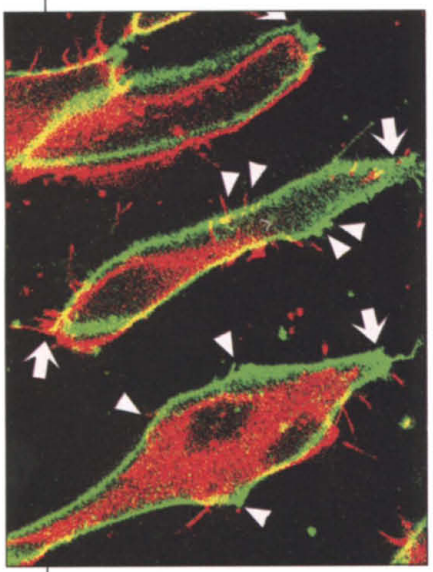
Humpty Dumpty and All That ...

"...the primitive way of breaking eggs before we eat them, was upon the larger end: but his present Majesty's grandfather, while he was a boy, going to eat an egg, and breaking it according to the ancient practice, happened to cut one of his fingers. Whereupon the Emperor his Father, published an edict, commanding all his subjects, upon great penalties, to break the smaller end of the eggs." (Jonathan Swift, *Gulliver's Travels*)

The study of polarity in biological systems has a long and illustrious past. The bilateral symmetry of most organisms contrasts with the major differences between the upper and lower halves of the organisms, be they animals or plants. Even the apparent symmetry across the body can be deceptive: The internal organs have a well-defined, predictable, left-right asymmetry in their organization, which again is widely preserved within vertebrates. It should then come as no surprise that even single-celled organisms such as bacteria possess and propagate intrinsically polar characteristics. This issue describes a variety of topics that are connected by the issue of polarity, loosely conforming to the prescription "From Cell to Organism."

Shapiro and colleagues (p. 1942) examine the issue of polarity in bacteria, with respect to extracellular structures such as flagellae and the intrinsic linear polarity of bacteria due to their rodlike shape. The localization of membrane proteins, signaling apparatus, and cytoskeletal components are all orchestrated to allow these organisms to respond to external cues such as those involved in chemotaxis toward food sources or mating partners.



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Pellettieri and Seydoux (p. 1946) describe how anterior-posterior polarity is established and maintained within the egg and look at the variety of molecular mechanisms used in different organisms, concentrating mainly on the worm *Caenorhabditis elegans* and the fruit fly *Drosophila*. Keller (p. 1950) explains how these early polarity markers go on to be translated into organs and organisms through polarized cell movements during embryonic development.

Knust and Bossinger (p. 1955) examine epithelial cell polarity in organisms ranging from worms to flies to vertebrates, and compare and contrast the mechanisms involved in establishing and maintaining polarity. Intriguingly, many of the same molecular players involved in epithelial polarity are also important in the cell movements outlined by Keller. Finally, Dickson (p. 1959) describes how one of the most structurally and functionally polarized cells—the neuron—exploits its characteristics to establish specific connections within the developing nervous system.

Establishing and maintaining polarity and the recognition and exploitation of gradients are key features of living organisms. When polarity is disrupted early in development, dire consequences for the body plan result. Throughout development and into the adult organism, polarized cells and organismal polarity remain important in promoting and maintaining health. Knowing top from bottom and left from right are key characteristics in nearly all forms of life, and refining our understanding of the cellular and molecular mechanisms involved in these processes remains an important aspect of ongoing research in cell and developmental biology and neuroscience. –STELLA M. HURTLEY

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Science

6 December 2002

Vol. 298 No. 5600
Pages 1835–2078 $9

Polarity
from Cell to Organism

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE