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## Marcus M. Rhoades (1903–1991)

**M**ARCUS M. RHOADES, cytogeneticist *par excellence*, died on December 30, 1991, at the age of 88. His dedication to research was extraordinary and a central feature of his life. Although suffering from a ventricular aneurysm and in weakened physical condition, he continued to work in the field and in his laboratory, classifying kernels or analyzing data, until the last days of his life. MARCUS was hospitalized on several occasions and invariably, as he was chauffeured home, he would try to persuade his wife VIRGINIA to drop him off at the laboratory or at his beloved cornfield. For him, summer was never vacation time or a time to travel to scientific meetings; it was the climax of the year when long hours were spent in the cornfield, observing, taking notes, and making pollinations. His preoccupation and enthusiasm for genetic research in no way diminished the force of his engaging personality. He had an indestructible sense of humor, an optimistic temperament, and a strong and sympathetic interest in his fellow man. His modest and unassuming manners were in sharp contrast to his stature and accomplishments in the field of genetics.

Born July 24, 1903, in Graham, Missouri, MARCUS spent his boyhood years in Downs, Kansas, and attended high school in Kansas City, Missouri. A brief exposure to surveying and forestry under the tutelage of his uncle led to an interest in botany. He enrolled in the University of Michigan, earning the B.S. degree

in 1927 and the M.S. in 1928. While at Michigan, he became acquainted with a young professor, E. G. ANDERSON. Invited by ANDERSON to attend his genetics seminar, RHOADES rapidly taught himself the basics of that science and developed a fascination for the logic and clarity of the laws of heredity. Continuing his graduate studies at Cornell with Professor R. A. EMERSON, RHOADES joined a distinguished group of maize geneticists which included BARBARA MCCLINTOCK, GEORGE BEADLE, L. F. RANDOLPH, GEORGE SPRAGUE and CHARLES BURNHAM. Prior to completing his studies at Cornell he spent a year (1929–1930) at Caltech as a teaching fellow to gain some experience in the genetics of the “other” organism, *Drosophila*. His tenure there and his association with giants of fly genetics such as T. H. MORGAN, A. H. STURTEVANT, C. B. BRIDGES and TH. DOBZHANSKY not only left a lasting impression and a broadened appreciation of the field but also led to the publication of two articles based on his research with *Drosophila*. RHOADES earned the Ph.D. in 1932 with a thesis entitled *The Cytoplasmic Inheritance of Male Sterility in Maize*. Graduating during the severe economic conditions of the great depression, he was forced to remain at Cornell for three more years as Experimentalist in Plant Breeding. In 1935 he moved to Ames, Iowa, where he was employed as Research Geneticist in the Division of Cereal Crops and Disease, Bureau of Plant Industry, USDA. His supervisor, MERLE T.

JENKINS, soon became aware of the exceptional ability of his new researcher and in 1937 he was promoted and transferred to the Arlington Experimental Farm in Virginia. RHOADES' career as a teacher commenced in 1940 when he accepted a position as Associate Professor at Columbia University. There he developed close personal and professional relationships with DOBZHANSKY, the SCHRADERS, FRANCIS RYAN and L. C. DUNN. MARCUS was appointed Professor in 1943 and remained at Columbia until 1948, when he accepted a Professorship in the Department of Botany at the University of Illinois in Urbana. During his 10 years in Urbana he taught courses in cytology and cytogenetics, supervised the theses of graduate students and actively pursued his research on the maize plant. Publication of several review articles brought him increased recognition, and scientists from Brazil, Portugal, Sweden, England and Yugoslavia came to work in his laboratory. In 1958 MARCUS RHOADES accepted an offer from Indiana University to chair the Department of Botany. He served as Chairman for 10 years while maintaining his research program, his teaching schedule, and the training of Ph.D. students in maize genetics. In 1974 he became Professor Emeritus when he reached the mandatory age of retirement.

MARCUS RHOADES was an inspiring teacher. His course on cytogenetics attracted considerable attention and was frequently audited by students and professors from universities as far as 50 miles distant. His complete absorption in his scientific work set a high standard for his students to emulate. He was usually the first to arrive in the laboratory and the last to leave. RHOADES never exploited students by assigning them problems intended to further his own research projects. In this regard he adopted the policy of his own professor, R. A. EMERSON. Students were given routine problems with the expectation that those of Ph.D. caliber would soon discover more interesting areas for their dissertations. If a student was mediocre, it did not matter what kind of problem he had. RHOADES' name never appeared on papers published by students completing their doctoral thesis research with him. A total of 26 students had the good fortune to receive their training in maize genetics under his tutelage.

MARCUS RHOADES had a long, productive and distinguished career in cytogenetic research. His studies were for the most part limited to maize as the research organism. Although his research dealt with theoretical aspects of heredity and was never directed to the solution of practical problems, some of his studies, such as those on cytoplasmic male sterility, eventually had a major impact on hybrid corn production. His pioneering study on the highly mutable gene system *Dotted* has become a classic in the genetic literature. The investigation of the *iojap* gene was a clear and

early example of an interaction between a nuclear gene and a cytoplasmic organelle, the chloroplast. The analysis of the abnormal chromosome *10* revealed its complex structure, its bizarre cytological behavior (induction of neocentromeres at knob regions) and its striking genetic consequences (preferential segregation). This was a major project of engrossing interest to him and it occupied a prominent place in his research for nearly 50 years. Much of his research was devoted to the role of the supernumerary heterochromatic B chromosomes. In certain backgrounds they were shown to cause dramatic increases in recombination while in other stocks they interacted with the heterochromatic knobs on the A set of chromosomes and were responsible for the delayed replication of the knobs and subsequent chromosome breakage at anaphase. Molecular evidence for delayed replication of knob DNA was obtained in a collaborative study with the laboratory of W. J. PEACOCK in Canberra, Australia. Highly mutable gene systems were always of major interest to MARCUS RHOADES. BARBARA MCCLINTOCK frequently visited his laboratory at Columbia University to discuss her revolutionary results with "jumping genes" and after he moved to Urbana, she kept him informed of the progress of her work with detailed and well documented expositions filling several notebooks. He was always a strong believer in the validity of her conclusions and the *Ac-Ds* mutable system was a major topic for discussion and laboratory exercises in his cytogenetics course. In the 1980s RHOADES resumed his studies on mutable genes and discovered a number of new transposable element systems. Much of this research was conducted in collaboration with his long time associate, ELLEN DEMPSEY.

RHOADES was a perfectionist. He accumulated a large amount of data from the long hours spent in laboratory and cornfield, but he published only the most important and significant results. He had a way with words and his papers were always comprehensive, logically presented and models of clarity.

From 1940 to 1948 MARCUS RHOADES was the Editor of *GENETICS* and he continued to serve on the Editorial Board from 1948 to 1966. He was also a member of the Editorial Boards of *Botanical Reviews*, *Advances in Genetics*, *Annual Review of Genetics*, *Cytologia*, *Caryologia* and the *Journal of Heredity*, in many cases serving for more than 20 years. He edited the first issues of the *Maize Genetics Cooperation News Letter* while still at Cornell, and assumed responsibility for the *News Letter* for many years with ELLEN DEMPSEY as co-editor.

MARCUS RHOADES was Vice-President and then President of the Genetics Society of America and President of the American Genetics Association. He served on review boards and planning committees for the National Science Foundation, the National Insti-

tutes of Health, the National Academy of Sciences, the U.S. Department of Agriculture, and the National Research Council. For 12 years he was a member of the Selection Committee for the Guggenheim Memorial Foundation. This proved to be a stimulating assignment; he enjoyed reading proposals from artists, musicians, economists, historians, mathematicians and chemists as well as those closer to his own interests, and he looked forward to the annual meeting in New York City attended by experts in a variety of fields. MARCUS RHOADES' contributions to scientific research were widely recognized. He was elected to the National Academy of Sciences in 1946 and to the American Philosophical Society and the American Academy of Arts and Sciences some years later. Among his many honors were the Certificate of Merit Award from the Botanical Society of America (1963), Foreign Fellow of the Royal Danish Academy of Sciences and Letters (1977), Thomas Hunt Morgan Award of the Genetics Society of America (1981) and Honorary Doctor of Science from Indiana University (1982). In 1958 he was invited to present the Jessup Lectures at Columbia University. His 70th birthday in 1973 was commemorated by a festschrift volume of *Theoretical and Applied Genetics* and on his 80th birthday in 1983 he was presented with a specially dedicated issue of *Maydica*.

MARCUS RHOADES is survived by his wife VIRGINIA (nee HATCHER) and two sons, MARCUS M., JR., and WILLIAM D. VIRGINIA was a native of North Dakota; she attended graduate school at Cornell where the couple met and were married. VIRGINIA relinquished

her own career to devote her energies to raising a family and providing a restful home atmosphere. A gracious hostess, she presided over many a dinner table filled with students or visiting scientists. MARCUS often referred fondly to his wife as "Frau" and the couple had a stable and long lasting relationship. In September of 1991 they celebrated their 60th wedding anniversary.

MARCUS RHOADES was a warmhearted person, unassuming, modest, gracious, and considerate of others. He was loved, admired and honored by colleagues, fellow scientists and all who knew him. Although always ready to open his door to a visitor, his chief pleasure was the study of the corn plant and he often expressed his gratitude for the opportunity to pursue a career which was really a delightful activity. He is remembered by his students for his friendly informality, his patient tutoring, his ready wit and the thoroughness and dedication with which he presented his lecture material. All of us who were his students look back with nostalgia to our student days when we enjoyed the hospitality and generosity of MARCUS and VIRGINIA RHOADES. He will be sorely missed.

In accordance with his wishes, upon his death there were no funeral or memorial services. His body was cremated with the ashes to be scattered over the cornfield.

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