

## IN MEMORIAM

### Abraham Fleminger 1925–1988

Abraham Fleminger's scientific career was a partnership with his copepods, focused on causes and manifestations of the differentiation of species. Abe was born in New York City 63 years ago. He died on January 13, 1988, after a long and difficult, up-and-down bout with kidney failure. He worked with vigor in his laboratory until the last days. His accomplishments in systematics, zoogeography, and ecology were fundamental—consistently framed in the broad picture of phylogeny and evolution. He was forever generous in sharing insights when he and his colleagues grappled with differing views of the shapes and ways of crustaceans in the vast ocean.

Abe Fleminger came to the Marine Life Research Program at Scripps in 1960 after a period of zooplankton research with the National Marine Fisheries Service in Galveston, Texas. He had earned graduate degrees at Harvard, stimulated and challenged—but not molded—by the provocative evolutionary biologists E. O. Wilson and Ernst Mayr. Speciation processes in the calanoid copepods had captured his attention, never to let go.

The first Fleminger papers were a series of species descriptions tackling gaps and confusion in knowledge of calanoid families including Euchaeidae, Stephidae, and especially Pontellidae in the Gulf of Mexico. Biogeographical evidence was a regular part of his means of arriving at taxonomic conclusions. Abe was impatient, even then, with ecologists who were less than exacting when distinguishing and labeling reproductively distinct populations.

As details of distributions were worked out, Abe became fascinated by the role of population interactions in enhancing morphological differentiation. He was the first to recognize that character displacement in reproductive structures of closely



related zooplankton species is a key mechanism in differentiation, appearing when there has been geographical reassociation of young species pairs.

A series of works on species and species groups within the pontellid genus *Labidocera* around the rims of the world's oceans became Abe's most compelling and satisfying endeavor. As this study evolved together with his understanding of variation among coastal environments, he became increasingly successful in predicting places where specific differentiation remained to be discovered. This led to the finding of a "species swarm" in the Caribbean, and of ordered groups in the Indian Ocean and in home waters along the west coast of North America. A study of speciation in the Indo-Australian archipelagos concluded that long-term,

local sea-temperature anomalies may well have established Wallace's Line.

Abe pioneered the study of minute integumental organs, called supernumerary pores, in copepods, recognizing the relationship of their sensory function to species-specific arrangements in *Eucalanus*. He used these organs to distinguish a recently evolved species of *Calanus* in the Black Sea and its relationship to Mediterranean species. His discovery of environmentally induced sex reversal in certain calanoid species has prompted a rethinking of aspects of their population biology.

Abe Fleminger's voyages carried him from the California coast to the Caribbean, to the Eastern Pacific Ocean and the archipelagos of the Indo-Pacific regions. He also served as an adviser on marine studies for several nations through UNESCO and other international agencies and universities. He was curator of the Scripps Institution's zooplankton collections—the most exten-

sive and diverse in the world, in part because they include the CalCOFI samples. He also served as editor of the CalCOFI atlas series.

Abe's gift of enthusiasm for the curiosity of students and colleagues and for worthwhile questions helped develop ideas and careers. He was not nominally a teacher, but young and old students of copepods gravitated to his laboratory from many lands. Discussions there sometimes called to mind the Tower of Babel, with Chinese, Japanese, Spanish, and German accents in spirited competition. By the end, though, information and ideas had been exchanged and knowledge generated.

A colleague has observed that now that Abe is gone the available information on copepods is vastly reduced, but we will have to muddle through as best we can. We are in debt for his humanity and for his scientific life.

*Edward Brinton*