IN MEMORIAM

Norman Walter Frazier
Lecturer and Entomologist, Emeritus
Berkeley
1907 — 2001

Norman W. Frazier, a native son born in Berkeley on January 28, 1907, died at the age of 94 in a rest home at Davis, California, on May 29, 2001. He spent his early years on the family ranch at Glen Ellen, and in his teens, he returned to the Bay Area to live with his father, a practicing dentist. He graduated from University High School in Oakland in 1924 and entered the University of California, Berkeley as a major in economics. Both a student and musician, he played trumpet in the Marching and the Straw Hat Bands. In 1927, he withdrew from the University to work in a variety of jobs: playing in a local dance band, clerking for The Mercantile Trust Co., and advertising Hills Brothers' Coffee. In 1933, he returned to Glen Ellen to help his brothers operate the ranch. He came back to UC Berkeley in 1935, majored in entomology and completed his formal education with successive B.S. (1938), M.S. (1939) and Ph.D. (1943) degrees.

By 1935, vineyards in the San Joaquin, Sonora and Napa Valleys were increasingly threatened by a serious outbreak of the historic lethal Pierce's or Anaheim disease of Southern California. Its etiology was unknown, but was assumed to be viral. Special funds were appropriated by the State Legislature and a multi-disciplinary Davis- Berkeley research committee was formed. As part of this research effort, Norm Frazier, upon completion of his B.S. degree, was appointed a technical assistant in the Department of Entomology at Berkeley to work closely with Professors W. B. Hewitt, Department of Plant Pathology, UC Davis, and J. H. Freitag of the Berkeley faculty in entomology. Norm's major responsibility was to search for a vector of the disease, and his successful effort was the subject of his doctoral thesis. He observed disease concentrations around light traps used to monitor insect activity, and his subsequent testing of trapped candidate insects demonstrated that several species in a subgroup of leafhoppers, the "sharpshooters," all were vectors. In 1941, plant pathologists at UC Davis reported a spatial correlation between Pierce's disease and alfalfa dwarf, a previously described disease of another major crop in the San Joaquin Valley. Norm used vector transmission tests between and among grapes and alfalfa plants to demonstrate their common etiology.

Upon obtaining his Ph.D. degree, Norm was appointed junior entomologist in the experiment station and continued his field research on the biology and ecology of sharpshooter vectors at Woodlake, California, where he lived on a commercial vineyard used for Pierce's disease investigations. His extensive field collections of sharpshooters, and the identification of their host plants, formed the basis for laboratory work at Berkeley that showed the disease had a wide host range, though largely symptomless, among plants, and that it was transmitted by any tested xylem- feeding insect. Interestingly, Pierce's disease, now known to be caused by a fastidious xylem- inhabiting bacterium, is once again a major threat to grapes in southern California because of an introduced sharpshooter vector species whose breeding hosts include grape.

Norm returned to the Berkeley campus in 1947 and became an international authority in the transmission and identification of the complex of virus diseases affecting the world's commercial clones of strawberry. These studies consumed his attention even after his retirement in 1974, when he moved to Davis. There he was appointed a research nematologist, consultant, in the Department of Nematology and continued greenhouse investigations on the strawberry. In addition, he volunteered to help with curatorial work on the leafhopper collection of the Bohart Museum of Entomology.

Norm was one of a rare group of scientists who combined the keenest of field observations with both field and laboratory experimentation. His experimental work with strawberries was such that few of his colleagues would have either the patience or persistence needed to cross, inoculate, select, and clone a series of Fragaria indicator plants to separate the bewildering variety of virus combinations. This was essential, for many of the diseases exhibit only obscure or nonspecific symptoms of decline when infecting commercial strawberry varieties. In recognition of his work, the 1987 U. S. Department of Agriculture Handbook, Virus Diseases of Small Fruits, was dedicated to Norman Frazier. The handbook was a revised version of the 1970 Virus Diseases of Small Fruits and Grapevines, published by the UC Davis Division of Agricultural Sciences, and to which Norm contributed, as well as edited.

Two other examples of Norm's ability as a naturalist can be given. First, during the post- World War I period, California's sugar beet industry was devastated by the curly top disease transmitted by only one leafhopper, Eutettix tenellus, a species whose systematic placement was uncertain. The disease remains a problem to this day. When the suggestion was made in 1948 that the vector was in fact a Circulifer species of Mediterranean origin, interest in biological control possibilities was renewed. First, the species had to be found in the Mediterranean region. Norm, while not considered an expert on either curly top or leafhopper systematics, was asked to survey for the species in suspect regions of Spain and North Africa. This was in recognition of his observational reputation and skills in leafhopper collecting. Among the specimens he collected were individuals that apparently were C. tenellus, and his work led to a revision of the genus Circulifer. Personnel associated with the Berkeley Biological Control Quarantine Laboratory later collected and shipped live specimens from North Africa to that facility, and cooperative cross- breeding and transmission tests show the California and North Africa C. tenellus leafhoppers were the same. Curly top disease itself was later found in the Mediterranean region. Second, in 1956, while on sabbatical in England and cooperatively engaged in research on strawberry virus diseases, he collected and demonstrated the vector of green petal disease, the first instance of leafhopper- transmitted plant disease to be found in Britain.

Norm had a hearing deficiency. It was extremely difficult for him to engage in group conversation, but on a one- on- one basis he was open, enthusiastic, cheerful, sharing and cooperative. For much of his career, five faculty members had their research base in a greenhouse complex at Berkeley, where he and two others also kept offices. He preferred to work alone, spending his days wearing a characteristic apron, bending over his greenhouse benches in meticulous cultivation, selection and cloning of candidate disease- indicator plant seedlings. Vectors, mechanical inoculation, grafting, cross- protection and interaction tests, and symptomatology, all were used to segregate, isolate and identify the viruses and their complexes. Finally, there was writing for publication and his bibliography contains almost 100 entries. Norm did all his own work. To him, experience had shown that it was necessary to constantly work and rework procedures of soil preparations, planting and grafting to achieve his research goals. His passing has meant not only the loss of a valued colleague and friend, but that of an unequaled naturalist who added balance and wisdom to his department, college and university. He is survived by his wife Marian, daughters Jean Gravning in North Dakota and Barbara Holderreed, with grandchildren Stephanie and Michael at Davis.

Woodrow W. Middlekauff
Edward S. Sylvester
Yoshinori Tanada