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**Spindle Checkpoint Regulated by Non-Equilibrium Collective Spindle-Chromosome Interaction; Relationship to Single DNA Molecule Force-Extension Formula** LEIF MATSSON — The spindle checkpoint, which blocks segregation until all sister chromatid pairs have been stably connected to the two spindle poles, is perhaps the biggest mystery of the cell cycle. The main reason seems to be that the spatial correlations imposed by microtubules between kinetochores and nonlinear dependence on the increasing number of such kinetochores, have been disregarded in earlier studies. From these missing parts a non-equilibrium collective spindle-chromosome interaction is obtained for budding yeast (*Saccharomyces cereviciae*) (*J. Phys. Cond. Matter* **21** (2009) 502101). The interaction, based on a non-equilibrium statistical mechanics, senses and counts the stably attached kinetochores and senses the threshold for segregation. It blocks segregation until all sister chromatids pairs are bi-oriented, regulates tension such that segregation is synchronized, explaining how the cell might decide to segregate replicated chromosomes. It also predicts kinetochore oscillations at a frequency which agrees well with observation. Finally, a relationship between this interaction and the force-extension formula of a single DNA molecule is obtained.

Leif Matsson
Department of Physics, University of Gotheburg

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