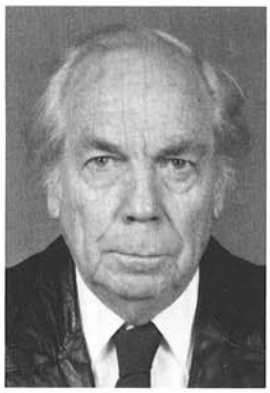
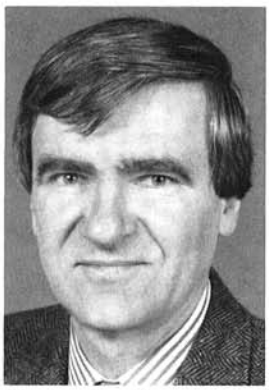
Ruth Allen Award

The Ruth Allen Memorial Fund was established in 1965 by gifts from the estate of Dr. Ruth Allen through the generosity of her heirs: Sam Emsweller, Mabel Nebel, Hally Sax, and Evangaline Yarwood. The award, consisting of a certificate and income from the invested fund, is given for outstanding contributions to the science of plant pathology.

John R. Edwardson, Ernest Hiebert, Dan E. Purcifull, and R. G. Christie



John R. Edwardson was born in Kansas City, Missouri, in 1923. He received B.S. and M.S. degrees from Texas A&M University in 1948 and 1949 and received a Ph.D. degree from Harvard University in 1954. He joined the Agronomy Department of the University of Florida in 1953 and was promoted to associate professor in 1960 and professor in 1966. Dr. Edwardson's research on cytoplasmically inherited male sterility led to cytological investigations of inclusions induced by viruses in different groups, particularly the potyviruses. Dr. Edwardson developed three-dimensional concepts for potyvirus inclusions and pioneered the concept, now generally accepted, that all viruses that induce cylindrical inclusions are potyviruses. His scholarly compilation of data on the potyviruses has been a key factor in potyvirus classification and identification and in the definition and organization of this large group of viruses. Dr. Edwardson is a fellow of the American Association for the Advancement of Science and has served as a member of the Plant Virus Subcommittee of the International Committee on Taxonomy of Viruses.



Ernest Hiebert was born in Rosenfeld, Manitoba, Canada, in 1941. He received a B.S.A. degree in plant science, with honors, from the University of Manitoba in 1964. His M.S. (1967) and Ph.D. (1969) degrees in plant pathology were completed under the direction of Dr. John Bancroft at Purdue University. He joined the Plant Pathology Department at the University of Florida in 1969 and was promoted to associate professor in 1974 and to professor in 1981. Much of Dr. Hiebert's research has focused on the molecular biology of the potyviruses. He developed procedures for the purification of numerous viruses and for the purification of the nonstructural proteins (cylindrical, amorphous, and nuclear inclusions) associated with potyvirus infections, an essential step for their subsequent characterization. His in vitro translation analyses of a number of different potyviruses with antisera prepared to the nonstructural proteins has revealed much of the organization and expression of the potyvirus genome. Several of Dr. Hiebert's students have also made outstanding contributions to the knowledge of potyviruses. He has served as a member and chairman of the Virology Committee and as associate editor of *Phytopathology*.

Dan E. Purcifull was born in Woodland, California, in 1935. He received B.S. and M.S. degrees in 1957 and 1959 and a Ph.D. degree in 1964, all from the University of California, Davis. In 1964, Dr. Purcifull was appointed assistant professor in the Department of Plant Pathology at the University of Florida, Gainesville. He was promoted to associate professor in 1969 and to professor in 1975. His research has focused on the development of immunodiffusion techniques for diagnosis and assessment of serological relationships of filamentous viruses, the characterization of viruses affecting vegetable, field, and fruit crops, the antigenic nature and relationships of potyviral inclusion body proteins, and the development of techniques for detection of potyvirus inclusion bodies. Dr. Purcifull has served as associate editor of *Phytopathology* and *Plant Disease*, as a member of the Plant Virus Subcommittee of the International Committee on Taxonomy of Viruses, and as a member of the APS Plant Virology Committee. He shared the Lee M. Hutchins Award in 1981 for his role in collaborative research on the development of serological procedures for detection and diagnosis of citrus tristeza virus and was named an APS Fellow this year.

R. G. Christie was born in Dunedin, Florida, in 1934. He received a B.S. degree from the University of Florida and began work in the Plant Virus Laboratory as a laboratory technician in 1960. He is now a biological scientist IV in the Department of Agronomy. He specializes in the cytology of plant virus infections and has developed innovative techniques for detecting and identifying plant virus inclusions with the light microscope. These techniques provided an essential assay for the purification of the potyvirus inclusions for which there were no biological assays. The light microscopic techniques developed by Christie are used to identify and distinguish the different cytoplasmic and nuclear inclusions produced by potyviruses and can be used as a practical, viable approach to potyvirus diagnosis. Hundreds of people have now been exposed to the world of plant virus inclusions in local, regional, national, and international workshops conducted by Christie. Interestingly, his brother Stephen (now deceased) also made important contributions to the potyvirus research effort at Gainesville.

J. R. Edwardson, E. Hiebert, D. E. Purcifull, and R. G. Christie are recognized for their innovative research on the potyviruses, the largest and economically most important group of plant viruses. They have pioneered methods for studying and characterizing nonstructural proteins, which have significantly influenced plant virology research and have fundamentally changed concepts of the potyviruses. Before their work, inclusion bodies associated with virus infections were considered viral aggregates or host responses to viral infection. Previous studies of viruses were limited to the nucleic acid and coat protein components. Typically, the coat proteins represented only about 10% of the coding capacity of the virion genome. The nominees' research identified and partially characterized four nonstructural proteins that represented about 70% of the potyviral genome and

predicted and mapped two other nonstructural proteins. These nonstructural proteins plus the coat protein and the VPg account for the entire coding capacity of the potyviral genome.

The nominees have worked together effectively by combining cytological, serological, and molecular approaches to achieve results not attainable by any single approach. The early cytological investigations of Edwardson and Christie showed cylindrical inclusions were uniquely and consistently associated with potyviruses and created the impetus for the molecular studies that followed. Edwardson compiled and organized the literature on potyviruses in monographs that are used worldwide; he defined key issues to resolve relationships in the potyvirus group. Christie developed and refined light microscopic techniques that were essential for monitoring cylindrical and nuclear inclusions during purification. Hiebert developed purification procedures for the structural and nonstructural proteins of potyviruses, demonstrated that limited proteolytic degradation of potyviral capsid protein was important in potyviral serological analysis, directly associated cylindrical, amorphous, and nuclear inclusions with the viral genome, and delineated a potyvirus gene map. Purcifull detected cylindrical inclusions and associated structures in leaf extracts by electron microscopy and then contributed essential serological studies of structural and nonstructural proteins on the basis of his expertise with the detergent-based immunodiffusion technique. This procedure allowed simple and reliable detection of structural and nonstructural viral proteins and provided valuable information on their relationships.

The purification of the cylindrical inclusions demonstrated that nonstructural proteins associated with plant virus infections could be studied and used in virus characterization. Serological studies of the purified inclusions indicated that the inclusions were virus-specific and unrelated to coat protein and normal host proteins. This was confirmed convincingly by in vitro translation analysis. Additional nonstructural proteins were identified and serologically characterized. The in vitro translation analyses have provided a detailed map of the potyviral genome and identified seven out of eight known genes on the genome. This indicated that the entire coding region of the genome was fully expressed and that all genes were synthesized in equimolar amounts via a polyprotein, which was subsequently processed. The inhibition of the proteolytic processing during in vitro translation by the small nuclear inclusion protein antiserum indicated this protein had a protease function. Thus, the study of the nonstructural proteins associated with potyviruses has led to an understanding of the organization and expression of the potyviral genome.

Dr. Hiebert's recognition that potyviral capsid proteins readily undergo limited proteolysis with a loss of unique serological determinants has been utilized in the preparation of highly specific potyviral antisera useful in potyvirus taxonomy. Sequence analyses of a number of potyviruses indicate that potyvirus capsid proteins differ primarily in 20–30 amino acid residues at the amino terminus, which can readily be lost by limited proteolysis during virion purification.

The research accomplishments of the nominees have been documented in numerous publications. Their cooperative interaction is reflected in more than 70 publications in which two or more of the nominees are co-authors. The research of the nominees has been cited in Markham's publication entitled, "Landmarks in Plant Virology: Genesis of Concepts" (Annu. Rev. Phytopathol. 15:17-39) and in Brakke's publication entitled, "Perspectives on Progress in Plant Virology" (Annu. Rev. Phytopathol. 26:331-350). Some of the technology generated by this research on potyviruses and potyviral nonstructural proteins has been summarized by Hiebert, Purcifull, and Christie in a paper entitled, "Purification and immunological analyses of plant viral inclusion bodies," published in *Methods in Virology Vol. 8*. Recognition of the increasing role of viral inclusions in virus detection and diagnosis is shown in Christie and Edwardson's feature article for *Plant Disease* (April 1986), "Light microscopic techniques for detection of plant virus inclusions." Edwardson and Christie have also just published a four volume monograph on the potyviruses.

The technology developed by the nominees for inclusion studies is widely used by other workers. Their efforts have contributed not only to basic knowledge of the potyviruses and stimulated potyvirus research worldwide, but have fundamentally improved potyvirus diagnosis and disease control. The validity of diagnosis of potyviruses on the basis of cytological characteristics of inclusions originally proposed in 1966 has been confirmed, and the nominees are actively continuing their highly productive cooperative research on potyviruses at Gainesville.