

# A simple active gel *in vivo* : The cytokinetic ring

D. Riveline

University of Strasbourg, Cell Physics Lab. ISIS/IGBMC, Strasbourg, France,  
[riveline@unistra.fr](mailto:riveline@unistra.fr)

**Keywords:** Acto-myosin, Cytoskeleton, Micro-Fabrication, Simulation, Theory

## Abstract

Cell division is a fundamental event for single cells and multi-cellular organisms with implications in embryo development. At the onset of cytokinesis, a ring of actin filaments and myosin motors forms and constricts, and this leads to the separation of cells. Although molecular players are known, it is not yet understood how collective interactions of thousands of filaments and motors cause the ring closure. This question is our main focus with this unique system inside a cell: the cytokinetic ring is a complete active gel which can be entirely captured both experimentally and theoretically. We have designed an integrated approach: we perform experiments to probe the molecular interactions and dynamics of the ring in microfabricated chambers [1,2,3] and we develop physical models to which we compare our results. We apply this approach to cytokinetic rings in mammalian cell and in fission yeast. Both rings reveal new patterns and dynamics, and we propose two frameworks for explaining their closures.

[1] Riveline, D. and Buguin, A. Devices and methods for observing the cell division. WO/2010/092116. *Patent* (2010).

[2] Riveline, D. and Wollrab, V. Devices and methods for observing eukaryotic cells without cell wall. WO/2013/135809. *Patent* (2013).

[3] Riveline, D. Methods for observing cells with cell wall or invertebrate embryos with oblong eggshell. WO/2013/144302. *Patent* (2013).