrift für Tiermedizin*, 1877, 101, and published in *American Veterinary Review* 3 (1880), 173–75. This was the first report of selenium toxicity, later called alkali disease, and the only veterinary report noted for twenty years.


Andrew Smith's college affiliated with the University of Toronto in 1897, becoming the Ontario Veterinary College. When Smith retired in 1908, the Ontario government acquired his interest in the college and placed it under the Department of Agriculture and moved it to Guelph in 1922; it became a college in the University of Guelph in 1964.


19. Saunders, “Some Pioneers in Comparative Medicine,” 27. William Osler was born in 1849 at Bond Head, Ontario, at the edge of the great Canadian forest that began a few miles west of Toronto. Influenced early in life by a theologian who was “an ardent naturalist and microscopist,” his changing interests moved him from theology, to natural science, and to medicine — progressing through Trinity College and a small private medical school. After graduating MD, Osler studied in England and then at pathological institutes in Berlin and Vienna. Returning, he wrote: “Virchow himself performs a post-mortem on Monday morning making it with such care and minuteness that three or four hours may elapse before it is finished”; and about Vienna, “it is absolutely painful to attend post-mortems here, they are performed in so slovenly a manner, and so little use is made of the material.” Virchow reinforced Bovell about comparative medicine.


22. The hog cholera outbreak Osler studied was an epizootic in a herd of three hundred pigs near Quebec in 1877. Osler precisely described the clinical disease, gross and histological pathology, and experimental transmission using blood and lymph node plasma and by feeding infected intestines. He wrote that the absence of bacteria in many cases indicated the cause was not bacterial. Despite this, there is no mention of Osler in the current Dunne’s *Diseases of Swine*, which attributes D. E. Salmon and Theobald Smith with first recognizing hog cholera as a distinct disease.


25. Born in Lawrence, Massachusetts, in 1857, Clement was educated in public schools, spent two years at Harvard in a premedical course, and graduated DVS from McGill University Montreal Veterinary College in 1882. After three years with Osler, he left for Europe for two years, spending periods in Berlin with Koch and Virchow, at the Pasteur Institute, and at the veterinary school in Alfort. Returning to Montreal, he left shortly to work in the Johns Hopkins Hospital laboratory and as a consultant with the USDA Bureau of Animal Industry on pleuropneumonia and to author *Veterinary Post-Mortem Examinations*. Socially active in hunt clubs, Clement played critical roles in organizing veterinary laws in Maryland and as an officer in the American Veterinary Medical Association, where he was president in 1897–1898. He died in Johns Hopkins Hospital after five weeks of “complications of disease.” “Obituary: Albert W. Clement,” *American Veterinary Review* 25 (1901): 65 (see editorial, p. 7).


28. Victor-Théodule Daubigny was born in France in 1836 the son of a farmhand, worked in a notarial office in Hérouville, married, and then farmed with his wife’s parents before opening an insurance office. In 1872 he sailed from Liverpool to Quebec, taking a train to Montreal—leaving his wife and four children in France. His wife died in childbirth the next year.


36. When the Civil War ended, William Mayo set up his practice in downtown Rochester, returning periodically to Bellevue Hospital in New York for seminars, surgical demonstrations, and autopsies. His extraordinary dedication in seeking new science and treatments after a destructive tornado in Rochester, and his compact with nuns to use their dormitory buildings for a hospital, were the seminal events in the beginning of one of the great medical institutions of the world.


39. F. Humphreys, *Manual of Dr. F. Humphreys, for the Administration of Medicine and Care of Disease* (New York, 1890), 130.


41. Contagious pleuropneumonia was highly contagious but required cow-to-cow contact. It had first arrived in the U.S. in 1943 in a cow imported on an English ship. Caused by *Mycoplasma mycoides*, a small and delicate primitive bacterium that did not survive in the environment, it succumbed to eradication programs; the last case was in New Jersey in 1892—the first big success in animal disease control of the USDA.


43. Joseph Bushman was commissioned later in the war to serve in the Quartermaster Corps’s horse and mule recruiting facility at Giesboro Depot along the Potomac River. After the war, Bushman lectured on horse diseases; he was the first veterinarian to lecture at the new Kansas State Agricultural College.


50. Williams, “Analogies Between Influenza of Horses and Influenza of Man,” 47.


56. *Second Biennial Report of the Board of Trustees of the State Agricultural College and Farm to the Governor of Iowa, and the Thirteenth General Assembly, January 27, 1868* (Des Moines, 1868).


58. *Third Biennial Report of the Board of Trustees of the State Agricultural College and Farm to the Governor of Iowa, and the Thirteenth General Assembly, January, 1870* (Des Moines, 1870).


62. Illinois Industrial University (now the University of Illinois) established a professorship of veterinary science in 1868 and appointed a graduate of the Royal Veterinary College London, F. W. Prentice, to teach agriculture students. Lectures were on entomology, physiology, and veterinary science. There were weekly horse clinics; sick animals were brought in and treated free of charge.

63. Kansas State Agricultural College originated from a Methodist Episcopal Church effort called Bluemont Central College that opened for classes in 1860. When Kansas was admitted as a state in 1861 and the Morrill Act passed in 1862, the trustees of Bluemont Central College offered their building to the Kansas Legislature. It was christened February 1863 as Kansas State Agricultural College.

64. Student notes from Iowa State University Special Collections and Archives.


66. Northwestern Veterinary College operated in Minneapolis from 1881 to 1890 under the direction of veterinarian C. C. Lyfords; its records have not been found. Complicating the issue is a scam called Northwestern Veterinary College that advertised in Minneapolis in the next century. See N. S. Mayo, “Northwestern Veterinary College,” *American Veterinary Review* 47 (1915): 247.


**PART III. PIONEERING VETERINARY EDUCATION**

1. James Law, “Cornell University and Veterinary Education,” *American Veterinary Review* 1 (1877): 365. Law noted the European outbreak of rinderpest in 1865 had been eliminated in one week by Germany, who had but one-third of the livestock of the U.S. but five state-supported veterinary schools (in Berlin, Hannover, Munich, Dresden, and Stuttgart), while England, with half the livestock of the U.S. and private veterinary schools, took fifteen months of parliamentary dithering at a cost of $40 million. His point was that the U.S. farmers had lost $20 million from hog cholera that year.

2. Louis A. Merillat and Delwin M. Campbell, “Private Veterinary Education,” in

3. “Veterinary Education in New York State,” editorial, American Veterinary Review 47 (1915): 661. New York College of Veterinary Surgeons and American College of Veterinary Surgeons amalgamated and under New York Laws of 1913, chapter 676, became the New York State Veterinary College at New York University. No appropriation was asked, and in the opening session classrooms were provided in the medical school building of New York University.


7. M. Stalker, Correspondence to the editor dated August 5, 1877, American Veterinary Review 1, no. 2 (1877): 257.


10. A Veterinarian, “The Veterinary Department of the University of Iowa and Its Critics,” American Veterinary Review 3 (1880): 408.


12. Liautard retired and returned to France in 1900. His journal continued, but in 1919 the name was changed to Journal of the American Veterinary Medical Association.


State College, 39. For many years Stalker was the state veterinarian and had very close connections to livestock producers. He was responsible for the first Veterinary Practice Act in the state that established educational requirements for practicing veterinary medicine and for the law creating the Office of the State Veterinary Surgeon that was passed in 1884.


20. David Fairchild married Wilhelmina Conrad Tattersall of High Forest, Minnesota, in 1870. Their son, David Sturgis Fairchild Jr., born the next year, graduated from the short-lived Drake Medical College in the Class of 1897 and entered the Army to serve as a brigade surgeon in the Philippines under Douglas MacArthur.


25. Professors Fairchild and Bessey were in the founding group of the Iowa Academy of Science; Bessey was its first president, from 1876 to 1884. At Iowa State, Bessey published an innovative textbook of botany that combined morphology, physiology, and systemic botany using German methods. C. H. Stange credited Bessey with a very large place in the instruction of veterinary students at Iowa State College.


27. Rush Shippen Huidekoper was descended on his father’s side from a Netherlands
immigrant and on his mother’s side from Edward Shippen, the first mayor of Philadelphia. William Shippen, a signer of the Declaration of Independence, was one of the founders of the Medical Department of the University of Pennsylvania. Huidekoper’s impact was national: he was on the faculty of the American Veterinary College and, later, professor of anatomy at the New York College of Veterinary Surgeons. He died in Philadelphia as a result of an operation for pleurisy arising from pneumonia.


29. Norton Strange Townshend was born in Northamptonshire, England, in 1835 and emigrated to Avon, Ohio. He earned the MD at Columbia University in New York City and returned to practice medicine and farm in Ohio. Hired by Adonijah Welch, he moved to Ames, Iowa, in 1869 and left the next year for his farm and to work with the Cleveland Association for the Investigation of Science and Its Application to Industrial Pursuits. His career as professor at Ohio State was from 1873 to 1892; he died in Columbus three years after retiring and was buried in the Protestant Cemetery in Avon.


32. Quoted in Dethloff, “Mark Francis,” 40.


40. Louis Pasteur reported in 1883 that the cause of a French hog disease, *rouget* (he was actually working with hemorrhagic septicemia), was a bacterium and immediately produced a vaccine for the disease—it failed to protect against hog cholera. Two years later, Loeffler reported from Germany the discovery of a bacterium that caused *rouget du porc* (he was dealing with swine erysipelas). Salmon, working with hog cholera, named the disease swine plague, and the bacterium he isolated produced a fatal systemic disease that was not hog cholera (it was today’s salmonellosis).


46. Originally from New England, the Niles family moved to a farm in Marshall County, Iowa, from Rock County, Wisconsin. William finished grade school in a one-room schoolhouse in Edenville. In the winter of 1882–1883, a country school in Eden Township employed him as its teacher. In the spring of 1884, he enrolled in veterinary medicine at Iowa Agricultural College. The next year his younger brother, Edwin Preston Niles, followed.


49. The Board of Trustees of Iowa Agricultural College appropriated $10,000 for two buildings for the “Veterinary Department” on June 18, 1884. A few rods to the southwest of the veterinary hospital, a two-story frame structure was built for basic sciences. Called the Sanitary Building, it was abandoned by veterinarians in 1893 when basic science instruction moved to the third floor of the new Agriculture Hall; for a time, it was the College Hospital and then the Music Building. Both were torn down in 1926 to make way for the Memorial Union.


51. Paul Fischer was educated at The Ohio State University; he was awarded the B.Agr degree in 1891 and an MVD in 1892. Fischer was an assistant to Detmers after graduation and instructor in veterinary anatomy and surgery. He visited veterinary schools in Hannover, Berlin, and Dresden and spent three months in the bacteriology laboratory of Robert Koch. Fischer returned to Ohio to teach bacteriology and horseshoeing. In 1895 he moved to Utah as professor of agriculture and veterinary science at the State Agricultural College in Logan.


55. Wilbert Harriman was also the coach of the Iowa State Agricultural College baseball team. In the fall of 1892 when the baseball season was over, the team looked for new outlets and, settling on the new rugby football that had become popular in the East, they organized a group of “elevens.” On November 3, 1892, the Iowa State Agricultural College held its first organized football game. The opponent was tiny State Centre. “The I.A.C.-State Centre game was very enthusiastic,” the Ames Intelligencer reported, and there had been “bruises and bloody noses.” The game ended in a 6–6 tie.


57. Pammel and Stalker produced a bulletin on disease in livestock caused by *Crota-ularia* species of plants. Rattle weed contained several pyrrolizidine alkaloids that attacked the liver to cause locoism. The disease was confusing because liver damage was delayed; it was sometimes weeks before signs of liver failure appeared. Horses would become progressively dull and wasted as products of dying liver cells accumulated in the bloodstream and were being deposited in the eyes and brain—yellow in the whites of the eyes, and head pressing, a sign of “hepatic encephalopathy” as bilirubin passed into the brain.
58. As quoted in Stange, *History of Veterinary Medicine at Iowa State College*, 16.

62. The Bureau of Animal Industry had a critical interest in veterinary education. As no one regulated scientific competences in veterinary schools, the BAI assumed a role as a federal regulator of veterinary education in 1884, the same year it placed veterinary inspectors in the Civil Service System. To be eligible for employment, the applicant had to be a graduate of a veterinary college that satisfied the requirements for curriculum set out by the BAI. The program continued until 1961, when it was given to the American Veterinary Medical Association.


64. The National Veterinary College continued to operate as the veterinary department of Columbian University, and then as the George Washington University (the renamed Columbian University) School of Veterinary Medicine. It ceased operations altogether in 1918 when the secretary of agriculture forbade federal veterinarians from teaching in veterinary schools in the District of Columbia. Salmon retired from the BAI in 1905 and spent six years as the director of the Veterinary School of the University of Montevideo in Uruguay. He died on August 30, 1914, in Butte, Montana.


67. Historical records, so dedicated to names and places, are strangely blank for this time. The faculty list for 1900–1901 shows McNeil and Klein as professors, Stalker only as a “lecturer” with no dean identified. Stalker appeared as lecturer until 1908–1909, when he disappears from the list, and Stange is listed as professor and dean.

68. In his later life, true to his Quaker heritage, Stalker was known as a philanthropist, philosopher, and peace activist. In the *Des Moines Mail and Times* of August 18, 1906, Alice Carey Wight editorialized in a full-page piece with the headline “Dr. Stalker’s Work for Peace” and the subheading “The Distinguished Man Who Has Contributed to
the International Peace Conference and the Lake Mohonk Meeting Going to Milan, Italy Next." Stalker had attended and spoken at an International Council of Peace Conference in Luzerne. When home, he brought to the Iowa Legislature a resolution, passed by both houses, as an expression of the people of Iowa, upholding President Roosevelt in his appointment of three members to The Hague Tribune. Only one other state, Massachusetts, had done so. As a result of his work, Stalker had been invited to the Fourteenth Annual Arbitration Conference at Lake Mohonk, New York, and then to the peace conference in Milan.


PART IV. LIVESTOCK AND VETERINARIANS GO WEST


4. The Missouri Valley Veterinary Association offices were in Leavenworth, Kansas. The founding president, Sesco Stewart, dean of the Kansas City Veterinary College, was an 1885 Iowa Agricultural College graduate and in 1902 the first president of the AVMA from west of the Mississippi River.


6. In 1865, the Union Stock Yard and Transit Company had converted marshland in South Chicago to a massive stockyard, and similar companies were being built in
Kansas City, Omaha, Denver, and Fort Worth. By the end of the Civil War, five railroads had been constructed into Chicago. Coupled with closure of the north-south transport of livestock on the Mississippi River during the Civil War, the railway expansion provided new opportunities and routes to eastern markets for produce of midwestern farmers.


H. W. Wiley studied medicine at Indiana Medical College and chemistry at Harvard, then became the first chemistry professor at Purdue University in 1876. In 1881 he began investigating food purity at the request of the Indiana State Board of Health and revealed that 90 percent of maple syrup bottles were fakes, that honey was diluted sugars, and that some beekeepers were not even keeping bees. Political pressure from beekeepers caused Purdue trustees to discipline Wiley, and he left to become chief of the USDA’s Division of Chemistry in 1883.


14. Twenty-Third Biennial Report of the Iowa State College of Agriculture and Mechanic Arts Made to the Governor of Iowa for the Biennial Period July 1, 1906 to June 30, 1908 (Des Moines, 1908), 18.


16. Leonard Pearson was born in Elkhart, Indiana, on August 17, 1868, of parents with Puritan ancestry. His two brothers were highly successful: Edward was a civil engineer and president of the New York, New Haven and Hartford Railroad and Raymond
was president of the University of Maryland; there were two sisters, Anna and Julia.

17. Richard Compton, *A Legacy for Tomorrow, 1885–1985: The 100 Year History of the College of Veterinary Medicine at The Ohio State University* (Columbus: The Ohio State University, 1984).


21. Charles Aileen Cary graduated from Iowa Agricultural College (BS in agriculture, 1885; DVM, 1887). He practiced veterinary medicine in Keokuk, Iowa, and served as assistant Iowa state veterinarian. Cary was appointed professor at South Dakota Agricultural College in Brookings in 1889 and moved to Auburn in 1892 to be the first professor of veterinary science at Alabama Agricultural and Mechanical College. Short periods of study were spent at the University of Missouri with Paquin in 1890 and at the Koch laboratories in Berlin in 1892.

22. D. Salmon, “Foot-and-Mouth Disease,” in *Nineteenth Annual Report of the Bureau of Animal Industry for the Year 1902* (Washington, DC: U.S. Department of Agriculture), 391. First recognized in the U.S. in 1838, foot-and-mouth disease had continued with “more or less” prevalence until 1886, when it disappeared only to be reintroduced in 1894 and again in 1896. The economic impact was severe, with local quarantines and international bans on trade with affected areas.

23. Marion Dorset had graduated from the University of Tennessee in 1893 and had earned an MD degree earned in 1896 by taking night classes from George Washington University. He accepted a position with the Bureau of Animal Industry and had worked on the biology and chemistry of the tuberculosis bacillus.


28. The Iowa State Biological Laboratory report for 1915 on the conference held at Iowa State College for the purpose of implementing the new serum and virus method shows BAI chief Alonzo E. Melvin as chairman. In attendance were Drs. Niles and Dorset; faculty members C. F. Curtiss, the dean of Agriculture, and C. H. Stange, dean and director of the Iowa Experiment Station in Ames; former dean John H. McNeil from Trenton, New Jersey; and concerned veterinarians throughout the country. The attendance list read like a Who’s Who of veterinary science in land grant colleges of the Midwest: F. S. Schoenleber, Kansas; A. T. Peters, Nebraska; J. W. Conaway, Missouri; M. H. Reynolds, Minnesota; R. A. Craig, Purdue; C. E. Marshall, Michigan; Paul Fischer, Ohio; and R. R. Dinwiddie, Arkansas. A hot topic at the meeting dealt with checks for antiserum purity.


31. The U.S. Department of Agriculture committee to investigate veterinary schools was A. M Farrington, Bureau of Animal Industry; Paul Fischer, Ohio state veterinarian; Joseph Hughes, Chicago Veterinary College president; R. P. Lyman, AVMA secretary; and Tait Butler, North Carolina state veterinarian. The committee classified schools as Class A: Chicago Veterinary College, Indiana Veterinary College, Iowa State, Kansas State, Kansas City Veterinary College, New York-American, New York State, Ohio State, San Francisco, Washington State, and Pennsylvania; Class B: Cincinnati, Grand Rapids, McKillip, United States; Class C: Colorado State, Ontario, St. Joseph, and Western.

32. Stange had been born in Cedar County, where he had gone to German grade school and graduated from Lowden High School in 1896; he graduated from Iowa State with his DVM in 1907.


34. Richard P. Lyman (ed.), Proceedings of the American Veterinary Medical Association (Lansing, MI, 1911), 99.


37. Correspondence: Crocker to Benbrook: 1918. E. A. Benbrook papers collection, Iowa State University Library Special Collections.
38. Stange, *History of Veterinary Medicine at Iowa State College*, 28. Academic departments established in 1912 at Iowa State College: Murphy was head of Anatomy and Histology, with two senior assistants; Dimock of Pathology and Bacteriology, assisted by Murray and two senior students; Bemis of Surgery and Obstetrics, assisted by Nelson; and Bergman of Physiology and Pharmacology, assisted by Judisch. Stange would be head of the Department of Practice and, by virtue of being dean, would be head of the veterinary section of the Iowa Agricultural Experiment Station. The list of veterinary colleges accredited by the USDA Bureau of Animal Industry (and approved for civil service examination) included eight state-supported schools in Alabama, Colorado, Iowa, Kansas, New York (at Cornell), Ohio, Pennsylvania, and Washington. The eight private schools approved were in Chicago (Chicago and McKillip Veterinary Colleges), Cincinnati, Grand Rapids, Indianapolis, Kansas City, New York (New York-American Veterinary College), and San Francisco.

39. “William Wallace Dimock, 1880–1953,” editorial, *Journal of the American Veterinary Medical Association* 123 (1953): 353. William Dimock was born in Tolland, Connecticut, received the BS degree in agriculture from the University of Connecticut and the DVM from Cornell University. He spent four years in Cuba at the National Cuba Experiment Station and was granted an honorary DVM degree by the University of Havana in 1908 and made honorary professor there in 1944. Dimock was president of the AVMA and a member of the American Association for the Advancement of Science.

40. Correspondence: Crocker to Benbrook: 1918.

41. Correspondence: Crocker to Benbrook: 1918.

42. Edward A. Benbrook was born in South Orange, New Jersey, in 1892 and graduated from high school there. Awarded the VMD degree from the University of Pennsylvania in 1914, he remained as an instructor in veterinary pathology for one year, being mentored by Crocker, and then accepted a position to teach veterinary science to agriculture students at Oklahoma A&M College. He was to work to establish a veterinary school, but despite his effort, the Bureau of Animal Industry did not issue Oklahoma A&M a permit to grant the DVM degree and start a veterinary a school.


German agents were involved in agroterrorism in other countries. Dilger’s boss, Captain Rudolf Nadolny, shipped anthrax and glanders organisms to the German embassy in Bucharest for Bulgarian agents who were collaborating with Germans to infect animals in Romania (bound for Russia), a program that ended in 1916 when Romania declared war on Austria-Hungary. To disrupt Norwegian reindeer from ferrying British supplies across northern Norway to Russia, German agents attempted to attack with bioweapons. Other attacks were planned for Spain, Argentina, and Romania.


48. When Dean Stange established the Department of Veterinary Investigation, the plan was to build a new research unit on the open southwest segment of the new Veterinary Quadrangle, the only space left unconstructed when the quad was built. But there was no money in the budget, and Schern was given rooms in the basement of the southeast unit, the Veterinary Physiology Building.

49. Stange, *History of Veterinary Medicine at Iowa State College*, 34.


51. After the war the Army Veterinary Service Laboratory was moved to Washington, D.C., as part of the Army Medical School and given permanency as the U.S. Army Veterinary Laboratory. The School for Meat and Dairy Inspectors in Chicago had trained eighty-two veterinary officers and ninety-six enlisted men. It was not disbanded as other military schools were demobilized but continued to instruct veterinarians in the Regular Army. Moved to Washington, D.C., as the Army Veterinary School, it became part of the Army Medical Center.

**PART V. ASCENDANCE**

1. The National Veterinary College changed names in 1896 when it merged with Columbian University (which changed its name to George Washington University), but ceased operations in 1898. The George Washington University School of Veterinary Medicine opened in 1908 but closed in 1918.

314 **NOTES TO PART V. ASCENDANCE**

*Medical Association* 13 (1922): 537. In the fall session of 1921, there were 975 students enrolled in the BAI-approved veterinary schools in the U.S. and Canada. Schools established in the previous century had high numbers: Ontario, 88; Iowa, 94; Ohio, 106; Pennsylvania, 30; New York State at Cornell, 75; and New York State at New York University, 23. The newer state veterinary schools were lower: Colorado, 82; Georgia, 21; Kansas, 71; Michigan, 21; Texas, 14; and Washington State, 23. The three agricultural colleges offering a two-year veterinary medicine program and a degree were in the single digits: North Carolina, 0; North Dakota, 6; and Oklahoma, 4. Two private schools had increased numbers by accepting students from private schools that had closed: Indiana, 137; and St. Joseph in Missouri, 102.


8. C. H. Stange, *History of Veterinary Medicine at Iowa State College* (Ames: Iowa State College, 1929), 87. The first use of tuberculin to diagnose tuberculosis in Iowa cattle was done by Niles on the McHenry farm in Denison. The test was based on a rise in body temperature in infected cattle as a response to the subcutaneous injection of tuberculin. A bulletin on bovine tuberculosis published in 1895 by Stalker and Niles emphasized the importance that milk could “convey the disease to humans.” Niles includes his records of the test on fifty herds in Black Hawk, Kossuth, Story, Boone, Page, Harrison, Sac, Wapello, and Floyd Counties.

9. Carl Frank Schlotthauer was a pioneer in laboratory animal medicine, the first to hold an academic professor position in the discipline. On October 21, 1959, Schlotthauer was accidentally shot and killed while hunting duck with his best friend and neighbor,


14. In 1931, physician Richard E. Shope published a paper in the *Journal of Experimental Medicine* from the Rockefeller Institute showing that a combination of a virus and bacteria produced swine influenza. The discovery spurred the search for a human influenza virus at Britain’s National Institute for Medical Research, where two experienced virologists, Smith and Andrewes, using nasal washings and gargling fluids from sick patients, inoculated several animal species — mice, rats, guinea pigs, pigs, horses, and monkeys — without reproducing disease. Failing, they turned to Laidlaw and Dunkin’s ferret model. Andrewes had caught influenza, and Smith dripped his nasal material into two ferrets, which developed influenza. Their report of the discovery of human influenza virus on July 8, 1933, in the *Lancet* was sensational. Mice were used worldwide in 1934 to work with influenza, and in 1940 the virus was shown to grow in chick embryos. In 1947 the National Institute of Medical Research was designated a World Influenza Center by the World Health Organization.

15. Interferon was discovered by Alick Isaacs and Jean Lindenmann in 1957 at Mill Hill. Working with chemist D. C. Burke and electron microscopist Robin Valentine, they discovered that heat-inactivated influenza virus, when placed on membranes of the chick embryo, induced an interfering protein that spread to and protected normal cells.


17. Karl Friedrich Meyer earned his veterinary degree from the University of Zurich in 1909, taught pathology at the University of Pennsylvania for three years, and was a
scientist at the University of California (both Berkeley and San Francisco) from 1914 to 1974, where he played a major role in the School of Public Health. He grouped the abortion-causing bacilli together, naming the new genus *Brucella* after his friend Bruce.

18. K. F. Meyer, B. Eddie, and I. M. Stevens, “Recent Studies on Psittacosis,” *American Journal of Public Health* 25 no. 5 (1935): 571, https://doi.org/0.2105/ajph.25.5.571. Meyer’s studies on epidemiology showed that the disease could be carried by canaries, finches, and other pet birds. The causal agent was independently identified by scientists in England, Germany, and the U.S. and was so small it was thought to be a virus. Meyer persisted in studies, discovering that the causative agent grew in embryonating chicken eggs and was a tiny bacterium now termed *Chlamydia psittaci*.

19. The Hygienic Laboratory of the U.S. Public Health Service began as a bacteriology laboratory to support infectious diseases in the Marine Hospital Service in 1887. (The Marine Hospital Service became the Public Health Service in 1912).

20. Veterinary faculty, Iowa State College, 1929 (fall). Two sources have identified the figures as follows. Front row (*left to right*): David F. Anderson, pharmacist; H. L. Foust, Anatomy; E. A. Benbrook, Pathology and Bacteriology; H. H. Dukes, Physiology and Pharmacology; I. A. Merchant, Pathology and Bacteriology; F. E. Walsh, Medicine; Paul F. K. Purwin, Veterinary Investigation; S. H. McNutt, Veterinary Investigation; C. D. Lee, Diagnostic Laboratory (Pathology). Back row (*left to right*): M. A. Emmerson, Anatomy; C. H. Covault, Medicine; W. A. Aitken, Surgery; H. E. Biester, Veterinary Investigation; C. D. Rice, Pathology and Bacteriology; W. H. Chivers, Surgery; C. H. Stange, dean; Charles Murray, Veterinary Investigation; H. D. Bergman, Physiology and Pharmacology; F. D. Patterson Jr., Veterinary Investigation; W. F. Guard, Surgery. Absent: Dixon, Fowler, Schwarte, Sloss.

21. Ival Merchant was awarded the PhD degree in veterinary bacteriology in 1933 under the direction of D. Charles Murray; the title of his thesis was *A Study of the Corynebacteria Associated With Diseases of Domestic Animals*. Spending the school year of 1933–1934 at Yale University in the College of Medicine’s School of Public Health, he received the CPH degree. Returning to Iowa State, he was promoted to associate professor, and on the retirement of Dean Murray in 1943 he was made professor and head of the Department of Veterinary Hygiene. Merchant played important leadership roles in veterinary public health. He was an organizing member of the National Board of Veterinary Public Health and chairman of its Committee on Education.

22. One herd, which had been sold surreptitiously, was found west of Moscow, in Muscatine County, and was tested promptly. Throughout the day, after the arrest,
farmers submitted their herds to the test without offering opposition to the National Guardsmen. Lenker was charged with selling cattle that were under quarantine, and with contempt. Although there were other farm blockades, sanity started to prevail.


24. “Iowa Basic Sciences,” Edward Antony Benbrook Papers, RS 14/7/12, Special Collections Department, Iowa State University Library.

25. Lea Rosson Delong, *Christian Petersen, Sculptor* (Ames: Iowa State University Press, 2000), 47–48. Campus sculptor Christian Petersen’s proposal was for a large continuous bas-relief depicting progress in veterinary medicine. From his notes the scenes depicted the following: inspection of a cow for foot-and-mouth disease; small-pox vaccine—two figures kneeling over a calf turned on its back to extract vaccinia fluids from its underside; a dominant panel depicting a man overpowering an animal, an incarnation of the centaurs on the pediments of the Parthenon—representing “protection of the human through the production of diphtheria and tetanus antitoxin from the blood of the horse”; men vaccinating a hog against hog cholera. The final scene depicts surgery on a dog, representing research on animals leading to medicine for humans and animals: “the protection of both humans and animals with rabies vaccine prepared from the spinal cord of rabbits and sheep; at extreme right a scientist making a microscopic examination of the brain for rabies.”


and first president of the American Association of Swine Practitioners, established an endowed award, the Ladwig Honor Student Award, and received many citations as an outstanding teacher.

5. Frederick D. Patterson, *Chronicles of Faith: The Autobiography of Frederick D. Patterson* (Tuscaloosa: University of Alabama Press, 1991). Frederick Douglass Patterson, named after the African American leader, was orphaned at the age of two when both parents died of tuberculosis. He received his secondary education at Prairie View Normal School in Texas—now A&M University—which had been established in 1876 as Alta Vista Agricultural and Mechanical College of Texas and became a land grant institution with the Morrill Act of 1890. Edward Evans was the first president (and eighth principal) of Prairie View in 1948.

6. The first faculty of veterinary medicine at Tuskegee Institute included three graduates of Kansas State College: Theodore S. Williams (Pathology), Lloyd B. Mobley (Anatomy), and Thomas G. Perry (Small Animal Medicine). Other graduates of Kansas State College moving to Tuskegee included Eugene W. Adams (KSC 1944), Raymond C. Williams (KSC 1946), Walter C. Bowie (KSC 1947), and Earl H. Brown (KSC 1947).

Theodore S. Williams was appointed head of the Department of Pathology and Parasitology at Tuskegee. When Evans resigned to become president of Prairie View College in 1946, Williams was appointed dean. Williams had practiced in Kansas City, taught on the faculty of Prairie View College, and inspected meat for the USDA in Des Moines. After his appointment as dean, Williams spent one year at Iowa State College to obtain his MS degree; he returned to teach the first class at Tuskegee in 1946.


NOTES TO PART VI. DUTY REQUIRED

319

731st Unit, trans. Scitran (Tokyo: Kaimei-sha, 1981), 140. The Soviets pushed the U.S. to cooperate in their international trial for Unit 731 prisoners. But in Japan, the U.S.-led International Military Tribunal for the Far East had begun its work for the trials of Tōjō and other Japanese Class A war criminals and had other plans for scientists who had been involved in biological warfare in the postwar world. Not found in the newspapers was that the Americans had captured several escaping officers from the Japanese biological warfare unit, including Professor Naitō and the camp director, General Ishii.


16. Aman Agarwal and Daksh Gopalani, Unit 731: Perpetrator of the Asian Holocaust, accessed November 12, 2020, https://44479808.weebly.com. Ryōichi Naitō had been third in command in Unit 731. Like many of the Unit 731 scientists, he moved as civilians in the National Institute of Health and other Japanese medical facilities after the war. Naitō founded Japan Blood Bank, an Osaka-based pharmaceutical company that changed its name to Green Cross Corporation; it was one of five Japanese firms in the Green Cross scandal that in 1984 were accused of killing many citizens from marketing HIV-contaminated blood components for hemophiliacs. Naitō died in July 1982.


Tuberculosis," *American Review of Tuberculosis* 52 (1945): 269. William Hugh Feldman, a Scottish immigrant to western Colorado, entered Colorado Agricultural College in 1913, and on graduating in 1917 he joined the faculty to teach pathology and bacteriology. In 1927, after graduate work in pathology with A. S. Warthin at the University of Michigan, Feldman joined the Institute of Experimental Medicine at the Mayo Clinic. In 1932 he published *Neoplasms of Domestic Animals*, and six years later, *Avian Tuberculosis Infections*. His portraits of Nobel laureates and other eminent people reside today in the National Library of Medicine. He was president of both the International Association of Medical Museums (which later became the International Academy of Pathology) and the American Association of Pathologists and Bacteriologists.


26. Donald F. Smith, *Middlesex Veterinary College: A Short-Lived Experiment in Meritocracy*, Perspectives in Veterinary Medicine, Cornell University College of Veterinary Medicine, October 24, 2013, https://hdl.handle.net/1813/46043.


30. *Steve Canyon* was a long-running adventure comic strip about an all-American, easygoing adventurer in the U.S. Air Force during the Korean War. The cartoon revolved around Cold War intrigue and the patriotic responsibilities of American citizens. The artist, Milton Caniff, had connections in the Washington, D.C., area. He was intensely patriotic and had great insight into Air Force maneuvers—it helped that he was close friends with those who had an inside track about military planning.


32. The Armed Forces Institute of Pathology’s series on human cancer, the standard of the day, included two books on cancer in animals. Over the next two decades, experts in medical pathology arose in hospitals of cities and state universities, and the AFIP lost its prominence. A victim of the Base Realignment and Closure program of 2005, it shut its doors on September 15, 2011. Operations were replaced by a new Joint Pathology Center at the Forest Glen Annex in Silver Spring, Maryland. Walter Reed Army Institute of Research was housed in the garrison command of Walter Reed Army Medical Center from 1953 to 2008.
PART VII. TRANSFORMATION


3. Harry Rubin was born in New York City in 1926. Earning his DVM at Cornell University, he worked with the Agricultural Research Service on the Mexican foot-and-mouth disease outbreak, at the U.S. Public Health Service Virology Laboratory in Montgomery, Alabama, and in the Virus Laboratory at the University of California, Berkeley.

4. In 1939 a Swiss research chemist, Paul Müller, testing chemicals for insecticidal properties, had discovered the extraordinary effectiveness of DDT. It was highly toxic to insects, insoluble in water, and of low toxicity to mammals, and by 1941, the Swiss were using the compound successfully to combat the Colorado potato beetle. By 1948, when Müller received the Nobel Prize for his discovery, DDT was used throughout the world.

5. In 1934 a physician, bitten by a normal-appearing rhesus monkey while engaged in polio research, had developed neurologic signs and died from encephalomyelitis. Albert Sabin, producer of the ultimate polio vaccine, isolated a virus at autopsy he called B virus from its source, Patient B. In 1949 Sabin again isolated B virus at autopsy from the brain of a second physician in which there was no bite, simply monkey saliva that had contaminated a minor cut on his finger. As research on polio using rhesus monkeys increased, the number of reports of fatal human B virus rose. The third fatal case was a veterinarian. Apparently, the professionals caught on to the danger since all succeeding cases were in animal handlers or technicians.

6. The Primate Centers are Wisconsin (Madison), California (Davis), Washington (Seattle), Yerkes (Atlanta), Tulane (Covington), Southwest (San Antonio), and Oregon (Beaverton). Contributions of veterinary scientists were many throughout the early life of the centers. At the California Primate Research Center, James Moe and colleagues documented that the lung disease in the developing fetuses of rhesus monkeys caused by the new adenoviruses could be prevented by immunization.

7. Ralph Brinster was born in New Jersey, graduated from Rutgers College of Agriculture, and earned his VMD and PhD degrees at the University of Pennsylvania.

8. Winston Malmquist was the most senior (and most prominent) veterinary virologist hired when the National Animal Disease Laboratory opened. Malmquist graduated
from Iowa State College with the DVM degree in 1944 and worked in the Rockefeller Laboratory in Kenya. He discovered a new diagnostic test for viruses based on the ability of certain viruses to clump red blood cells into visible red spots. In Iowa he developed cell culture systems to isolate leukemia viruses from cattle.

Martin Van Der Maaten graduated from Iowa State College in 1956 and spent two years at the Army Biological Laboratories at Fort Detrick. Returning his father’s practice in Orange City, Iowa, he then joined the Veterinary Medical Research Institute in Iowa for a PhD in virology.

9. Students sharing the intellectual environment at The Ohio State University at the time were Charles Capen, John Shadduck, and Edward Hoover, who would become science leaders, passing their concept of inquiry on to the next generation of Krakowka, Perryman, Wolfe, Jacoby, Fowler, Bishop, Rohovsky, Wiesbrode, and others whose careers were to have such a great impact on veterinary science.


11. William David Hardy Jr. graduated DVM from the University of Pennsylvania in 1966. He worked at the ASPCA’s Henry Bergh Memorial Hospital in New York City and then at Memorial Sloan Kettering Cancer Center for twenty-four years. In 1975, working with Lloyd Old, he started a cancer center at the Animal Medical Center.


Myron “Max” Essex was born in Coventry, Rhode Island, and received the DVM degree from Michigan State University in 1967 and a PhD from the University of California, Davis, in 1970. He spent his career at the Department of Microbiology in the Harvard University School of Public Health. Essex holds ten honorary doctorates, fifteen patents, and the Lasker Award.

13. The U.S. secretary of agriculture, Ezra T. Benson, appointed the site committee as Dan Collins, president of the American Cattlemen’s Association (chair); Wilbur Plager of Iowa, president of the National Swine Growers; Ted Byerly, deputy administrator of ARS (secretary); and Van Howeling, a USDA employee. The site list was narrowed to nine schools of veterinary medicine: Iowa State College, Michigan State College, U. of
Wisconsin, Texas A&M, Kansas State, U. of Georgia, U. of Missouri, Oklahoma State College, and Colorado State College. On Sunday, July 1, 1956, the committee visited Ames, Iowa, and toured the college’s research facilities, business areas, and three potential building sites. Unique in the bid of Iowa State College was three hundred acres of land acquired through the State Legislature’s Interim Committee by Iowa State president Hilton that would be deeded to the USDA.

14. William A. Hagan was born and educated in Fort Scott, Kansas, and received the DVM from Kansas State Agricultural College in 1915 and MS from Cornell University in 1917. In 1925 he took a graduate course in infectious diseases at the Robert Koch Institute for Infectious Diseases in Berlin. During a leave of absence from Cornell, Hagan was an assistant in the Department of Animal Pathology of the Rockefeller Institute for Medical Research at Princeton in 1921–1922 and three years later was appointed a European Fellow of the International Education Board. See “The New Dean,” editorial, Cornell Veterinarian 22 (1952): 211.

15. Chester A. Manthei was born in Michigan, went to veterinary school at Michigan State University in the 1940s, and moved to the USDA’s Beltsville research program. His work on bovine brucellosis revealed the unique persistence of bacteria in infected herds: individual cows with chronic infection had intermittent bacteremia and antibody levels—a cow negative for bacteria and antibody one month may have antibodies and Brucella abortus in her bloodstream the next. This discovery provided an accurate assessment of herd infection and laid the groundwork for eradication of brucellosis from cattle.

16. William Mengeling changed focus to vaccines against porcine parvovirus and porcine reproductive and respiratory virus. Both are dangers for feral swine—five million of them—progeny of pigs introduced in North America in the fifteenth century and of escaped wild boars, and of hybrids of the two. They caused over $1.5 billion in damage annually and were a constant danger for domestic pig producers.

17. Harley Moon earned the DVM and PhD degrees from the University of Minnesota. He spent a year at the Brookhaven National Laboratory in New York and taught veterinary pathology at the University of Saskatchewan. Moon was the fourth director of the National Animal Disease Center from 1988 to 1995 and later the director of the Plum Island Animal Disease Center. Elected to the National Academy of Sciences in 1991, he served as chairman of the National Research Council’s Board on Agriculture and Natural Resources; their study on biological threats to agricultural plants and animals was done early in the early 2000s to assess the nation’s strengths and weaknesses
in preventing bioterrorism against crops and livestock. In 2002 Moon moved to a faculty position at Iowa’s Veterinary Medical Research Institute, with an endowed chair in veterinary medicine at Iowa State University, and retired two years later.


19. Norman F. Cheville, Dale R. McCullough, and Lee R. Paulson, Brucellosis in the Greater Yellowstone Area, (Washington, DC: National Research Council, 1998). National Academy studies were traditionally done with a team of experts, usually twelve or more, that developed a study over a year’s time. Because the sponsor was in a hurry, this was to be a trial study with only two lead scientists. There were objections to the principal investigator. A letter appeared in the June 20 issue of Science stating that he was “a longtime employee of USDA, which has threatened to decertify the safety of Montana beef because the wandering Yellowstone bison are infected with brucellosis.” The next week’s issue had a response from an executive officer of the National Research Council defending the appointment and pointing out that one of the critics cited was in a law firm that had brought two lawsuits based on the Federal Advisory Committee Act against the National Academy of Sciences.


26. Congress transferred ownership of the Front Royal Remount Station to the U.S. Department of Agriculture in 1909. It operated a beef research station (in cooperation with Virginia Polytechnic University), which closed in 1973. Lying vacant for months, the thirty-two-hundred-acre campus was transferred to the SCBI.


30. Veterinarians who were pioneers in wildlife disease research included Gary A. Wobeser in Saskatoon, David Hunter in California, Tom Thorne in Wyoming, and Frank Hayes and Vic Nettles of the Southeastern Cooperative Wildlife Disease Study in Georgia.


33. Coronaviruses cause disease in mice, rats, rabbits, ferrets, and chickens. Mouse hepatitis virus and rat sialodacryoadenitis virus have been used as models of human disease. Bat-transmitted paramyxoviruses include Nipah virus from pigs in Malaysia in 1998–1999 and Hendra virus from horses and trainers along the East Coast of Australia in 1994.


was an Animal Disease Research Association Station that concentrated on sheep diseases. J. T. Stamp led a team that reproduced scrapie in sheep by passing filtered scrapie brain tissue from one sheep to another.

37. Björn Sigurđsson, director of the Keldur Institute for Experimental Pathology at the University of Iceland, first proposed the concept of slow viruses. He first described visna in 1954 in Karakul sheep imported from Germany; his research centered on maedi/visna virus, which caused chronic neurologic (visna) and respiratory (maedi) disease in sheep and goats.


39. Beth Williams studied at the University of Maryland (BS), Purdue University (DVM), and Colorado State University (PhD). She married Tom Thorne, a wildlife biologist—both moving to the University of Wyoming in Laramie—and continued work in chronic wasting disease. Tom Thorne became a noted wildlife expert who headed the restoration of the black-footed ferret.


PART VIII. EPILOGUE


3. William Switzer and his progression of graduate students, including Richard Ross, Robert Duncan, John Maré, and Hank Harris, tackled the problem head-on. In the next decade they would investigate atrophic rhinitis and pneumonia caused by *Mycoplasma hyopneumoniae*, *Mycoplasma hyorhinis*, and *Bordetella bronchiseptica*.

4. Richard Ross had pushed for a new cutting-edge containment facility for research on infectious diseases of large animals; the Healthy Livestock Initiative, a legislative funding body dedicated to animal health and production animal medicine; instructional teaching systems and information systems for the Department of Veterinary Clinical Sciences; and the Veterinary Diagnostic Laboratory, including development of computer-assisted instructional software and an expanded graduate program in swine medicine.

5. At California-Davis, an impressive research program was established. During the
period, Deans Frederick Murphy and Bennie Osburn were both scientists who saw a clear path to success for their institution. At Texas A&M University, John Shadduck was successful and similar changes occurred as with Robert Marshak at Penn, Donald Smith at Cornell, and Keith Prasse at the University of Georgia.


7. Peter Doherty was a graduate of the University of Queensland with a PhD from Edinburgh. He had returned home to Australia to the John Curtin School of Medical Research to investigate how lymphocytes protect against viral infection. Doherty discovered how a special subset called T-lymphocytes attack and destroy cells that have been infected with viruses. For attachment to virus-infected cells, the T-killer cell had to recognize two components on the surface of the infected cell: a protein from the virus and a unique protein complex called the major histocompatibility complex (MHC for short). Doherty discovered how the MHC recognizes the virus and displays its proteins on the cell’s surface in a way that the virus-infected cell can be recognized by roving killer T cells. Veterinary and medical scientists began to provide new models for how diseases worked.


9. Aleen Cust, hiding her gender, enrolled in the New Veterinary College in Edinburgh, Scotland, in 1894 under the name of A. I. Custance. The Royal College of Veterinary Surgeons denied her application for registry in 1897 so that she was unable to list herself or practice as a veterinarian. Born in Tipperary, she returned to Ireland to work as an assistant to a veterinarian.

10. Archives of the *Journal of the American Veterinary Medical Association* show the first college-educated female veterinarians in the United States to be Mignon Nicholson, graduated from McKillip Veterinary College in 1903; Elinor McGrath, from Chicago Veterinary College in 1910; and Florence Kimball, from Cornell University in 1910.

11. In the rural Midwest, Kansas State College led with women graduates Helen Richt in 1932 and Louise Sklar in 1933. Mary Knight Dunlap (who founded the Association for Women Veterinarians in 1947) finished at Michigan State College in 1933, and Ida Mae Dodge was the first woman to graduate in veterinary medicine from The Ohio State University in 1936. The University of Pennsylvania voted to admit women to veterinary school in 1933, and five years later Mary Josephine Deubler graduated VMD.

12. N. Cheville, “The Shift in Gender of Veterinary Students,” *Gentle Doctor* 16

13. M. Meselson et al., “The Sverdlovsk Anthrax Outbreak of 1979,” *Science* 266 (1994): 1202, https://doi.org/10.1126/science.7973702. Matthew Stanley Meselson was a molecular biologist at Harvard University; he had worked with Henry Kissinger in the Nixon administration to convince President Nixon to renounce biological warfare. In 1980 he was appointed consultant to the Central Intelligence Agency on anthrax and in 1992 led the team that investigated the outbreak in Sverdlovsk.


18. Jerry Jaax and Nancy K. Jaax, “An Ebola Filovirus Is Discovered in the USA: Reston, Virginia, USA, 1989,” *Veterinary Heritage* 39, no. 1 (2016): 16. Nancy Jaax was a resident in veterinary pathology at USAMRIID in 1979 and began work with Ebola virus in 1983. She was the chief of the Pathology Division at Aberdeen Proving Ground in Edgewood, Maryland, where she worked with chemical warfare agents. Nancy and Jerry Jaax, graduates of Kansas State University, were both career officers in the U.S. Army Veterinary Corps. They worked in research planning in the Provost’s Office at Kansas State University. Both were instrumental in winning the national competition for the National Bio and Agro-Defense Facility to be placed in Kansas.


24. Cornell University Veterinary School began offering a veterinary diagnostic service in 1912. In 1970 the New York State Legislature enacted a law authorizing the agriculture commissioner to contract with Cornell to operate an official state veterinary diagnostic laboratory. In 2001 the law was amended to include zoo and wild animal populations for evidence of human pathogenic microorganisms. It was a new modern facility for two hundred professionals whose work extends into food safety and the environment, including units as diverse as Quality Milk Production Services and Department of Environmental Conservation.


27. James Roth is a Distinguished Professor of Iowa State University, a member of the National Academy of Medicine, and a recipient of the American Association of Veterinary Medical Colleges Senator John Melcher, DVM, Leadership in Public Policy Award. Senator Melcher was an Iowa State College of Veterinary Medicine graduate of 1950.


33. Serageldin, “Science in Muslim Countries.”
