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Microtubules search for chromosomes by pivoting around the spindle pole

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During cell division, proper segregation of genetic material between the two daughter cells requires that the spindle microtubules attach to the chromosomes via kinetochores, protein complexes on the chromosome. The central question, how microtubules find kinetochores, is still under debate. We observed in fission yeast that kinetochores are captured by microtubules pivoting around the spindle pole body, instead of growing towards the kinetochores. By introducing a theoretical model, we show that the observed angular movement of microtubules is sufficient to explain the process of kinetochore capture. Our theory predicts that the speed of the capture process depends mainly on how fast microtubules pivot. We confirmed this prediction experimentally by speeding up and slowing down microtubule pivoting. Thus, microtubules explore space by pivoting, as they search for intracellular targets such as kinetochores.

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