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Size scaling of microtubule asters in confinement[1] JAMES PELLETIER, Dept., of Physics, Massachusetts Institute of Technology, Dept., of Systems Biology, Harvard Medical School, CHRISTINE FIELD, Dept., of Systems Biology, Harvard Medical School, KASPARS KRUTKRAMELIS, Dep., of Chemical Engineering, University of Wyoming, NIKTA FAKHRI, Dept., of Physics, Massachusetts Institute of Technology, JOHN OAKEY, Dept., of Chemical Engineering, University of Wyoming, JAY GATLIN, Dept., of Molecular Biology, University of Wyoming, TIMOTHY MITCHISON, Dept., of Systems Biology, Harvard Medical School — Microtubule asters are radial arrays of microtubules (MTs) nucleated around organizing centers (MTOCs). Across a wide range of cell types and sizes, aster positioning influences cellular organization. To investigate aster size and positioning, we reconstituted dynamic asters in *Xenopus* cytoplasmic extract, confined in fluorous oil microfluidic emulsions. In large droplets, we observed centering of MTOCs. In small droplets, we observed a breakdown in natural positioning, with MTOCs at the droplet edge and buckled or bundled MTs along the interface. In different systems, asters are positioned by different forces, such as pushing due to MT polymerization, or pulling due to bulk or cortical dynein. To estimate different contributions to aster positioning, we biochemically perturbed dynactin function, or MT or actin polymerization. We used carbon nanotubes to measure molecular motions and forces in asters. These experimental results inform quantitative biophysical models of aster size and positioning in confinement.

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