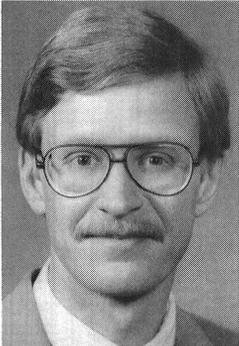


# Ruth Allen Award

The Ruth Allen Memorial Fund was established in 1965 by means of 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.

## Paul G. Ahlquist



**Paul G. Ahlquist** was born in Des Moines, IA. He received a B.S. degree in physics in 1976 from Iowa State University. In 1981 he completed his Ph.D. degree in biophysics at the University of Wisconsin-Madison under the direction of Dr. Paul Kaesberg. He then joined the Biophysics Laboratory as an assistant scientist until 1984 when he accepted a joint position as assistant professor with the Department of Plant Pathology and the Institute for Molecular Virology. He was promoted

to associate professor in 1987. His research and teaching programs are in the areas of plant molecular virology and disease physiology.

Dr. Ahlquist is nationally and internationally known for his research on the molecular genetic analysis of gene functions and their regulation in plant RNA viruses, particularly brome mosaic virus (BMV) and cowpea chlorotic mottle virus (CCMV). He has made contributions to an understanding of mechanisms of virus replication, gene expression and regulation, host specialization, short-term genetic variation, and long-term evolution.

As an initial phase of this research, he and his research associates have completely sequenced the RNA of two multicomponent viruses, BMV and CCMV. Since RNA is not amenable to direct genetic engineering as is DNA, Dr. Ahlquist and colleagues were the first to develop an *in vitro* transcription system for obtaining

infectious RNA from cloned cDNA of the RNA viruses. These techniques allow the direct genetic manipulation of RNA viruses, and they are becoming a central approach in many research laboratories that are working on the genetic and functional analysis of RNA viruses.

Genetic engineering of BMV has allowed Dr. Ahlquist and colleagues to construct and replicate designed variants. This has led to the definition of an origin of replication for plant RNA viruses and sequences responsible for the transcription of subgenomic viral mRNAs. Virus mutants expressing multiple novel subgenomic RNAs have been produced using these sequences responsible for transcription. In collaborative studies by colleagues at the University of Wisconsin-Madison, Cambridge University, and the California Institute of Technology, extensive comparisons of RNA and protein sequences were completed for several RNA viruses. These comparisons revealed striking relationships among a number of superficially dissimilar plant viruses and also between plant and animal RNA viruses.

The deletion analyses of BMV and virus evolution studies suggested that many RNA virus genomes can be largely described as assemblies of separable functional modules that have been reassorted in evolution. Consequently, it should be possible to engineer the insertion and expression of functional genes from heterologous viral and nonviral sources into an RNA virus. This has led to the construction of hybrid viruses and vectors for plant transformations. One set of hybrid viruses constructed contained the tobacco mosaic virus (TMV) coat protein sequences and the assembly origin sequences inserted in BMV RNA3. This hybrid RNA is replicated in protoplasts and is packaged in TMV coat protein in short rods rather than the usual BMV icosahedral

particles. Similar approaches were used to construct the first RNA virus gene expression vector. This vector has expressed selected bacterial genes in barley protoplasts and leaves.

Adaptation of viruses to specific hosts is being studied by construction of hybrid viruses between BMV and CCMV, which infect monocotyledonous and dicotyledonous plants, respectively. The results obtained to date by Dr. Ahlquist and his associates indicate that systemic infection requires host-specific adaptation of multiple viral genes.

Dr. Ahlquist's awards include the Presidential Young Investigator Award from the National Science Foundation, the Shaw Scholar Award of the Milwaukee Foundation, and the G. S. Pound Research Award from the College of Agricultural and Life Sciences, University of Wisconsin-Madison.

Dr. Ahlquist currently serves as associate editor for the journals *Molecular Plant-Microbe Interactions*, *Plant Molecular Biology*, and *Virology*, and he is a member of the Executive Committee of the International Commission for Taxonomy of Viruses.