Lee M. Hutchins Award

The Lee M. Hutchins Fund was established in 1979 by means of gifts from the estate of Dr. Lee M. Hutchins. The award, consisting of a certificate and income from the invested fund, is made for the best contribution to basic or applied research on diseases of perennial fruit plants (tree fruits, tree nuts, small fruits and grapes, including tropical fruits but excluding vegetables). The results of the research must have been published in an official journal of the Society.

Roger C. Pearson and David M. Gadoury

Roger C. Pearson was born in Kingsburg, CA, in 1946. His association with agriculture began early in life on his family's small farm, where they raised grapes and peaches. He received his B.S. degree in biological sciences and M.S. and Ph.D. degrees in plant pathology from the University of California at Davis in 1968, 1969, and 1973, respectively. After working as a research associate for two years at Cornell University's Hudson Valley Laboratory, he was appointed assistant professor of plant pathology in 1975. In 1977, Dr. Pearson moved from the Hudson Valley Laboratory to the New York State Agricultural Experiment Station at Geneva and changed the emphasis of his research program from diseases of tree fruits to diseases of grapes. He was promoted to associate professor in 1981 and professor in 1990.

Dr. Pearson and co-workers in his research and extension program consistently attack problems and produce results that are of great use to plant pathologists and farmers. Examples include determination of the temperature and moisture requirements for teliospore germination, basidiospore formation and release, and infection of apple by the cedar apple rust pathogen, *Gymnosporangium juniperi-virginianae* and the identification of the critical period for infection of grape berries by *Phomopsis viticola*. Pearson identified a new disease of grapevine, angular leaf scorch, caused by a previously undescribed fungus (*Pseudopezicula tetraspora*), and conducted the first studies of the epidemiology of this disease. He has also contributed significantly to the understanding and control of grape diseases caused by *Eutypa lata* and *Botrytis cinerea*. Pearson's knowledge of control of grape diseases, his close collaboration with grape pathologists throughout the world, and his service as an author and coeditor of the APS "Compendium of Grape Diseases" exemplify his devotion to plant pathology and the grape industry.

David M. Gadoury was born in Providence, RI, in 1954, and was raised in Scituate, one of the few remaining rural areas of the state. He received the B.S. degree in agricultural technology from the University of Rhode Island in 1978 and M.S. and Ph.D. degrees in botany from the University of New Hampshire in 1981 and 1984, respectively. Dr. Gadoury remained at the University of New Hampshire as a research associate until 1985 and then joined Pearson's program at Geneva. At Geneva he assumed major responsibilities in Pearson's ongoing study of the biology and ecology of *Uncinula necator* and the epidemiology of grape powdery mildew. In 1990 he joined Dr. Robert Seem's research program on the epidemiology of fruit diseases and was promoted to research associate III.

Gadoury has specialized in the study of plant pathogens during the intercrop period and in the development, survival, and dispersal of primary inoculum. Gadoury is best known for his work, in collaboration with Dr. William MacHardy at the University of New Hampshire, on the apple scab pathogen, *Venturia inaequalis*. This work has ranged from very pragmatic descriptions of techniques for the assessment of ascospore maturity to seemingly esoteric studies of geotropism in ascocarp formation. Over a period of 10 years, Drs. Gadoury and MacHardy (and several cooperators) assembled each piece of new information to develop a management program for apple scab that has had a major impact upon the control of this disease in the northeastern United States. In recent years, he has worked to integrate the disease and insect management programs for apples and to develop a unified program to simultaneously control the major fungal diseases of grape.

Drs. Pearson and Gadoury are both recognized for their work on the role of cleistothecia of *U. necator* in the epidemiology of grape powdery mildew (*Phytopathology* 77:1509-1514). Many previous investigations had indicated that ascocarps were often nonfunctional and were of minor or no importance in the epidemiology of this disease. Although the winter survival of *U. necator* in dormant infected buds is common in most other viticultural regions, Drs. Pearson and Gadoury could not confirm its occurrence in New York, nor did the spatial pattern of epidemics of grape powdery mildew fit the focal pattern of disease that would be expected to arise from "flag shoots," the result of this form of overwintering. Instead, they found the first infections on the undersides of leaves near the trunk of the vine. An examination of bark from grapevines revealed the presence of viable cleistothecia trapped in bark crevices. Further studies demonstrated that ascospores from these cleistothecia were infectious and that airborne ascospores of *U. necator* were present in vineyards before the detection of conidia.

Gadoury and Pearson subsequently found that cleistothecia were selectively dispersed by rain to the bark of the vine as they matured (*Phytopathology* 78:1413-1421). Initially, the ascocarps are attached to the mildew colony by anchorage hyphae, which necrose as the cleistothecium reaches morphological maturity. This allows the mature ascocarps to be dispersed by rain to their winter residence on the bark of the vine. At leaf fall, most cleistothecia remaining upon mildew colonies on leaves, canes, and rachises are immature and die during winter. Heterothallism of *U. necator* from grapevine was demonstrated, and the relationship between disease incidence and the probability of pairing of compatible mating types was shown to be the principal determinant of when ascocarps form in vineyards.

The mechanism of ascocarp dehiscence and ascospore discharge was reported by Drs. Pearson and Gadoury in *Phytopathology* 80:393-401. Cleistothecia would only dehisce when a circumscissile thin zone developed in the wall of the overwintered ascocarp. The thin zone in the ascocarp wall developed as lipids in the cytoplasm were metabolized during overwintering and the water potential of the ascospore cytoplasm decreased. Unlike other ascomycetes, conversion of glycogen did not appear to be involved in ascospore discharge. This work not only reported on the mechanism of dehiscence and spore release but also described the relationship between rainfall, temperature, and ascospore discharge.

Although free water was required for ascocarp dehiscence and ascospore release, previous reports had often noted that ascospores frequently burst in water. Drs. Gadoury and Pearson showed in *Phytopathology* 80:1198-1203 that the water potential of ascospore cytoplasm changed substantially during overwintering and that changes in water potential and strength of the ascospore wall were correlated with the ability of the ascospores to survive, germinate, and infect leaf surfaces. They also found that germination of naturally released ascospores was favored by saturated atmospheres and free water. Thus, unlike its xerophytic anamorph, the teleomorph of *U. necator* was dependent upon rain events for release of inoculum, and infection was favored by those conditions most likely to follow rain. This work also established the fundamental temperature and moisture conditions for germination of ascospores and infection of grape by ascospores of *U. necator*.

The impact of this research upon management programs for grape powdery mildew was significant and has also led to several other investigations. The presence of a functional sexual stage of *U. necator* has important implications in regard to pathogenic specialization, in breeding for disease resistance, and in the development of resistance to fungicides. The identification of ascocarps on the bark of the vine as the sole source of primary inoculum in New York vineyards has led to treatments that have successfully eradicated the overwintering inoculum in dormant vineyards and greatly delayed the development of powdery mildew epidemics. Drs. Pearson and Gadoury have applied their findings on ascocarp dehiscence and ascospore discharge, germination, and infection to develop forecasting systems for primary infection by *U. necator*. Finally, the selective dispersal of mature ascocarps to secondary substrates in *U. necator* may prove to be a model system for the survival of cleistothecia of powdery mildews of several deciduous perennial hosts.