PALAIOS
Emphasizing the impact of life on Earth's history

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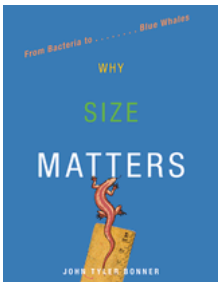

Why Size Matters: From Bacteria to Blue Whales, by John Tyler Bonner, 2006, Princeton University Press, Princeton, New Jersey, 161 p., USD 16.95, ISBN: 978-0-691-12850-4.

As human beings, we take measure of the size and shape of things in our environment often in reference to our own size. We are most fascinated with objects that are vastly bigger or smaller than ourselves, though we sometimes have little understanding of how these size differences affect the lives of organisms. The sizes and shapes of fossils are of particular interest to paleontologists because these physical measurements are used for taxonomic identification that, in turn, is the basis for biostratigraphic correlation, paleoenvironmental reconstruction, and phylogenetic comparison.

In his book, *Why Size Matters*, John Bonner observes that organism size is often overlooked in the biological sciences, except when linked with such biological phenomena as locomotive speed or rate of metabolism. Bonner, however, makes a succinct and compelling argument that while an organism's size and shape are interrelated due to the physics that underlie biology, it is size that acts as the primary determinant governing shape, function, and behavior. A central issue in the book is the role of size in evolution. Bonner contends convincingly that evolutionary size changes are not facilitated by anatomical or functional adaptations; but rather it is the new conditions set by changes in size that necessitate structural and behavioral modifications.

Bonner presents five properties of living organisms that generally correlate with and vary consistently with their size. These Size Rules are presented in the book's introduction and include the following: 1) strength varies with size; 2) surfaces that permit diffusion in and out of the body vary with size; 3) organismal complexity (division of labor) varies with size; 4) such time-related processes as metabolism, generation time, longevity, and speed of locomotion vary with size; and 5) the abundance of organisms in nature varies with their size. The Size Rules are expanded upon and explained in later chapters with examples correlated from Bonner's own work on slime molds and the research of others on a wide variety of organisms, from single-celled bacteria and protists to the truly gigantic sequoias and cetaceans. Bonner amusingly uses Lemuel Gulliver's encounters with the diminutive Lilliputians and the monstrous Brobdingnagians in Jonathan Swift's *Gulliver's Travels* as a running metaphor to illustrate how different organisms must adapt to sometimes radically different environments and physical conditions based solely on their size. The major topics are illustrated sparsely, though effectively, with line drawings and graphs.

My only real criticism is with the chapter dealing with complexity and division of labor. Bonner uses the differences between small and large human societies as an analogy for increasing complexity and labor division in larger organisms. While I can't find specific fault with Bonner's analysis of the subject, I would say that it's always a dangerous path to equate cultural evolution to biological evolution. Pointing this out seems like quibbling, however, as these are minor faults in an otherwise well-written and entertaining book.

This compact tome is not only the story of Bonner's growing fascination with how body size impacts the organism, but also a summation of a long career in the biological sciences. His insights on the subject and how they developed are recalled through an entertaining mix of social commentary, scientific and scholarly research, personal epiphanies, and humorous anecdotes. The book has a relaxed, conversational tone that is highly accessible to the nonspecialist, but with just enough cited references for the interested professional to pursue further understanding on a given topic.

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