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JAMES G. DICKSON: THE MAN AND HIS WORK[1]

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During his mature years James Geere Dickson possessed the greatest knowledge of more diseases of more field crops than any other person—hence this resumé of his life and work.

The Formative Years

James Geere Dickson was born February 7, 1891, on a farm in the Moxee Valley which lies between Yakima Ridge and the Rattlesnake Hills, 12 miles east of Yakima, Washington. He was the first of seven children born to Nelson James and Alethe Rose (Conrad) Dickson. His elementary education was obtained close to home, but he had to ride horseback 11 miles each way to attend high school in Yakima.

As the eldest son Jim had many responsibilities. He drove the family cattle from the parched sagebrush environment of the Moxee Valley to summer pasture on the north branch of the Tieton River. There in a meadow he built a log cabin in which to spend the summers while tending the stock. Irrigation water came to within two miles of the Dickson farm. Some of the farmers fortunate enough to have water grew hops, and Jim had the responsible task of operating a kiln in which hops were dried. He earned cash in this manner.

Jim Dickson attended Washington State College, now Washington State University, at Pullman. There he majored in agriculture and botany. He was employed as assistant soil chemist and assistant librarian at the college. His

[1]For details and considerable information not presented see "James G. Dickson," by H. C. Green, 1963, in *Mycologia* 55:537–39, and "James Geere Dickson, 1891–1962," by E. W. Hanson and D. C. Arny in *Phytopathology* 52:1093–94.

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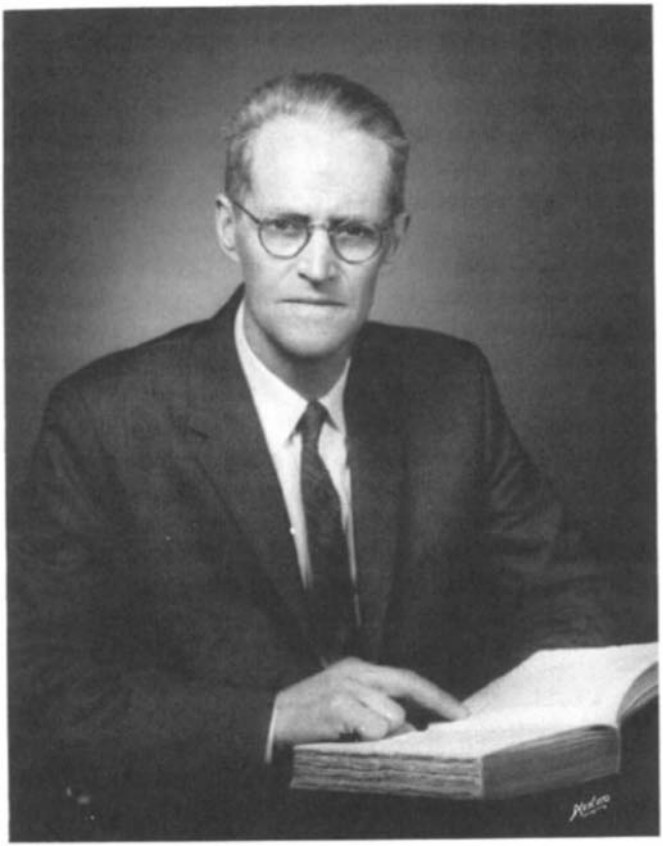

Figure 1 James G. Dickson.

brother Allan believes that it was here that he developed his interest in physiology. Allan helped Jim care for oats growing in sand in pots placed in the family orchard—a study of the mineral nutrition of oats. James received his BS degree in 1915 and that same month, after graduation, married Leah Alice Dodd.

Jim and his brother Allan both went on to earn PhDs. What nurtured such a strong academic desire in this rude, pioneering background? Jim's father quit school at 17; however, his mother had some formal education, for she taught school occasionally and his paternal grandfather, a retired minister who had been educated at Dartmouth, spent the last years of his life with this young, struggling family.

Those who knew Jim in later life reported him to be a carpenter, plumber, electrician, stonemason, fisherman, hunter, photographer, artist, cook. In

retrospect it seems obvious that, on an isolated pioneer farm, things were built and repaired at home. Skills, strength, self-reliance, confidence were the result. He was also forced into an intimate, reflective relationship with nature, especially while watching the cattle in the Tieton meadows. These were truly formative years.

Early Years at Wisconsin

While a graduate student Jim Dickson must have been at his physical and mental peak. His studies specialized in plant physiology, biochemistry, and plant pathology. In 1918 he became an agent of the USDA, an appointment making part-time employment possible as a plant pathologist. He remained an agent until his retirement. Professor L. R. Jones must have been impressed by this young man because he secured Jim Dickson for the University of Wisconsin to develop a research and teaching program on the diseases of field crops in 1919. He received his PhD in 1921. By 1922 he was elevated to associate professorship, and in 1926 he became a full professor. By the time he received his PhD he had published two papers on the nutrition of oats, with A. G. Johnson a bulletin on eradication of the barberry for the control of stem rust, and with Helen Johann a paper on the sporulation of *Gibberella zeae.*

By 1922 cooperative corn disease tests were initiated between Indiana, Illinois, and Wisconsin. Testing inbred corn lines for survival and emergence in cold wet soils in cooperation with the USDA and Illinois was under way in 1925. The first inbred lines used commercially in the corn belt came from these efforts, and some of them were used for at least 40 years. *Pythium* species were the main rotters of corn in these cold, wet soils, and for years the testing of inbred lines and protective fungicides was continued by Paul Hoppe.

At this time the nature of resistance to pythium and other seedling blighters was being investigated. Wisconsin was north of the best corn region, and one way to lengthen the effective growing season was to develop corns with greater early spring vigor. These efforts led to the concept of "balanced" metabolism. Corns most susceptible to blight in cold, wet soils possessed enzyme systems that hydrolyzed the nitrogenous food reserves more rapidly than the carbohydrate reserves at low temperatures, resulting in seedlings with thin, watery cell walls. These possessed unbalanced metabolism. The enzymes of the more resistant lines hydrolyzed the carbohydrates in proper proportion with nitrogenous reserves, and the resulting seedlings had cell walls with greater secondary thickening. Thus, they maintained balanced metabolism over a wider range of environmental conditions. S. H. Eckerson, K. P. Link, and J. R. Holbert collaborated in these studies on the influence of environment on corn seedling blights.

These were golden years for the Department of Plant Pathology. The staff was superb. L. R. Jones, G. W. Keitt, A. J. Riker, J. C. Walker, and the first full-time extension plant pathologist in the United States, R. E. Vaughn, formed a stimulating group of associates and an atmosphere of effort and of accepted challenges. Mutual growth must have been stimulated. During these years Wisconsin was becoming famous as the school for environmental effects on plant disease, particularly the soil environment. Dickson helped design the Wisconsin soil temperature tanks. His most famous single research paper was on the influence of soil temperature and moisture on the development of the seedling blight of wheat and corn caused by *Gibberella zeae.*

Wheat and barley scab was often devastating when spring wheat and barley followed corn in much of the corn belt and in the warm, humid areas to the east of the American corn belt. Dickson, Holbert, and Koehler pioneered in studies that revealed the importance of the perithecia of *G. zeae* on corn stalks as a source of inoculum. The export of scabby barley for feed to England and Germany led to sick hogs and a poor reputation for our exported grain. Dickson prepared a film strip on the scab disease and its control for the USDA Extension Service. This strip was moved one frame at a time through what must have been rather primitive projectors. Crop rotation and complete burial of corn stalks greatly reduced the scab disease.

Trip to Europe and the USSR

The export of scabby grain to Europe caused such concern that the University of Wisconsin and the USDA sent Jim Dickson and his wife to Europe to investigate the ramifications of these exports on the trade and to collect cereals for the USA. In February 1930, Dickson and his wife left for England. They traveled to central Europe, and by spring entered the USSR. There they had complete freedom to go where they wanted, to see what they wanted, and to do what they wanted. They traveled alone much of the time, frequently sleeping and eating in farmhouses. The trip was physically exhausting. Both travelers lost weight. But motels and jet airplanes were not the mode of travel in those days. They observed cereal diseases and talked with farmers and party officials about farm and grain trade problems. They met and worked with N. E. Vavilov, the great Russian cerealist and student of the origin of cultivated plants. Dickson held Vavilov in highest esteem. He was saddened when Vavilov suffered in later life because of political changes within the USSR.

Perusal of the collection sites record an amazing journey—Transcaucasia, Georgia, Saratov, Omsk, Ukraine, Turkmenistan, Turkestan, Tashkent, Kazakstan, and Afghanistan. Jim Dickson was farsighted in that

he did not just collect the most advanced agronomic types. Many of the accessions have the notations—scab resistant, rust resistant. Among his finds were *Aegilops cylindrica, Hordeum spontaneum, Triticum monococcum, T. dicoccum, T. durum, T. persicum, T. timopheevi, T. turgidum,* winter rye, rye X wheat hybrids, and even some corns. Most of his collections have the PI numbers 94302–94762, 94787–94922, 95091–95308.

He believed in coexistence with the USSR, for he was seen bathing with the Russians in the Black Sea, minus bathing attire (source reliable but uncited).

Middle Period

Judged by the written record, the period of greatest scientific activity, enthusiasm, and scope was the early period. The middle period continued with a narrower scope but resulted in a remarkable understanding of tissue anatomy and physiology versus fungal penetration. Studies by Johann, Pearson, and Pugh, either participated in or encouraged by Dickson, brought the details of fungal invasion of the wheat and corn kernel either during formation or after, and of kernel or seedling invasion after planting, to a high state. These studies emphasized the differential rate of maturity and resistance offered by the pericarp, testa, and various other structures, from flowering to maturation of the kernel. The complexities of these tissues, both physiologic and anatomic, were understood and appreciated by Dickson, probably beyond the level attained by anyone today. In my opinion this was the technical and conceptual peak of his career.

With the reinterpretation of the Volsted Act under President F. D. Roosevelt, beer containing 3.2% alcohol became legal in the USA. Prohibition had decimated the legal brewing industry in Wisconsin, and the expanding malting and brewing industry soon found itself in need of scientific support. Oderbrucker, a high quality barley, was susceptible to helminthosporium stripe, and it had barbed awns. Dickson, B. D. Leith, H. Shands, and R. G. Shands worked closely to support this revived industry. Wisconsin Barbless or Pedigree 38, with smooth awns and higher yield than Oderbrucker, and resistance to stripe soon developed other problems, especially spot blotch. Efforts to test malting properties of experimental lines started in fruit jars and advanced to 15 pound samples malted in the basement of old Moore Hall. Eventually his brother, Allan Dickson, a trained chemist, took responsibility for malting and brewing trails. The regular barley workers and a few students made up a taste panel to evaluate the brews. The close cooperation between industry, the USDA, and the University of Wisconsin resulted in construction of the Federal Barley and Malt Laboratory at Madison in 1949. J. G. Dickson is credited with the initial success and

stimulation of these fruitful cooperative efforts. Many graduate assistantships were supported by this industry. Malt is an important ingredient of beer, breakfast foods, and baking and confection products.

He was instrumental in the formation of the Malt Research Institute in 1939 and in the formation of the Malting Barley Improvement Association in 1945.

Andy Lejeune reports that he was in his barley plot at Fargo, North Dakota, one Saturday when J. G. Dickson drove out. Lejeune had some early generation lines that Dickson believed promising. Dickson was so impressed that he obtained financial support to help Lejeune evaluate those lines. Traill, an important malting barley, was among them.

The book, *Diseases of Field Crops,* first printed in 1947, and revised in 1956, is probably Dickson's greatest single contribution to plant pathology. This major text and reference work contains sections on the cereals, forages, legumes, and fiber crops. It is concise, authoritative, and well illustrated. Eugene Herrling, photographer for the plant pathology department, deserves credit for many of the original illustrations. This book resulted from teaching an "old-fashioned" course, one on diseases of field crops. His lectures were short, boiled down to essentials. He embellished little, maybe too little. Laboratory materials were as good as dried specimens and pictures can be.

Later Years

At some point Dickson's interests became so varied they cannot be described in detail. During his career he guided over 100 graduate students to advanced degrees. They studied the smuts, rusts, *Physoderma* spp., *Helminthosporium bromi, H. oryzae, H. sativum, H. turcicum, H. victoriae, Pythium* spp., *Colletotrichum* spp., powdery mildew, the winter crown rot of alfalfa caused by a fungus that produces HCN, grain storage fungi, *Septoria* spp., and the chemical control of rusts.

His major research in later years was on the rusts of corn. He was concerned with the loss of variability and the narrowing of the genetic base of the American maize crop as hybrids replaced the open-pollinated varieties. The rusts were of little importance but they began to appear dangerous. This work involved him with Latin America.

In the summer of 1956, Dickson, C. E. Logsdon, and R. L. Taylor studied the diseases of forage crops from the Aleutian Islands to the Yukon Valley of Alaska.

Dickson served as vice president of the American Phytopathological Society in 1932 and as its president in 1953. He served for eight years on the governing board of the American Institute of Biological Sciences, on its

executive committee, and as its president, 1959–1960. He was a fellow of the American Association for the Advancement of Science (1930).

Jim retired in June 1961. While serving as an agricultural consultant he was killed in the Philippine Islands in a plane crash, March 1, 1962. He was inspecting barley, corn, wheat, oats, soybeans, sorghum, and other crops for possible use in the Philippines. One of his sons, Alan N. Dickson, to whom his book was dedicated, was killed on a landing craft in World War II less than 200 miles from the crash scene. Father and son had an amazing rendezvous.

Summary

To what do we attribute such a productive career? The family setting developed pioneering traits, scholarship, and an appreciation for practical agriculture. An undetermined force at Washington State College turned him toward basic research, primarily physiology. His wife and life-long partner obviously shared his exploits and disappointments. The University of Wisconsin, with strong contemporary agronomy, botany, biochemistry, genetics, and bacteriology departments and strong cooperative traits, and a plant pathology department alive with intellectual growth, provided the proper setting for productivity.

The background and setting may nurture productivity, but leadership depends upon personal qualities. Physical stamina was required to sustain the efforts of the early years. Jim Dickson had a quick mind in a strong body. He could rest (sleep?) and hear at the same time. He always attended seminar, sat in the front row, and his nodding head was noted by all. Yet, we knew he heard by the questions he asked.

He was generous to associates. Professor Dickson would fill his car with students on a trip to local fields. He knew the restaurants as well as the fields. We always had a good meal and he always paid the bill. After two or three of these experiences some students attempted to get the check. They never did!

I quote Arne Ullstrup: "The morning after President Roosevelt declared a bank moratorium (closed the banks), back in the depths of the depression, Jim called me into his office and offered to grub-stake me until I could recoup my finances." Luckily Ullstrup had enough cash to make it until his next assistantship check arrived. When a student graduated, but had no immediate job, Dickson did his best to find work for him.

His record of accomplishment requires eternal optimism. Corns for cold wet soil? We can do better! Scabby grain? We can do something about that. The malting and brewing industry has problems? Great. (His days in the hop kilns in the Moxee Valley must have increased his empathy for this

industry.) This eternal optimist was once a pessimist. In the 1940s the Russians reported that they had developed perennial wheats. We asked Professor Dickson about this. Right in class—for the first time in our memory—he disparaged something! Perennial wheats won't pay! Grains are selected to sacrifice everything for grain—to store all their food in the seed. A perennial would have to leave food in the roots, crowns, rhizomes or whatever—at the expense of the grain. This incomplete translocation to the kernel would sacrifice more than any advantage. To date that dire prediction is true. And his response to the question was immediate.

His own research at times was inadequately organized. This must be true! His interests were so varied, his enthusiasm so forceful, he must have, more than once, rushed into things with too little deliberation.

Although Jim rose early and worked at home for two to three hours before "coming to work," all work and no play did not make him a dull boy. He built several houses. He was once president of the local fireman's association. He helped maintain the University Arboretum. Hazel Shands reported that, in a cabin on a fishing trip, a mouse was running around on the floor. Jim fired a rifle, missed the mouse but the ricochet killed it (shades of home on the range in Washington).

Acknowledgments

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The photograph was furnished by Charlotte (Dickson) Fitzgerald, the youngest daughter. It was her mother's favorite.