Bilaterian animals in distantly related groups extend their bodies via growth from a posterior generative zone. This phenomenon is referred to as terminal addition (which should not be confused with Haeckel’s use of the same term for successive evolutionary additions the end of ontogeny). Segmentation often renders terminal addition morphologically explicit, permitting examination on a morphologic basis in certain fossil groups. However, terminal addition is also a developmental process that can be investigated with the powerful molecular tools now at hand. Thus, this process can be approached both through classical comparative morphology and incisive unraveling of molecular mechanism. When placed in phylogenetic context such information should provide the investigative power to unravel the evolution of developmental systems.

The differences in early development between different animals are often emphasized and these contribute to the recognition of distinct phyla and superphyletic groupings within the Bilateria. However, it is now generally accepted that the bilaterian axis is homologous. This implies that in the ancestral bilaterian this axis must have had a mechanism of formation, and that the diverse set of axial specification and elongation mechanisms present among modern bilaterians evolved from this initial mechanism. Terminal addition provides one model for the ancestor because of its presence across many bilaterian groups. This volume results from a symposium that brought together developmental geneticists, paleontologists, and systematic morphologists to explore aspects of terminal growth and patterning from a variety of perspectives. This symposium, titled Terminal Addition, Segmentation, and the Evolution of Metazoan Body Plan Regionalization, was held at the Society of Integrative and Comparative Biology (SICB) in San Diego on January 7–8, 2005.

In this volume, terminal addition is considered in a range of taxa including arthropods, annelids, and vertebrates. Its demonstration in echinoid echinoderms gives a flavor of the taxonomic breadth of the terminal addition phenomenon and papers on myriapods document the marked variation of developmental processes that occur within groups. Such variation provides attractive areas for further evolutionary investigation and hints at the range of developmental mechanisms and processes yet to be treated in detail. Other work demonstrates the unique details of the developmental processes in particular taxa and clades, and distinctive patterns that may occur in different germ layers of the same individual. New gene expression data in annelids and arthropods provide increased understanding of the range of potentially homologous molecular process active in terminal addition. Interpretations of ontogenetic series from the fossil record provide clues as to the nature of postembryonic development in early arthropods. Accurate descriptions of developmental pattern permit increasingly testable models of mechanism. Models are presented herein, along with broad synopses of the terminal addition phenomenon. Through using these varied approaches we may ponder Darwin’s famous conclusion that "from so simple a beginning endless forms most beautiful and most wonderful have been, and are being evolved" from an angle almost certainly other than that which he intended!

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