Background and Project Goals

**Background:** In mitosis, the spindle apparatus (pictured below) must accurately align and segregate the duplicated genome equally to two daughter cells. In metaphase, sister chromatids are aligned and tethered to opposite poles. The cell measures tension at the kinetochore (DNA-filament attachment site) to sense if the chromosomes are properly aligned, which leads to faithful segregation of one chromosome to each daughter cell. However it is unknown how the cell senses tension across multiple attachments each with independent movements.

**Goal:** Use **yeast as a model to examine dynamics across multiple attachment sites to investigate cross-linking, which aids in tension sensing.**

Yeast spindle (16 chromosomes, one attachment site) is analogous to single mammalian chromosome (16-20 attachment sites).

Yeast chromosome: one DNA-filament attachment site per chromosome

Human chromosome: multiple DNA-filament attachment sites per chromosome

**Why this is important:** Failure to accurately align/sense tension and segregate chromosomes leads to cancer, developmental defects, and cell death.
Cohesin and Cin8 (kinesin motor protein) are necessary for correlated stretching. Therefore, **cohesin and Cin8 act as cross-links**, allowing the cell to **sense tension of multiple attachment sites as an aggregate**. (Cohesin mutants display more stretching due to the perturbation of the chromatin)

Cin 8 (kinesin motor protein) is required for correlated movement of different chromosomes. Therefore, **Cin8 further cross-links different attachment sites**, aiding the cell in **sensing tension across attachment sites as a whole**.