

Journal club



LORD OF THE RING

The elegance of one cell dividing into two has fascinated cell biologists for over a century. Few papers have revealed more insights about the contractile ring that drives cell cleavage than the classic work published by Thomas Schroeder in 1972.

Schroeder made four observations that defined the field of cytokinesis. First, he showed that in sea urchin eggs, the assembly and constriction of the contractile ring occurs reproducibly ~20 seconds after the end of anaphase, suggesting that contractile ring assembly is rapid and controlled by the cell cycle clock. Second, and perhaps most important, Schroeder showed that during constriction, the volume of the contractile ring decreases,

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suggesting that constriction must be coupled with disassembly. This contrasts with Huxley's 'sliding-filament model' for muscle contraction, in which the number of contractile units remains unchanged during contraction. Third, Schroeder established a clear cause-effect relationship between the contractile ring and cleavage furrow formation by using cytochalasin B, which disrupts the contractile ring and arrests furrowing during any stage of constriction. Fourth, Schroeder showed that different-sized cells display very different rates of constriction. Large cells such as sea urchin eggs (which are 75 μm in diameter) constrict much faster (with a circumferential constriction rate of 40 μm per minute) than smaller ones such as HeLa cells (which are 20 μm in diameter and have an 8 μm per minute constriction rate). This suggests that a mechanism exists that coordinates cell size with constriction

rate to ensure completion of cytokinesis in a similar time interval for cells of different sizes.

Every time I read this paper I feel a spark of pleasure. I would definitely recommend this paper to anyone who wants to know the basic properties and the crucial questions about the contractile ring as, almost 40 years on, it still guides the main questions and directions in the field of cytokinesis.

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ORIGINAL RESEARCH PAPERS Schroeder, T. E.

The contractile ring II. Determining its brief existence, volumetric changes, and vital role in cleaving *arbacia* eggs. *J. Cell Biol.* **53**, 419–434 (1972) | Huxley, H. & Hanson, J. Changes in the cross-striations of muscle during contraction and stretch and their structural interpretation. *Nature* **173**, 973–976 (1954) | Huxley, H. E. The mechanism of muscular contraction. *Science* **164**, 1356–1366 (1969)