New frontiers in functional morphology of molluscs: A tribute to Drs. Vera Fretter and Ruth Turner

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Abstract: The symposium “New Frontiers in Functional Morphology of Molluscs” was held at the second World Congress of Malacology in Vienna, Austria, in August 2001. The symposium honored Drs. Vera Fretter and Ruth Turner, two outstanding women scientists who made significant contributions to the study of form and function of molluscs and played important roles in laying the groundwork for a growing field of research in functional morphology. The goals of the symposium were to focus attention on the vast potential of the use of molluscs as model systems in the study of form and function and to provide a forum for presenting new ideas and approaches and for proposing directions for future study. Symposium topics ranged from the processes of feeding in bivalves and gastropods to the biomechanics of byssal threads. These papers represent some of the diversity of research goals and methods in the field today and, it is hoped, will rejuvenate the field among the international community of malacologists.

Key words: Symposium, Form and Function

The study of form and function has been fundamental to the development of major areas of biological science, from medicine, physiology, and biomechanics, to ecology and evolution. The overwhelming complexity of bio study, presented obstacles to comprehensive understanding of function. Recently, important contributions to the understanding of functional morphology have been made by the comparative study of groups of organisms that are diverse but that share unifying structures at their basic levels of organization. One such group of model organisms is the phylum Mollusca.

Two women scientists, Drs. Vera Fretter and Ruth Turner, were pioneers, making significant contributions to the study of form and function of molluscs and playing important roles in laying the groundwork for this growing field of research. Both were also outstanding role models for women in science.

Dr. Vera Fretter (1905-1992) is best known for her outstanding contributions to our understanding of functional morphology of the “prosobranch” gastropods. She dedicated her career to understanding the relationships between morphology, function, and the fitness of species in different habitats. With her mentor, Alastair Graham, she produced the key reference on gastropods, British Prosobranch Molluscs, published by the Ray Society in 1962 and republished after her death (Fretter and Graham 1962, 1994). She published other key books on the functional morphology of molluscs and numerous papers on the biology, form, and function of a wide range of gastropods. In addition, she was a teacher and mentor to several generations of students, many of whom have become leaders in malacology. Dr. Fretter’s life and scientific contributions have been summarized by Graham (1993), Chatfield (1993), and Morse (2003).

Dr. Ruth Dixon Turner (1914-2000) was the world expert on boring bivalve molluscs, the Pholadidae and the Teredinidae (shipworms). She was a dedicated teacher, a skilled dissectionist, and excellent illustrator. Dr. Turner was the first woman scientist to use the Deep Submergence Research Vehicle ALVIN to study the deep sea and was honored by the Woods Hole Oceanographic Institution as a “Woman Pioneer in Oceanography.” Her works include detailed descriptions of shipworm anatomy and boring, as well as notes on techniques in anatomical work and the use of cinephotomicrography in the study of form and function. Dr. Turner was an Honorary Life member of the American Malacological Union beginning in 1981 and served a term as Honorary President of the American Malacological Union (from 1997 until her death in 2000). Over the course of her career, Dr. Turner was a mentor to hundreds of students.
Several authors have honored the life and contributions of Dr. Turner (Abbott 1973, 1987, Downing 1983, Boss 1989, Weber and Thurman 1991, Anonymous 2000, Buckley 2000, Mann 2000, Martin 2000, Morse 2003). In 2001 a symposium at the second World Congress of Malacology (Vienna, Austria) was held not only to honor the past contributions and accomplishments of these two outstanding scientists, but also to look to the future. The following papers in this issue were inspired by this symposium.

An established researcher who knew Drs. Vera Fretter and Ruth Turner, M. Patricia Morse, started the symposium with a tribute to their lives and studies. This tribute was followed by contributions from younger scientists working in a variety of subdisciplines who have demonstrated the ability to take the field of molluscan functional morphology into innovative new directions. Our goal was to focus attention on the vast potential of the use of molluscs as model systems in the study of form and function by providing a forum for putting forward new ideas and proposing directions for future study. Symposium topics ranged from the feeding processes of bivalves and gastropods to the mechanical design of byssus, and served as the starting point for a lively discussion forum. These papers represent some of the diversity of research objectives and methods in the field today. Our hopes are that these contributions will draw attention to the study of functional morphology of molluscs and rejuvenate the field among malacologists.

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LITERATURE CITED


SELECTED LIST OF PUBLICATIONS – VERA FRETTER

Fretter, V. 1946. The genital ducts of Theodoxus, Lamellaria and Trivia, and a discussion on their evolution in the prosobranchs. Journal of the Marine Biological Association of the United Kingdom 26: 312-351.


SELECTED LIST OF PUBLICATIONS – R. D. TURNER


Turner, R. D. 1966. Implications of recent research in the


of Calliostoma occidentale, a coelenterate-associated proso-

phytoplankton in the diets of adult and larval shipworms,

Turner, R. D. and J. L. McKoy. 1979. *Bankia nettai* n. sp. (Bivalvia:
Teredinidae) from Australia-New Zealand, and its relation-

Hoagland, K. E. and R. D. Turner. 1980. Range extension of ter-
edinis (shipworms) and polychaetes in the vicinity of a tem-
perate-zone nuclear generating station. *Marine Biology* 58: 55-
64.

Boss, K. J. and R. D. Turner. 1980. The giant white clam from the

Larval dispersal of a deep-sea hydrothermal vent bivalve from

culture competitive interactions on growth of *Teredo navalis*.
*Biological Bulletin* 159: 465.

Turner, R. D. 1981. Wood islands and thermal vents as centers of
diverse communities in the deep-sea. *Biologia Morya* 1: 3-10,
[in Russian]

aspects of wood consumption, growth, and reproduction in the
shipworm, *Lyrodus pedicellatus* Quatrefages (Bivalvia: Teredinidae). *Journal of Experimental Marine Biology and
Ecology* 52: 63-76.

Preliminary observations of bacteria and shipworms

Hoagland, K. E. and R. D. Turner. 1981. Evolution and adaptive radia-
tion of wood-boring bivalves (Pholadacea). *Malacologia* 21:
111-148.


nitrogen-fixing bacterium cultured from the gland of Deshayes

Turner, R. D., Y. Yakovlev, and E. M. Karaseva. 1983. Some aspects of the

Calloway, C. B. and R. D. Turner. 1983. Documentation and implica-
tions of rapid successive gametogenic cycles and broods in the

progress and future directions. In: J. D. Costlow and R. C.
Tipper, eds., *Marine Biodeterioration: An Interdisciplinary
Study*. Naval Institute Press, Annapolis, Maryland. Pp. 3-16.

Turner, R. D. 1984. Some aspects of the life history of *Zachsia zenke-


and dispersal at deep-sea hydrothermal vents. *Science* 226:
1451-1454.


1986. Larval ecology of mollusks at deep-sea hydrothermal

Williams, A. B. and R. D. Turner. 1986. Squat lobsters (Galantheidae:
Munidopsis) associated with mesh-enclosed wood panels

recruitment of marine invertebrates to hard substrates on
George's Bank and the eastern continental shelf of the United

marine invertebrates to hard substrates at deep-sea hydrothermal
vents on the East Pacific Rise and Galapagos spreading center.
*Deep-Sea Research Part A - Oceanographic Research Papers* 35:
1833-1849.

Turner, R. D. 1988. Wood, phytoplankton, dissolved organic materi-
al and nitrogen in teredinid nutrition (Mollusca: Bivalvia: Teredinidae). In: M. F. Thompson and N. Tirmizi, eds., *Marine
Science of the Arabian Sea, Proceedings of the International


Conway, N. M., B. L. Howes, J. E. Capuzzo, R. D. Turner, and C. M.

A new genus and five new species of mussels (Bivalvia, Mytilidae) from deep-sea sulfide/hydrocarbon seeps in the

Marine biodeteriorogenic organisms - I. *Lignicolus fungi* and bacte-
ria and the wood boring mollusca and crustacea [Reprinted].

Turner, R. D. 2002. On the subfamily Xylophagainae (family

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