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Shape and Size of the Fission Yeast Nucleus are governed by Equilibrium Mechanics GERALD LIM, Baylor College of Medicine (BCM), GREG HUBER, University of Connecticut Health Center, JONATHAN MILLER, BCM, SHELLEY SAZER, BCM — Nuclear morphogenesis in the asexual reproduction of *Schizosaccharomyces pombe* (fission yeast) consists of two stages: (i) volume-doubling growth, in which a round nucleus inflates uniformly, and (ii) division, in which the nucleus undergoes shape changes from round to oblong to peanut to dumbbell before it resolves into two smaller, round daughter nuclei, driven by the formation and elongation of a microtubule-based spindle within the nucleus. The combined volume of the daughter nuclei immediately after division is the same as the volume of the single nucleus at the onset of division. Consequently, the nuclear envelope (NE) area must increase by 26% during division. We are developing a model in order to determine the mechanics governing these shape and size changes. It is based on current knowledge of the nuclear structure, insight from normal and abnormal nuclei, and concepts from the mechanics governing lipid-bilayer membranes. We predict that (a) the NE prefers to be flat, (b) the NE is under tension, (c) the nucleus has an internal pressure, (d) nuclear growth is governed by the Law of Laplace, and (e) some abnormal nuclei behave like vesicles with encapsulated microtubules.

Gerald Lim
Baylor College of Medicine (BCM)

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