**Fig. S1: Motor inhibition experiments.** Microtubule organization on chromatin spots of diameter ~15 μm (separation~37 μm) at t=60min, for untreated extracts (top-right), in the presence of 100 μM monastrol, an inhibitor of Eg5 (bottom-left) or 1mg/ml p50, an inhibitor of dynein (bottom-right). Scale bars: 50 μm.
**Fig. S2: Internal control.** Microtubule organization on chromatin lines (length~100 μm) with a nearby circular chromatin spot of diameter ~15 μm. Right panel: a line of thickness 65 μm generates symmetric structures. Red: tubulin, blue: chromatin, scale bars: 50 μm.

**Fig. S3: Asymmetric structures undergo poleward flux.** Left: Assymetric structure formed on a 30μm wide chromatin line in *X. laevis* egg extract containing 35nM of Cy3-tubulin. Images were acquired every 4 s for 240 seconds. Right: Kymographs were constructed from the dashed lines using MetaMorph (Universal Imaging Corp., West Chester, PA). Microtubules fluxed poleward at a rate of ~2.5 μm/min. Scale bars 5 μm (see also Movie 6).
Fig. S4: Effects of hexylene glycol on the transition to asymmetric structures. Microtubule organization in the absence (left) and presence (right) of 0.5% vol/vol hexylene glycol, a mild microtubule stabilization agent. A 10 μm thick chromatin line generates symmetric structures in both cases. With a thickness of 15 μm, organization is
asymmetric in untreated extracts, and symmetric in the presence of hexylene glycol. For a thickness of 20 μm, organization is in both cases asymmetric. The experiment was performed in parallel using the same extract. Lines are always 100 μm apart (center-to-center).

**Method:** Hexylene glycol ((+-)-2-methyl-2,4-pentanediol, Sigma) was used at 0.5% vol/vol from a 20% stock in water (Mitchison et al., 2005). Hexylene glycol was added after 17 minutes, when microtubules were still located symmetrically around chromatin lines. A control chamber without hexylene glycol was prepared and imaged in parallel. Pictures were taken after ~50 minutes.

**Fig. S5:** Pole tractions require dynein activity. Right: 1mg/ml p50 inhibits the interactions of adjacent structures that normally occur on this pattern (left). Chromatin is arranged in circular spots of diameter ~15 μm, separated by ~30 μm. Scale bars: 50 μm.
Fig. S6: Spindle organization on long thin lines at late time points. (A) Example of chromatin lines producing only one spindle after 135 minutes. Red: tubulin, blue: chromatin, scale bar 50 μm. (B) Quantification: each dot corresponds to the observation of a chromatin line with only one spindle. On the x-axis is the length of the chromatin line. On the y-axis is represented the time of the observation.