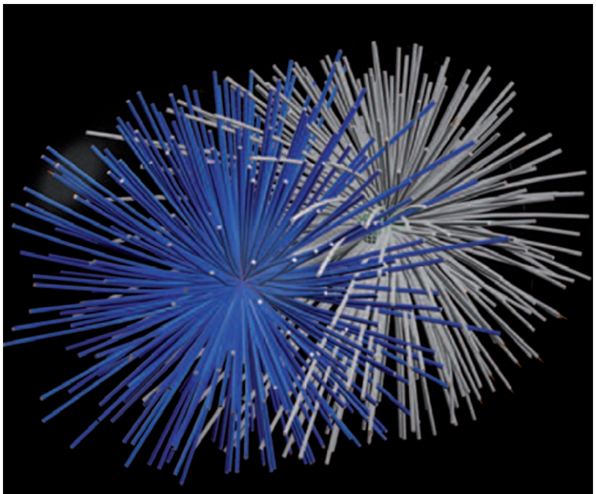

CELL DIVISION

Tug of war

Three-dimensional simulation of asymmetric spindle placement in the *Caenorhabditis elegans* embryo. Image courtesy of C. Kozlowski and F. Nedelec, European Molecular Biology Laboratory, Heidelberg, Germany.

Correct positioning of the mitotic spindle is crucial in determining cell-division axes. But how are microtubule (MT) dynamics and the local generation of mechanical forces integrated across the cell to move and position the mitotic spindle?

Reporting in *Cell*, Kozlowski and colleagues tackle this question and show that an interplay between spindle pole movements and MT dynamics contributes to asymmetric spindle placement in the *Caenorhabditis elegans* embryo.

It has previously been shown that MT dynamics influence the orientation and geometry of MT contacts with the cortex and regulate the mechanism of force production and transmission. The authors reasoned that MT dynamics are likely to affect spindle pole motion because they determine the number of MTs that reach the cell cortex where the force generators (FGs) are located. Therefore, they first investigated the role of MT dynamics using confocal microscopy in two worm strains that express different fusion proteins: α-tubulin to visualize entire MTs, and EBP-2 (a homologue of the plus-end tracking protein end-binding-1 (EB1)) to visualize the growing plus ends of MTs. By examining MTs in the cytoplasm and at the cortex, they found that the plus ends of MTs contact the cortex for ~1 second. MTs shrink soon after cortical contact, which prompted the authors to propose that cortical adaptors convert MT depolymerization energy into pulling forces.

The cortex towards which the spindle is moving encounters more new MT ends and makes more force-generating contacts than the opposite cortex, which makes far fewer contacts over the same time period. In addition, many MTs appear to associate to form persistent astral fibres that may function as guides to mediate the growth of new MTs.

Based on their findings, the authors generated a three-dimensional simulation of two poles connected by a 'spindle' and found that two different models could explain both the posterior displacement and the asymmetric oscillations of the spindle: either there is a higher number of active FGs on the posterior, or there are stiffer FGs on the anterior cortex.

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ORIGINAL RESEARCH PAPER Kozlowski, C. *et al.* Cortical microtubule contacts position the spindle in *C. elegans* embryos. *Cell* **129**, 499–510 (2007)

DOI:
10.1038/nrm2192