

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.

Salomon Bartnicki-Garcia



Charles E. Bracker



Jose Ruiz-Herrera



Three investigators jointly share the 1983 Ruth Allen Award for their collaborative and independent investigations that led to the discovery and elucidation of chitosomes and their function. They are **Dr. Salomon Bartnicki-Garcia**, professor of plant pathology, University of California at Riverside; **Dr. Charles E. Bracker**, professor of plant pathology, Purdue University; and **Dr. Jose Ruiz-Herrera**, professor and head, Institute of Experimental Biology, University of Guanajuato, and professor of the Center of Investigations and Advanced Studies at the National Polytechnic Institute, Mexico. Their work represents a fundamental contribution to the understanding of cell wall formation in fungi, and a radical departure from prior ideas.

The work has identified chitosomes as subcellular microvesicles containing the enzyme chitin synthetase. Chitosomes are considered cytoplasmic containers and conveyors of chitin synthetase en route to sites at the cell surface where they function in synthesizing cell wall fibrils. Moreover, these investigators made the revolutionary discovery that chitosomes are capable of synthesizing fibrils of native chitin *in vitro*—the first subcellular biological structures shown to be capable of synthesizing a cell wall microfibril *in vitro*. Inasmuch as studies of cell wall formation have been hindered by lack of a system that could function *in vitro*, the discovery and characterization of chitosomes was a major breakthrough. It provides a unique opportunity for conducting concurrent biochemical and ultrastructural studies on synthesis of the fungal cell wall, the form-determining structure of the fungi and often the first site of their interaction with their hosts and with their environment. The contributions of these investigators and the

potential ramifications therefore underlie our understanding of such fundamental problems as fungal growth and morphogenesis, and of host interaction and chemical control in the pathogenic fungi.

Bartnicki-Garcia's main research area has been in fungal physiology, with an overriding interest in mechanisms of cell growth and morphogenesis. He began by studying environmental control of the yeast-mold dimorphism in *Mucor*. His work on fungal dimorphism led him to investigate the chemistry and organization of cell walls and the important roles of cell walls in development. These studies also generated the now classic synthesis of the relationship of cell wall composition to taxonomy and phylogeny of fungi. His work has included characterization of cell wall polymers and storage carbohydrates, discovery of the mechanism of adhesion of fungal zoospores to host surfaces, and more recently biosynthesis of cell wall polymers including chitin, glucans, and chitosan.

Bracker, a cell biologist trained in plant pathology, focused his efforts on developmental ultrastructure—especially in the fungi. His early studies revealed the structure and development of fungal septa, host-parasite interactions, and detailed analyses of reproductive development in fungi. Among Bracker's most important contributions are landmark investigations of spore formation and germination, hyphal tip organization, and of endomembranes in fungi. These findings were the basis for a generalized model for hyphal tip growth in fungi involving the coordinated functioning of cytoplasmic vesicles and other endomembranes. He has continued to study the roles of cell

membrane systems in morphogenesis through his research on isolated and in situ cell components from fungi, culminating in the chitosome research which is still ongoing.

Ruiz-Herrera, a microbial biochemist, has worked extensively on both bacteria and fungi. His early work was on microbial transformations of steroids and respiratory metabolism, and in the 1960s his interest in metabolism intensified his concern with enzymology. This developed into a primary emphasis on the enzymatic organization of cell membranes and the cell wall. Through his use of mutants as well as direct analysis and experimental manipulation, he generated critical information on enzyme properties and regulation. He has demonstrated and purified membrane-bound and wall-bound anabolic and catabolic enzymes, and in a quest to tie biosynthetic processes to morphogenesis he developed his program on synthesis of cell wall polysaccharides.

Dr. Bartnicki-Garcia was born May 18, 1935, in Mexico City, where he received his M.S. at the National Polytechnic Institute before earning the Ph.D. degree at Rutgers University. He has held academic appointment at the University of California at Riverside since 1962, where he became associate professor in 1968 and professor in 1971. Dr. Bracker was born February 3, 1938 in Port Chester, NY, and received B.S. and Ph.D. degrees at the University of California at Davis. Since then he has worked at Purdue University, receiving promotion to associate professor in 1968 and to professor in 1973. Dr. Ruiz-Herrera was born May 12, 1935 in Mexico City. He obtained the M.S. at the National Polytechnic Institute in Mexico and received a Ph.D. degree at Rutgers University. Since then he has held academic appointments at the

National Polytechnic Institute in Mexico City, and is currently professor and director of the Institute of Biological Investigations at the University of Guanajuato.

These three investigators are individually recognized worldwide for their contributions. Bartnicki-Garcia has received the New York Botanical Garden Award, Distinguished Alumnus Award-National Polytechnic Institute, Mexico, and Annual Lecturer-Mycological Society of America. Bracker was awarded The Sigma Xi Faculty Research Award at Purdue University in 1981, and one of his publications was named a "Citation Classic" by the Institute of Scientific Information in 1977. Ruiz-Herrera received the National Award of the National Academy of Scientific Investigation, Mexico, in 1974, and was named Distinguished Alumnus by the National School of Biological Sciences in 1978. All three have served their professional societies and journals. Ruiz-Herrera served as president of the Mexican Association of Microbiology and is now vice-president of the Mexican Society of Biochemistry. Bartnicki-Garcia and Bracker helped co-found and served as senior editors of the international journal *Experimental Mycology*. Each has given numerous invited lectures and symposia around the world, and been responsible for organizing symposia at national and international meetings.

When the paths of their independent research programs covered in the early and mid 1970s, these three investigators forged a collaboration and comradeship that brought their diverse talents and viewpoints to bear on a single goal. Their joint effort in assembling the information on which they have based present understanding of chitosome structure and function is exemplary of the ideals of collaboration and coordination in scientific research.