WILLIAM ALLEN ORTON

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No loss from the ranks of American plant pathology has ever been personally mourned more widely and sincerely than that of Dr. W. A. Orton. Few had more varied friendships than his in Washington's scientific and administrative circles or more wide-reaching in those of the United States. Beyond our national confines his personal relations and professional correspondence encircled the globe. He was at once an internationalist of world-wide vision and interest and a friendly adviser to everyone who sought his aid. His breadth of interest and charm of personal qualities made him the helpful counselor for a host of foreign scientific visitors who made Washington the point of entry to American agricultural institutions. He was himself an experienced traveler and by skillful planning of itineraries and courteous letters of introduction he contributed much to the happiness and success of many such foreign guests.

Dr. Orton exemplified in a peculiar way the heroic in science. To those who knew his ancestry and early development this was not surprising. He came from the best Vermont stocks. As his name suggests, the blood of the Allens flowed in his veins. Since the days of "The Green Mountain Boys," this has stood for dauntless leadership, forgetful of personal dangers. The name of Orton also has long been known in New England science and administration as well as in pulpit and school. Born in a Vermont village, North Fairfax, he entered the Agricultural course in the University of Vermont when he was only sixteen and received his baccalaureate degree with honors (Phi Beta Kappa) at twenty. This was the better evidence of his native genius because from his childhood he was handicapped by partial deafness. As his botany teacher I well recall my impressions of this immature freshman always in the front seat as I lectured, eyes open, lips parted, eagerly "drinking in" every idea, although many of the words must have escaped him. I do not recall that he took a note but he always understood and retained. To the last weeks of life he showed remarkable powers of concentration upon any question under discussion, with unfailing ability to analyze and hold the essentials. In his student days, as in his later life

with its greater physical trials, instead of yielding to handicaps he forced them to contribute to his successes. If he recognized any limitations it was only that he might turn from lesser tasks to concentrate the more effectively upon the greater ones. Upon these he never admitted the possibility of failure.

For two years after graduation he remained at the University as an advanced student and research assistant. His chief interests concerned the parasitic fungi of Vermont, reviewing the literature, reworking all available material, collecting eagerly, and listing for publication. One of his University classmates of this period recalls a day when "Mr. Orton, an eager youth of somewhat indifferent college preparation, came into the laboratory saying that he had to use Latin books on mycology (Saccardo) although he had never studied Latin. To the admiration and chagrin of his fellow students who had spent several years upon Latin, young Orton acquired in a surprisingly short time a practical use of the language." He assisted also in our experimental work with potato diseases, inaugurating interests which guided him into important developments a decade later.

In 1899, when I was a guest in the laboratory of Dr. Erwin F. Smith in Washington, he told of his need of a promising research man for work on the control of cotton wilt. Immediately I urged consideration of young Orton, and he accepted my judgment. It certainly was something of a venture to accept for such a task a half-trained boy of twenty-two who had never even seen a cotton plant. With such brief suggestions as could be given in Washington, Orton went alone to spend the summer with the Carolina planters. He afterwards confessed his initial lonesome homesickness. But here, as always, his quick vision of the bigness of the job made him oblivious to all petty hindrances. His kindly personality, keen perception, sterling integrity, and tireless devotion to his tasks won the confidence and enduring friendship of the Carolina planters. From them he soon learned whatever their experience had taught them about cotton. Doctor Smith, following Atkinson's early work, had already diagnosed the cotton wilt as a soil-borne, vascular Fusarium disease. Seed disinfection and spraying were thus useless. Experiments with soil fungicides and fertilizers gave negative results. Hygienic measures, sanitation, and rotation, suggested by Smith, were only palliatives, pronounced impractical by the planters. What was to be done? Fortunately Orton had entered the old Division of Vegetable Physiology and Pathology, later merged into the Bureau of Plant Industry, at a time when the work was dominated by a small group of men with whom associations were most stimulating to thoughts along new lines. These included, in addition to Doctors Galloway, Woods, and Smith, such men as Carleton, Fairchild, Swingle, Waite, and Webber. Under such in-

fluences increasing attention was being given to the physiological aspects of phytopathological problems along with genetics and disease resistance in relation to control measures. Carleton had just brought from northern and eastern Europe his first large collection of foreign cereals as a basis for breeding for resistance to rust. Webber and Swingle were diffusing through the departmental ranks the glowing enthusiasm for plant improvements recently kindled by their epochal work in Florida on frost-resistant citrus. Orton was an eager young listener at such discussions. Almost immediately, as he surveyed the cotton fields of Carolina, he saw the possibilities of wilt control through disease resistance. Within two years he had the most remarkable evidence produced to that date as to the practical significance of disease resistance in plant-disease control. His first departmental publication, in 1900, "Wilt Disease of Cotton and Its Control," will remain a historic classic. This recorded the result of selections for disease resistance made the first summer and brought to completion after but two summers' work in the southern cotton fields by this inexperienced Vermont youth in his early twenties. Yet his conclusions are valid to-day. Along with these studies he had succeeded, where both Atkinson and Smith had earlier failed, in establishing, by pure-culture inoculation, the pathogenicity of this Fusarium on cotton. Nor was this all. His inspiration carried him on to the discovery of the wilt-resistant cowpea, which he, in association with Webber, showed to be the more remarkable in that it was also immune from the root-knot nematode. From this he turned to water-melon wilt, to overcome which he hybridized the resistant citron with the edible melon. These, with Bolley's work on flax, laid the secure foundation for all subsequent work with selection and breeding for resistance to the group of vascular Fusarium diseases. Thus in two years' time he mapped the way to the solution of problems which Smith had in 1898 defined as among the most seriously threatening in the field of phytopathology.[1]

The happy culmination of these earlier observations and researches upon disease resistance came with the formulation of his concepts as to the explanation and classification of disease-resistant types. These were outlined in the Yearbook of the Department of Agriculture for 1908 and in his address before the Conférence Internationale de Génétique, Paris, 1911.

His early work on these wilt diseases in the southern cotton and truck fields represents his outstanding personal researches. In these, except for brief association with Doctor Webber on cowpea breeding, he worked alone. Orton's genius was, however, always stimulated by contacts, and his natural instincts sought companionship.

[1] Smith, Erwin F. The fungus infestation of agricultural soils in the United States. Sci. Am. Supplement 48: 19981. 1899.

His unusual originality in ideas, coupled with his ability in organization for their advancement, was soon recognized in the Department of Agriculture. In 1907 he was made head of the newly created Office of Cotton, Truck, and Forage Crop Disease Investigations. Here his infectious enthusiasm found ampler field. He built up a scientific staff of some forty members, characterized at once by scientific ability, integrity in service, and devoted personal loyalty to their leader. He was a member of the committee of three which guided the organization of The American Phytopathological Society in 1908–09.[2] Of this Society he was a charter member and one of the drafters and signers of the articles of incorporation and held numerous offices, including the presidency and the editorship of PHYTOPATHOLOGY. At the first meeting of the Society it appointed a committee of five, of which he was a member, "to draft resolutions concerning wart disease of potato and white pine blister rust and to take steps to secure such action as would prevent their further introduction and spread." These two serious European diseases had recently appeared on the American Continent in quick succession in 1908 and 1909. From this, with correlated action by the American Association of Economic Entomologists, came the initiation of the Federal plant-quarantine service. The administration of this was placed in the hands of the Federal Horticultural Board, of which he was vice-chairman and pathologist for twelve years. These responsibilities stimulated his breadth of interest and information, especially concerning international problems. He was always a believer in the importance of international cooperation in quarantine matters. Whereas quarantines may naturally tend to create international frictions and material misunderstandings, he saw in them the opportunity for the very opposite. Might they not rather offer foci for international conferences and coordinated researches? To accomplish these he led in the movement, unfortunately interrupted by the World War, to encourage the visits to America of European pathologists and to favor like foreign journeyings of Americans for surveys and studies. The continuing benefits to international fellowship in scientific endeavor are to-day as clearly recognized in European countries as in America and Orton's early services in this field as fully appreciated.

[2] In addition to his official relations with The American Phytopathological Society he was also a charter member of the American Horticultural Society and held membership in other scientific organizations as follows: The American Association for the Advancement of Science, the Botanical Society of America, the Botanical Society of Washington, the Washington Academy of Sciences, the Society for Horticultural Science, the American Society of Agronomy, the American Forestry Association, the American Genetics Association, the American Society of Naturalists, the International Society of Soil Science, the Société de Pathologie Végétal, the Society of American Foresters, the Cuban Association of Sugar Cane Technologists, the International Society of Sugar Cane Technologists, the World Agricultural Society, the Cosmos Club, and Phi Beta Kappa.

His interest in potato wart and in the virus diseases of potato, together with the Conférence International de Génétique, took Orton to Europe in 1911. His earlier interest in potato pathology was thereby enhanced. His contacts with the work of Doctors Appel and Wollenweber in Germany were especially stimulating. Several important developments resulted. The system of potato-seed inspection and certification already in early operation in Germany under Appel's leadership was launched in America, where it continues as one of the great constructive preventive measures. Orton came back convinced of the importance of the virus problems in potato pathology. Through his publications and personal leadership he started the investigations concerning these problems which have ever since continued to increase in recognized scientific complexity and economic importance.

He brought back with him from Germany, as an addition to his staff, Dr. H. W. Wollenweber as Fusarium expert. This was done in order to put American studies of pathogenic Fusarium species into line with those of Europe, a type of contribution of continuing need with like complex problems. Later, he brought also Dr. Otto Appel from Germany that America might benefit from his experience with potato diseases in Germany. He contributed his influence in an important degree to the later visits of other leading European mycologists and pathologists, especially Butler, Cotton, Pethybridge, and Brierley, from Great Britain, Quanjer from Holland, Pole-Evans from South Africa, Foëx from France, and Vavilov and Jaczewski from Russia.

Dr. Orton organized and for several years carried on the plant-disease survey of the Bureau of Plant Industry, which has become of great importance in connection with work on the control of crop diseases. During the World War he was active in organizing research on diseases causing losses of vegetables in transit, market, and storage, which was developed in close cooperation with the food-products inspection service of the Bureau of Agricultural Economics and very materially increased knowledge of the causes of losses in shipment and marketing. As a result of this work methods for the reduction of disease losses in the process of marketing have been developed.

Following the war's interruptions of European international relations, Dr. Orton's vision sensed the increasing need for leadership in agricultural and especially phytopathological problems in the Latin Americas. The organization of our National Research Council gave him occasion for crystallization of these ideas. For nearly a decade, until his death, he was chairman of the Research Council's Committee on Phytopathology in the Tropics. Much thought was given to the correlation of tropical education

and research. Constructive reports were made on graduate education in tropical agriculture. The outstanding specific accomplishment was the organization under the National Research Council of the Tropical Plant Research Foundation. In 1924 he resigned from the Department of Agriculture to become the Scientific Director of this Foundation. This was designed as an agency to provide for tropical countries, particularly in the Western Hemisphere, a scientific service in support of crop production. As Director he gave concrete form to his ideals of such service through science in the interests of progress in two continents already closely interdependent. He always considered these undertakings a logical part of an inclusive national development. It is of interest to record that his most intimate early associates in inaugurating and advancing this project were Dr. George R. Lyman, then Secretary of The American Phytopathological Society, and Fred C. Meier, the present Secretary.

His first thoughts in specific researches dealt with the needs of large tropical-plant corporations such as the United Fruit Company. Such corporations engaged in any phase of plant culture in the Latin Americas are continually in need of reliable expert scientific advice upon pathological or other cultural problems. Their efforts at securing this by the temporary employment of individual expert advisers were, in general, expensive and relatively ineffective. He conceived the possibility of a non-profit-sharing organization under the patronage of the National Research Council, with expert scientific guidance, so functioning as to serve as an intermediary or activating agency in bringing the best scientific service to bear upon the peculiar problems involved.

His leadership of the Tropical Plant Research Foundation as Scientific Director continued until his death. This Foundation rendered expert services to such great corporate interests as the Cuba Sugar Club, representing the united sugar-cane growers of the Island, for which it organized and directed an experiment station. It served in an advisory capacity to various governments of Central and South America upon agricultural problems, including the organization and manning of both experiment stations and agricultural institutions. During the later years Doctor Orton was official agricultural adviser to the Pan-American Union.

In the field of tropical forestry Dr. Orton was a pioneer, giving it an impetus and a standing that it had never before enjoyed in the New World. His early grasp of the fact that in the American tropics the products of the forest are crops whose wise care and harvesting are as necessary as in agricultural crops led him to take a leading part in the little-known field of tropical forestry. An acceptance of silviculture and of conservative logging by the Latin-American Republics he conceived to be a part of his con-

tribution to their agricultural and economic stability. In this field he directed forest work in a number of Latin-American countries, and under his supervision the first survey of tropical American forest resources was made.

It must suffice to comment on only one other specific example, as outlined by Colonel George P. Ahern, formerly Director of the Philippine Forest Service, a Trustee of the Foundation representing forestry: "Dr. Orton at the invitation of the Brazilian Government in 1928 went to that country and discussed their forest problems with the officials. Before he left Brazil he submitted to them a draft of a forest policy so sound and comprehensive that it is marveled at by leading foresters, who are amazed that a man not a technically trained forester could prepare such a splendid document. This will, I believe, serve as a guide to the administration of the new forest service in Brazil for many years to come."

Much of this service was rendered gratuitously, and Doctor Orton in the best sense functioned as a missionary of Agricultural Science. Many expressions of appreciation of this followed Doctor Orton's death. One of these may be quoted from the *Revista de Agricultura de Puerto Rico* published in February, 1930, under the caption "*In Memoriam*:" "Porto Rico counted him among her practical benefactors. The cyclone of September, 1928, found him in our Island. After estimating the extent of the damage to our agriculture occasioned by this great disaster, Doctor Orton organized the work of rehabilitation, prepared reports for the Red Cross, and interested the Federal authorities in the defense of our agriculture, giving Porto Rico the benefit of the dynamic ability which always distinguished him."

All of this was done under increasing personal physical disabilities because of diabetes, which, added to his deafness, would have early inhibited a less courageous soul. Fortunately, these things never dimmed his intellectual vigor. It was chiefly a fight against malnutrition. Here again he forced his very disabilities to serve his scientific ends. Before the discovery of insulin he brought together for experimental culture in his own garden what was undoubtedly the most complete collection ever assembled of foliaceous food plants suited to a diabetic dietary. He mastered the physiological pathology of diabetes as well as the chemistry, culture, and cooking of these plants to a point where he was recognized as the national authority on the culture and use of diabetic foods of this class.[3] With the later use of insulin supplementing these dietary precautions and the wonderful co-

[3] Following Dr. Orton's death the eminent specialist on diabetes, Dr. Elliot P. Joslin, of Boston, wrote as follows: "When in my practice the outlook for diabetes was darkest, Doctor Orton brought the first rays of light. . . . From the very start his interest in diabetes was not confined to himself. He always tried to help some one else, and you know what a stimulus his garden, with its ninety-nine different diabetic vegetables, gave

operation of his wife and family, he fought his way back from the brink of bodily starvation to the amazing efficiency of the later years of his life.

For years his American friends, staff associates, and visiting agricultural scientists from all parts of the world found his home a welcome, grateful place of gathering. The memories will long remain with many of evening walks among his beloved dahlias and the inspiration that followed the free informal fellowship with men from many lands. Of these associations so pleasantly formed, not a few were later destined to continue as significant and productive friendships among students in kindred fields. One must number this great, unfailing gift of friendship in the long list of his contributions to mankind.

Any evaluation of his scientific accomplishments fails except as one recognizes the dominance of a great courageous spirit and a clear intellect over physical handicaps. It was this that made him so influential with and so beloved by all his immediate associates. As one of them writes: "He stood on an eminence apparently without realizing his own greatness. He was so friendly, so tolerant, so just, so modest with all, that it seems to me now we worked with a great man without then understanding his true greatness or the rare privilege of serving with him."

These words may well serve as a closing tribute to William Allen Orton, one of our heroes in science.

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to other patients." Dr. Joslin concludes that Dr. Orton's contributions to the understanding and treatment of diabetes must, indeed, be rated as of importance comparable to his scientific work in phytopathology.

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