Chromosomes in Action: New Ways to Model Mitosis and Meiosis

3d molecular designs

Transforming Science Learning

3d molecular designs

Transforming Science Learning

Ruth Hutson, MSSE

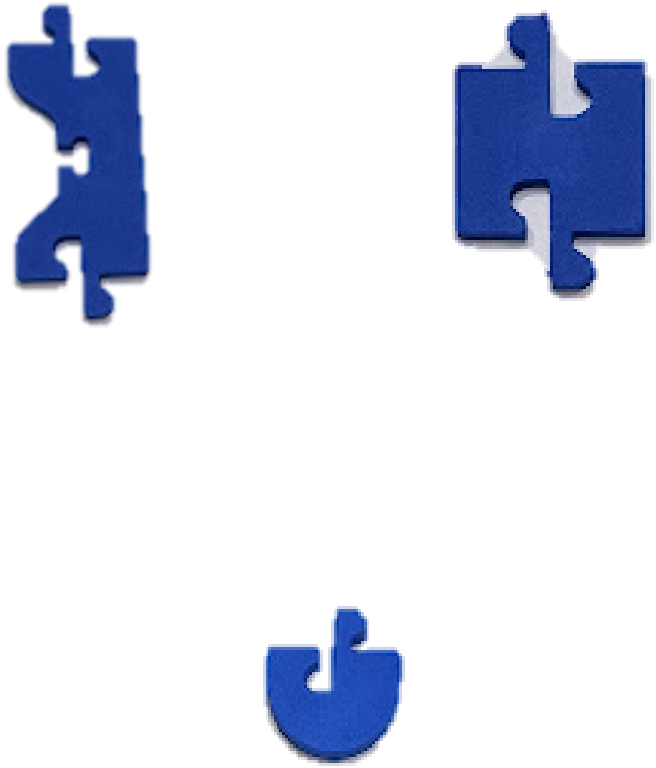
Who's Here

- Middle School, High School, Post-secondary
- Rural, Suburban, Urban
- Biology, AP Biology, Anatomy and Physiology, Other
- Where are you in your course?

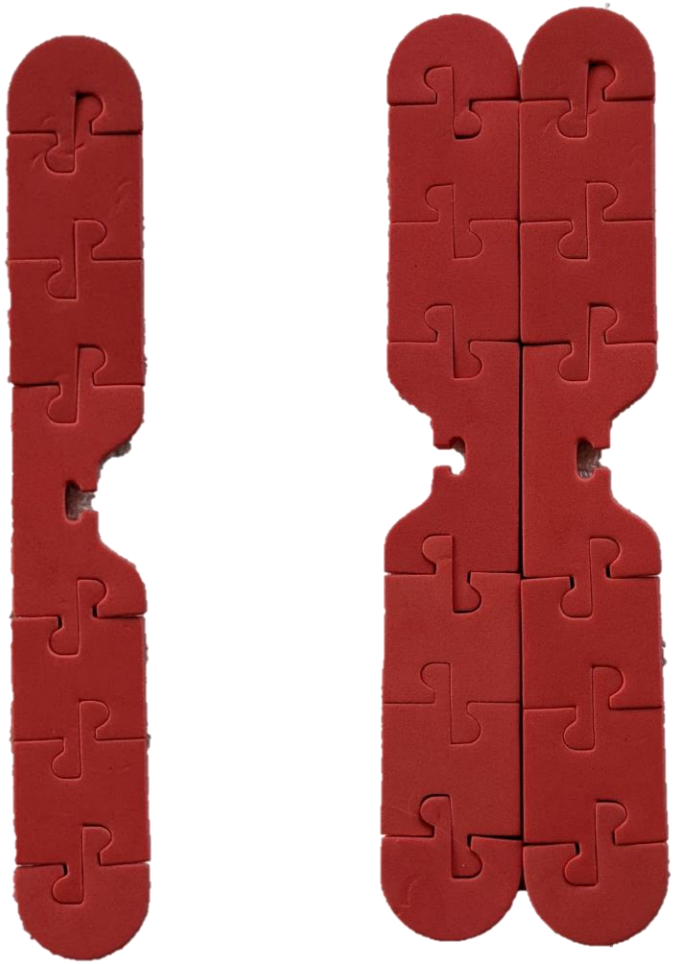
Workshop Learning Goals

- Demonstrate how cell division using mitosis results in identical daughter cells.
- Explain how mitosis alternates with interphase in the cell cycle
- Compare and contrast mitosis with meiosis.
- Demonstrate what processes in meiosis increase gamete diversity when compared to the parent cell.
- Have fun!

Construct a chromosome

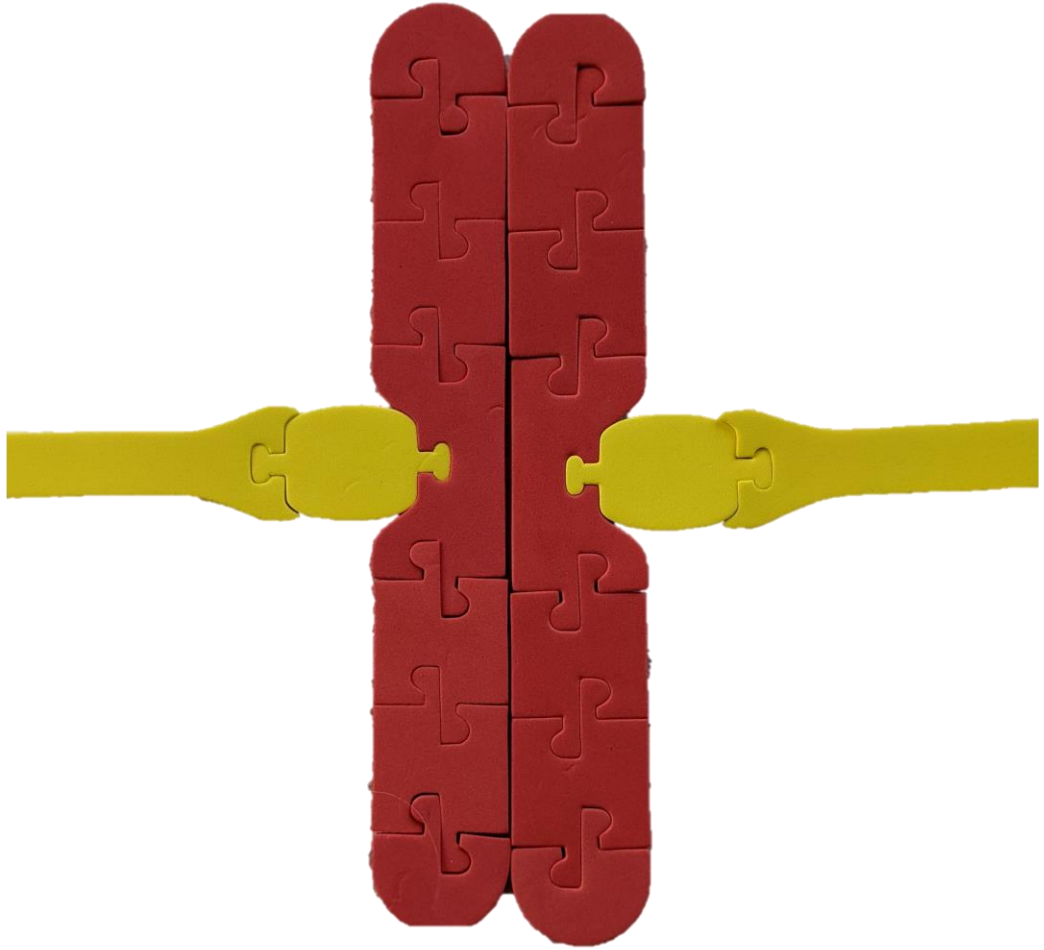


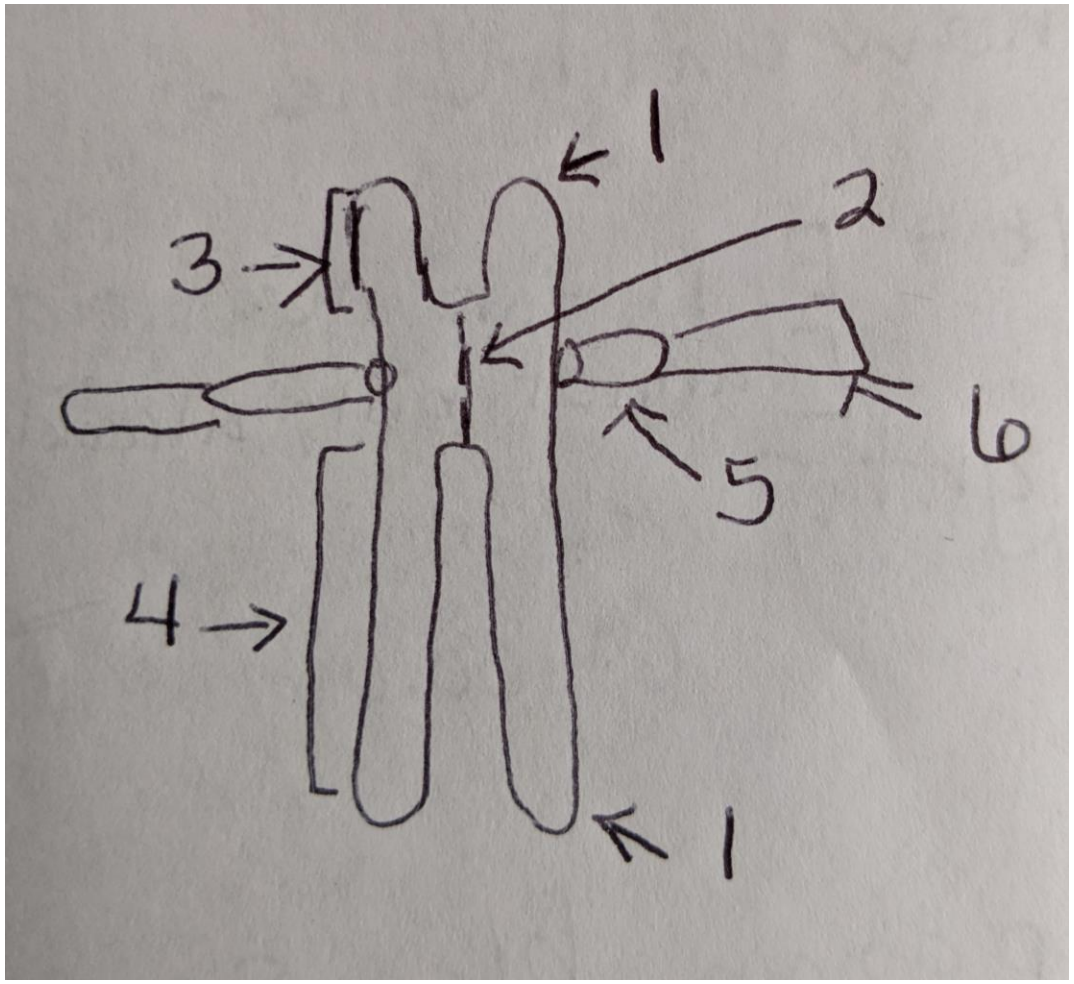
- Start with one centromere
- Add 3 to 4 chromosome connectors to each side of the centromere.
- Add a cap piece to each end of the chromatid.



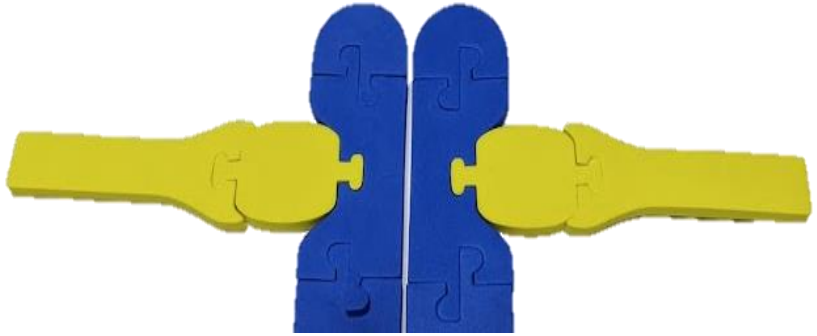
- Create a duplicate copy of the chromosome to make a sister chromatid

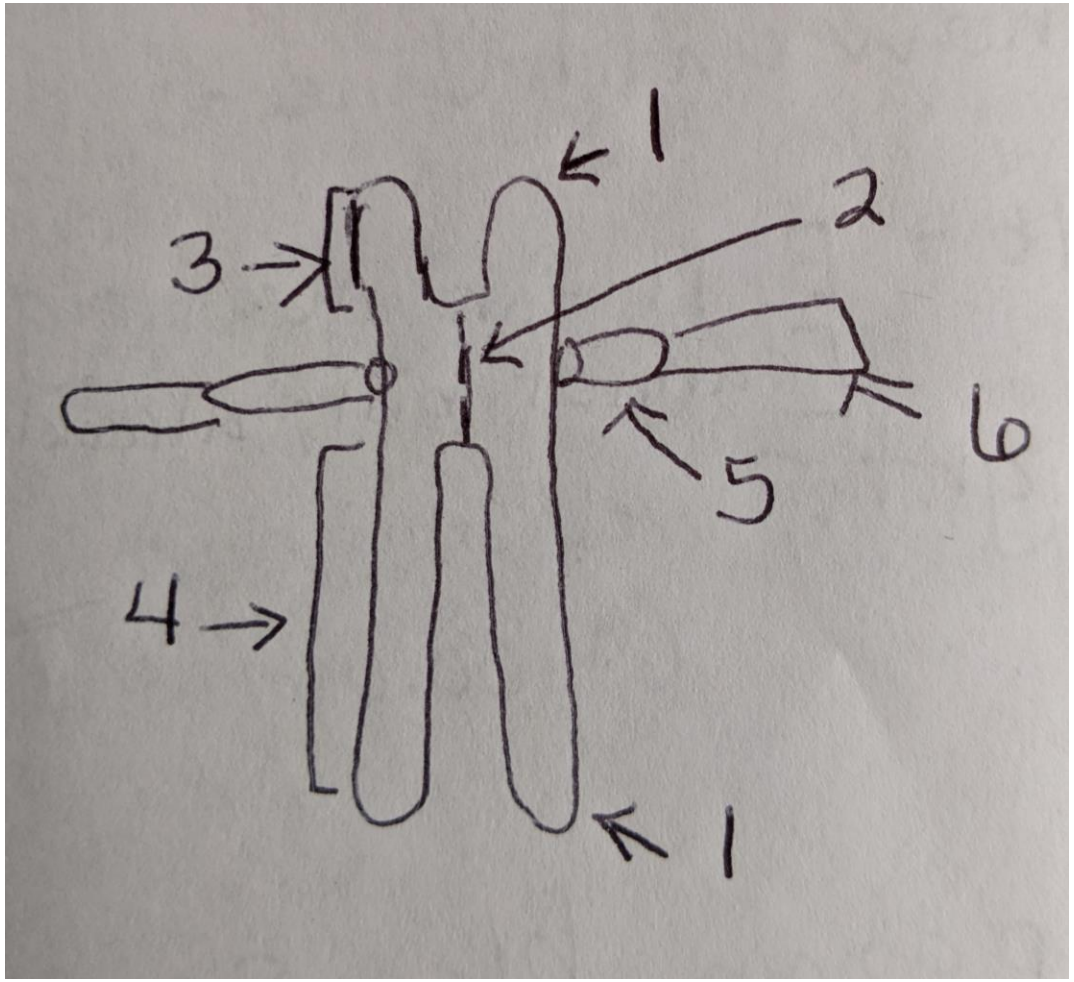
Label the parts



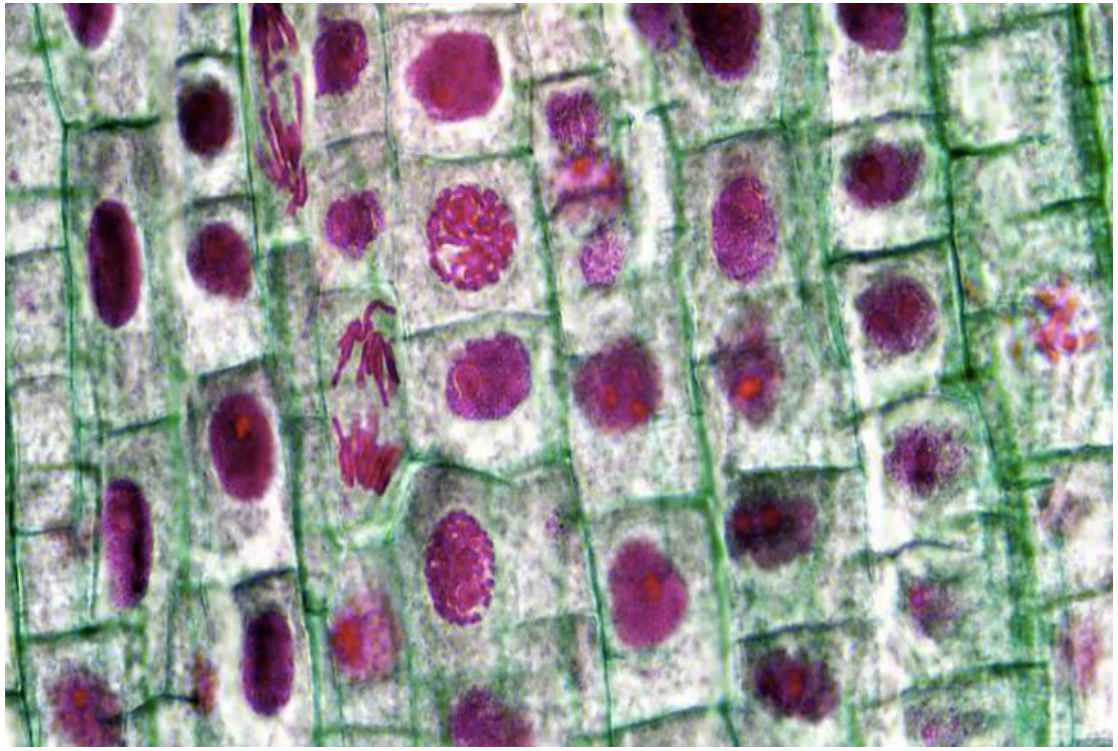


A closer look at the spindle apparatus

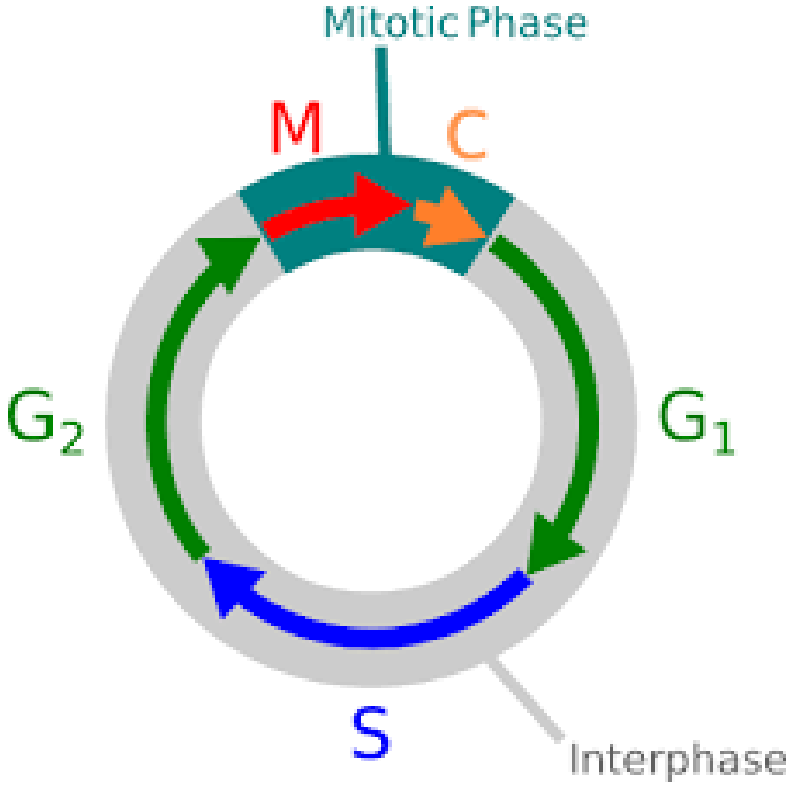




Onion Root Tip Lab



Berkshire Community College Bioscience Image *Library (2014)*



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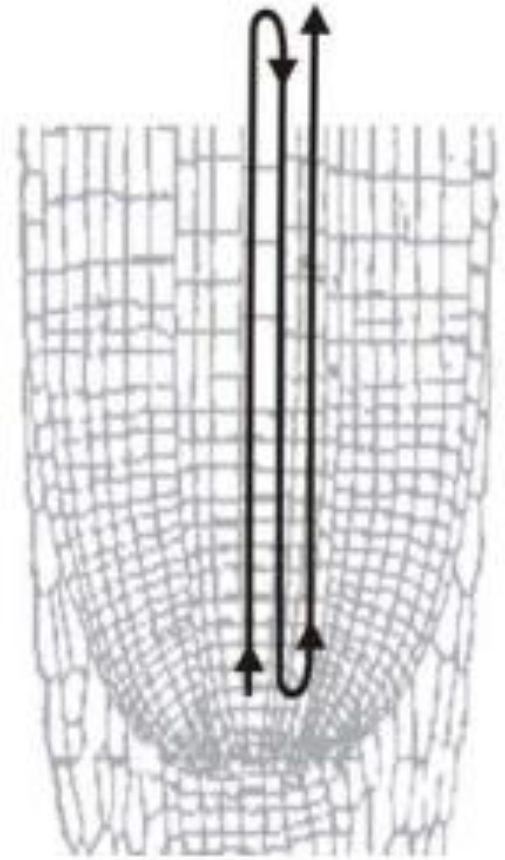
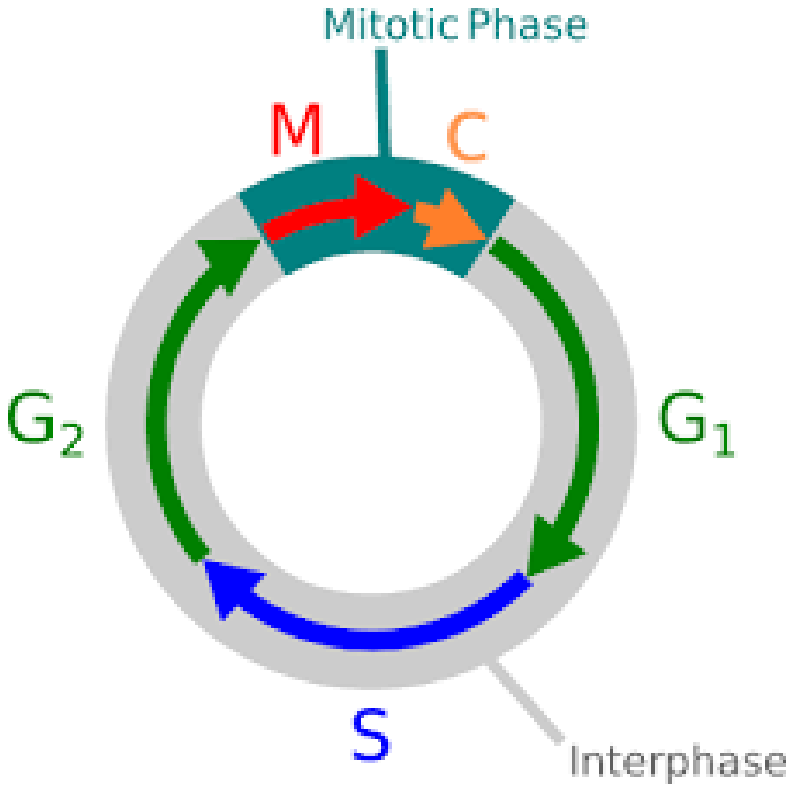




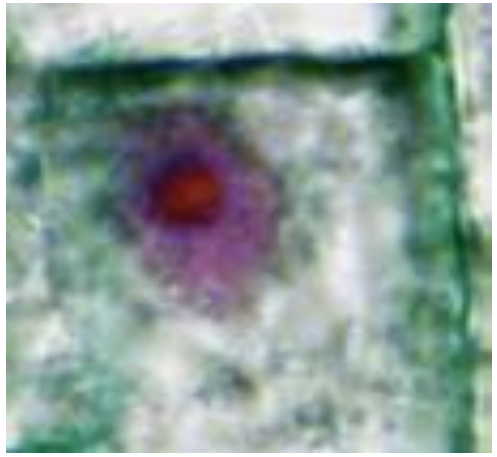
Use an inverted S pattern to count cells

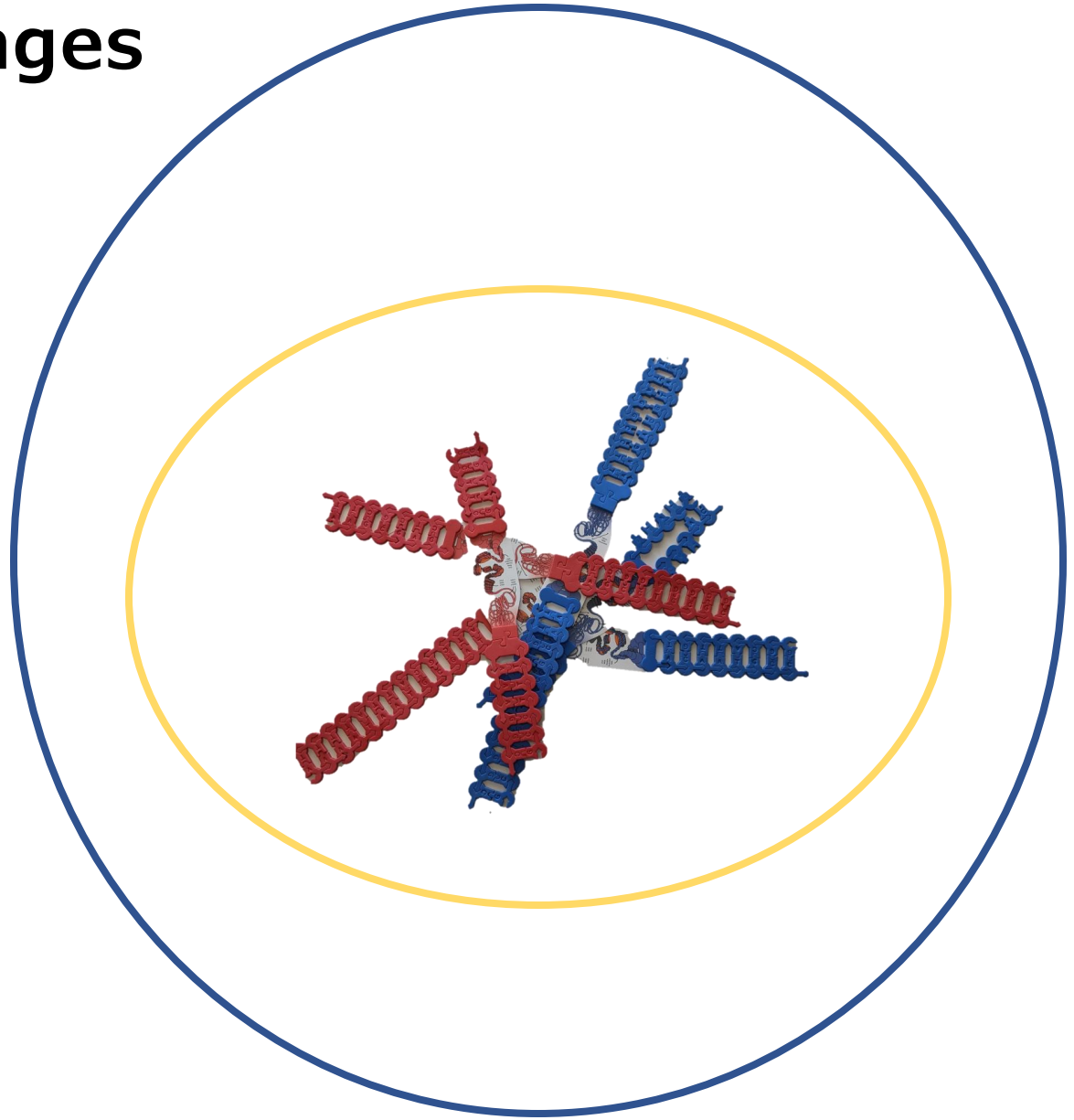
Wikipedia Creative Commons

	Interphase	Prophase/ Prometaphase	Metaphase	Anaphase	Telophase	Total
Number of cells						100
Proportion in each phase						1
Approximate Timing						24 hours

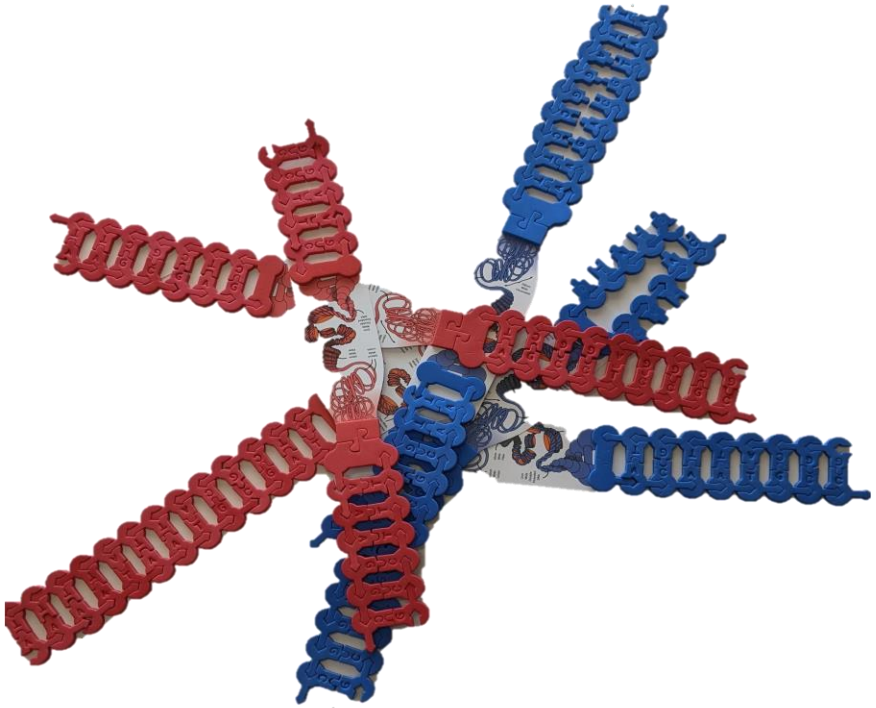
Data table for cell counts for student or professionally prepared slide

Modeling Allium lab images





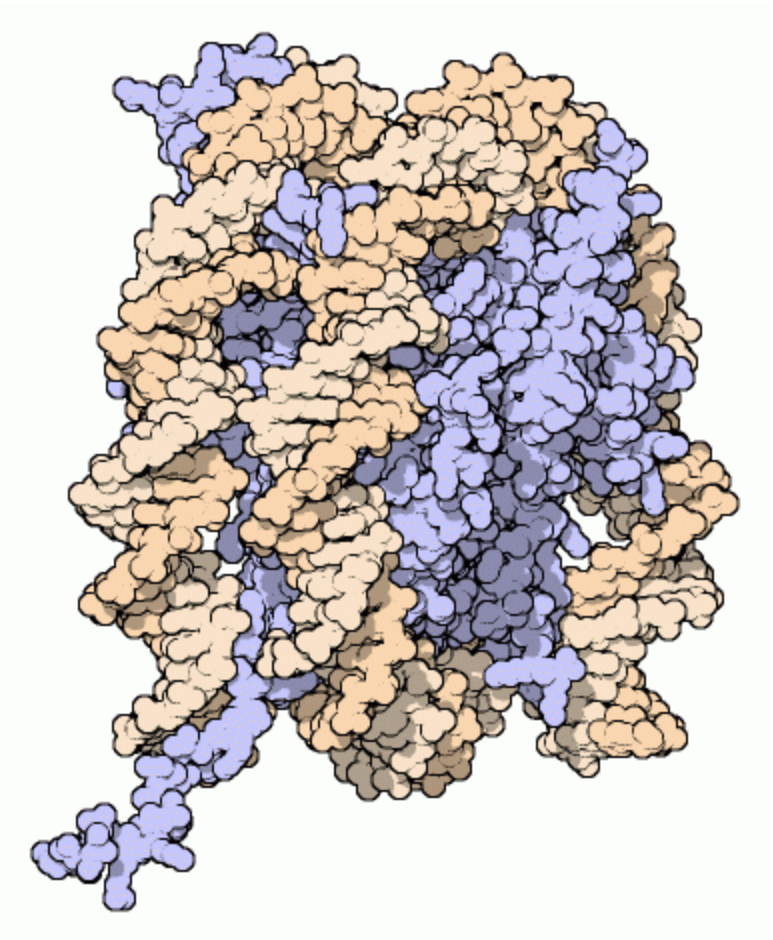
A closer look at the Cell Cycle: Modeling Interphase



What are the key highlights in this phase that students need to understand?

What structures to students need to understand so they can understand cell processes in the future?

A closer look at the nucleosome



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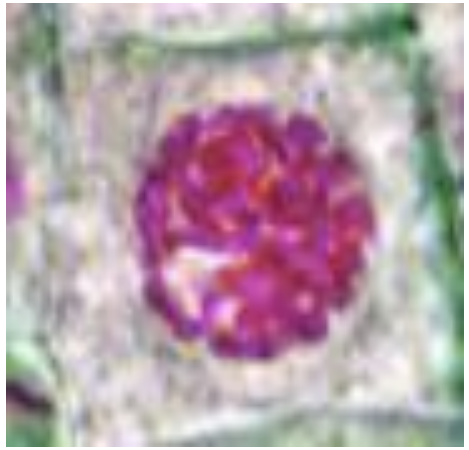
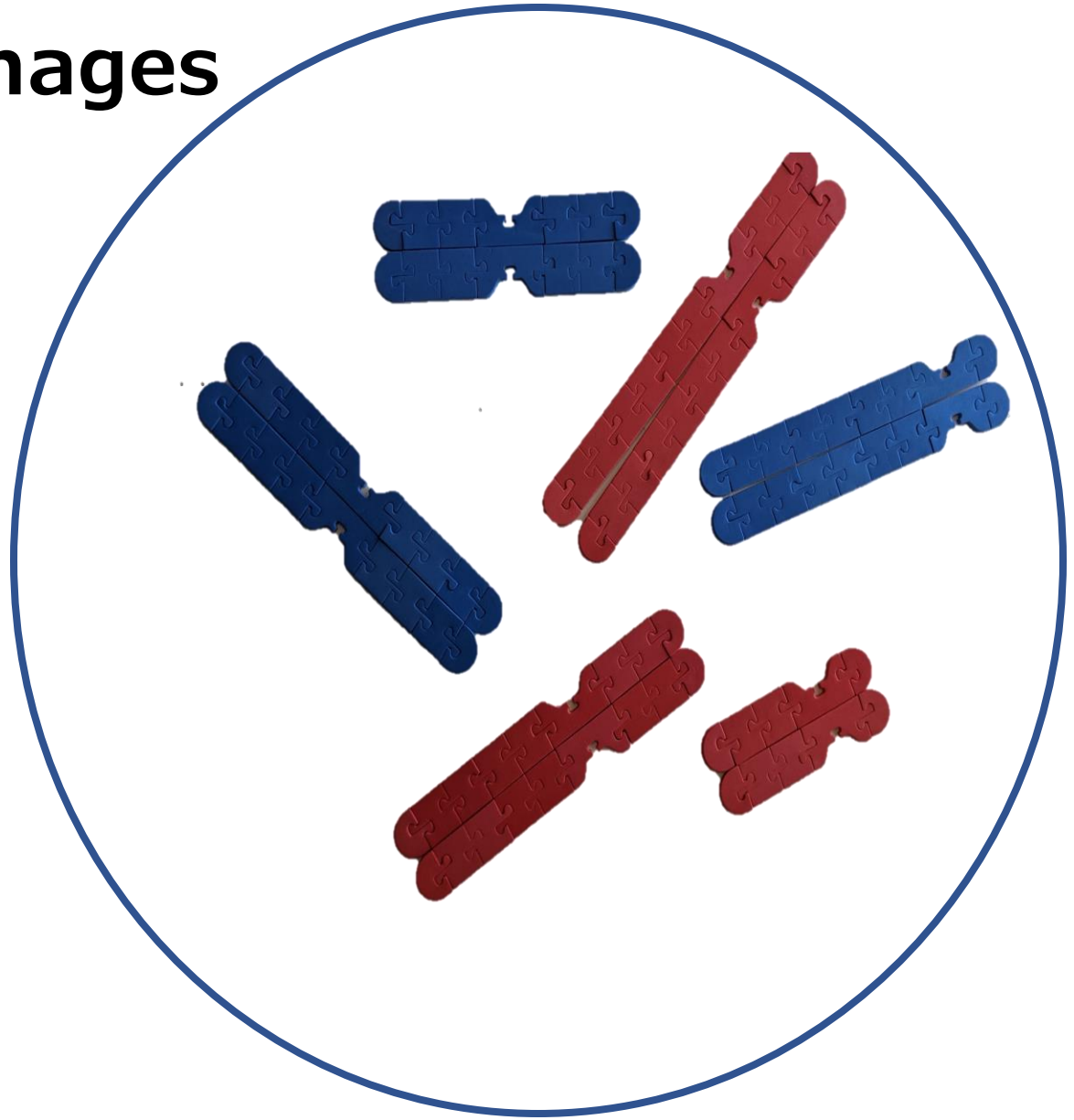
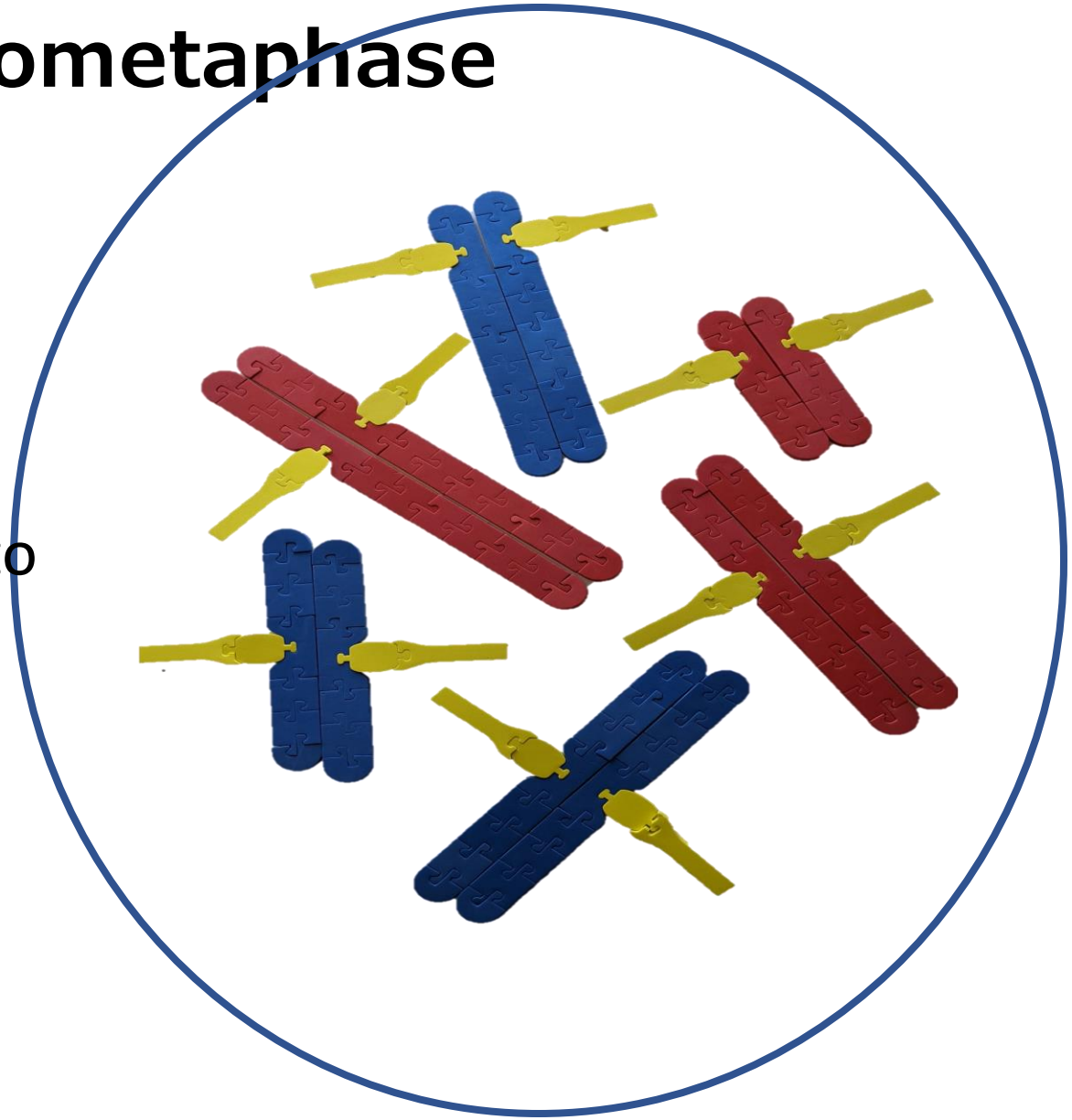




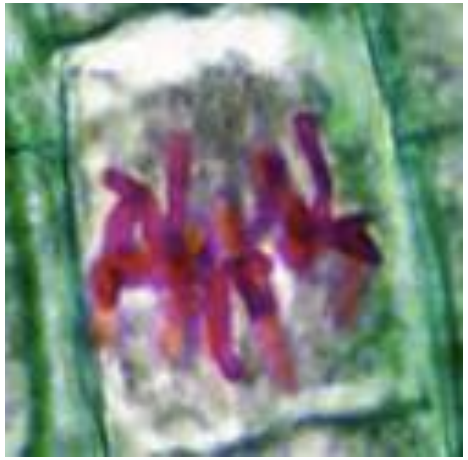
Cell Cycle: Modeling Prometaphase

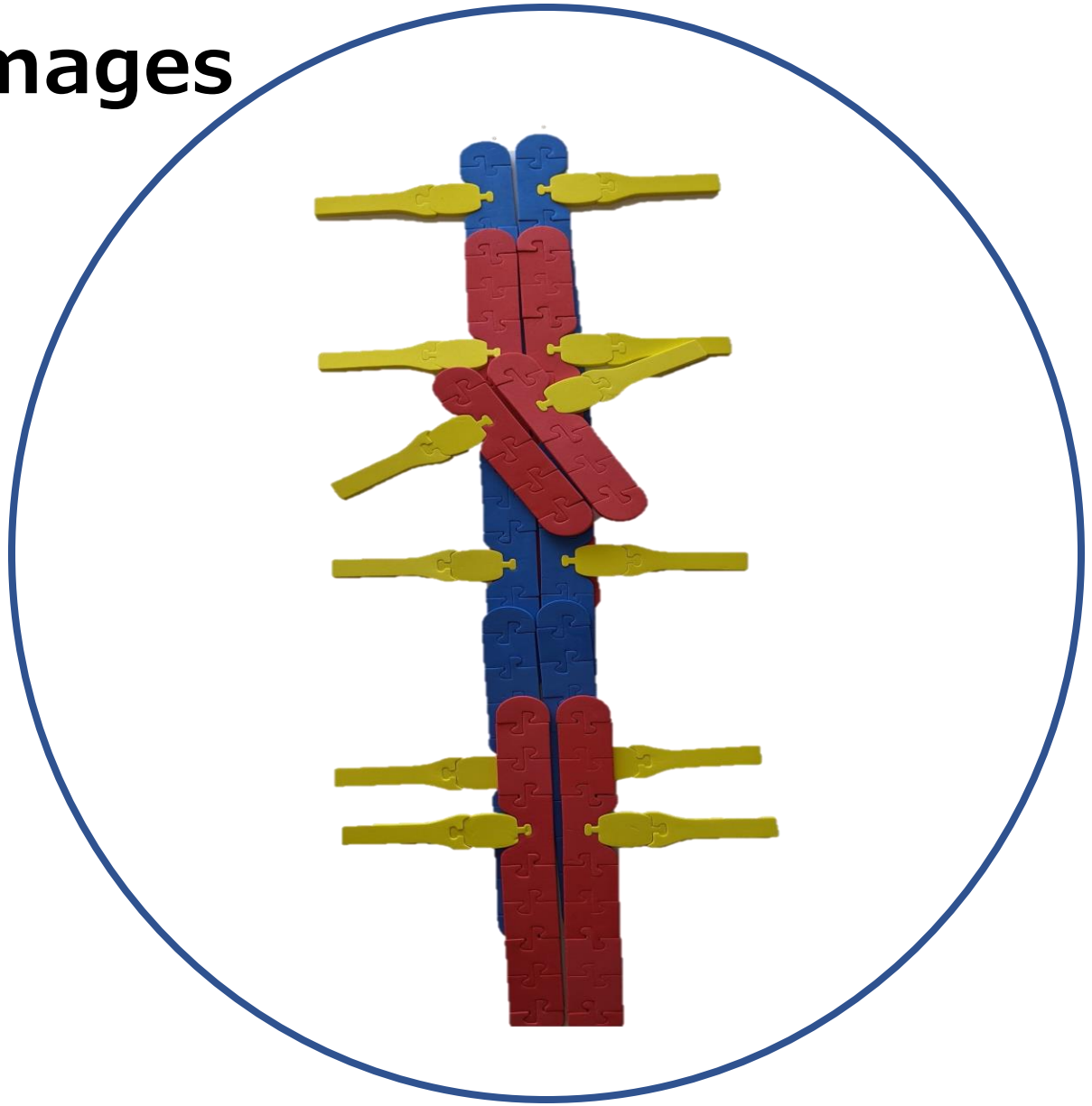
What are the key highlights in this phase that students need to understand?

What structures to students need to understand so they can understand cell processes in the future?



Modeling Allium lab images





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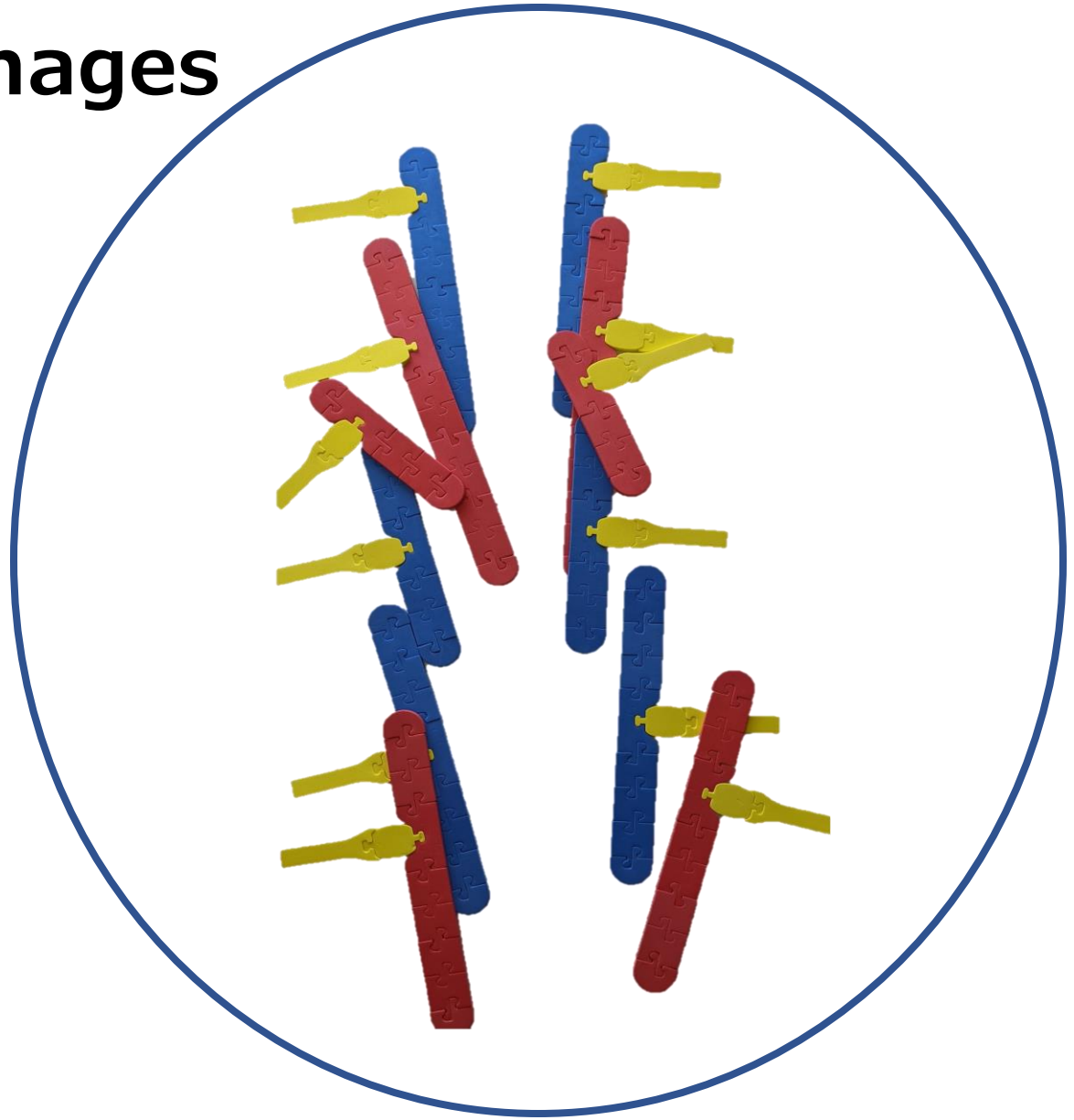
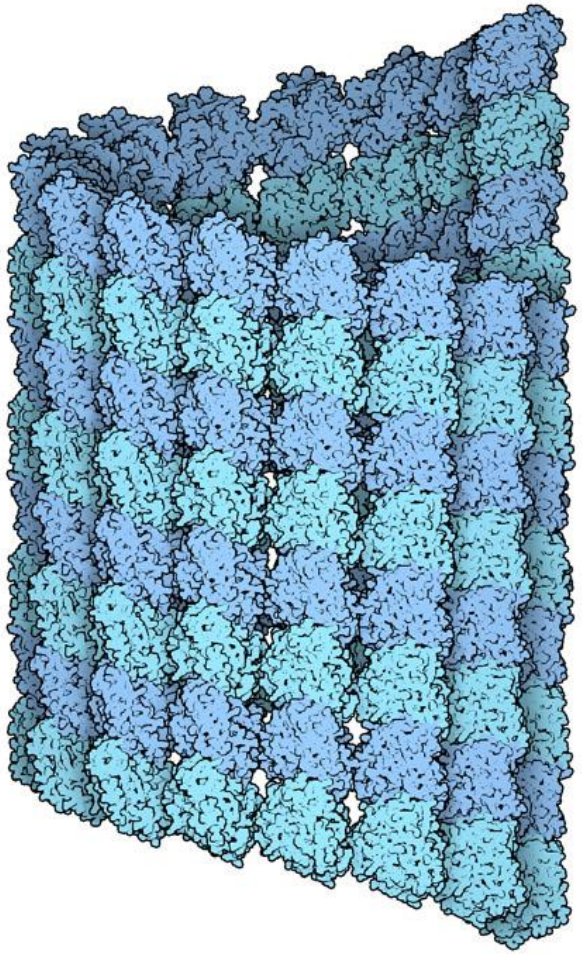
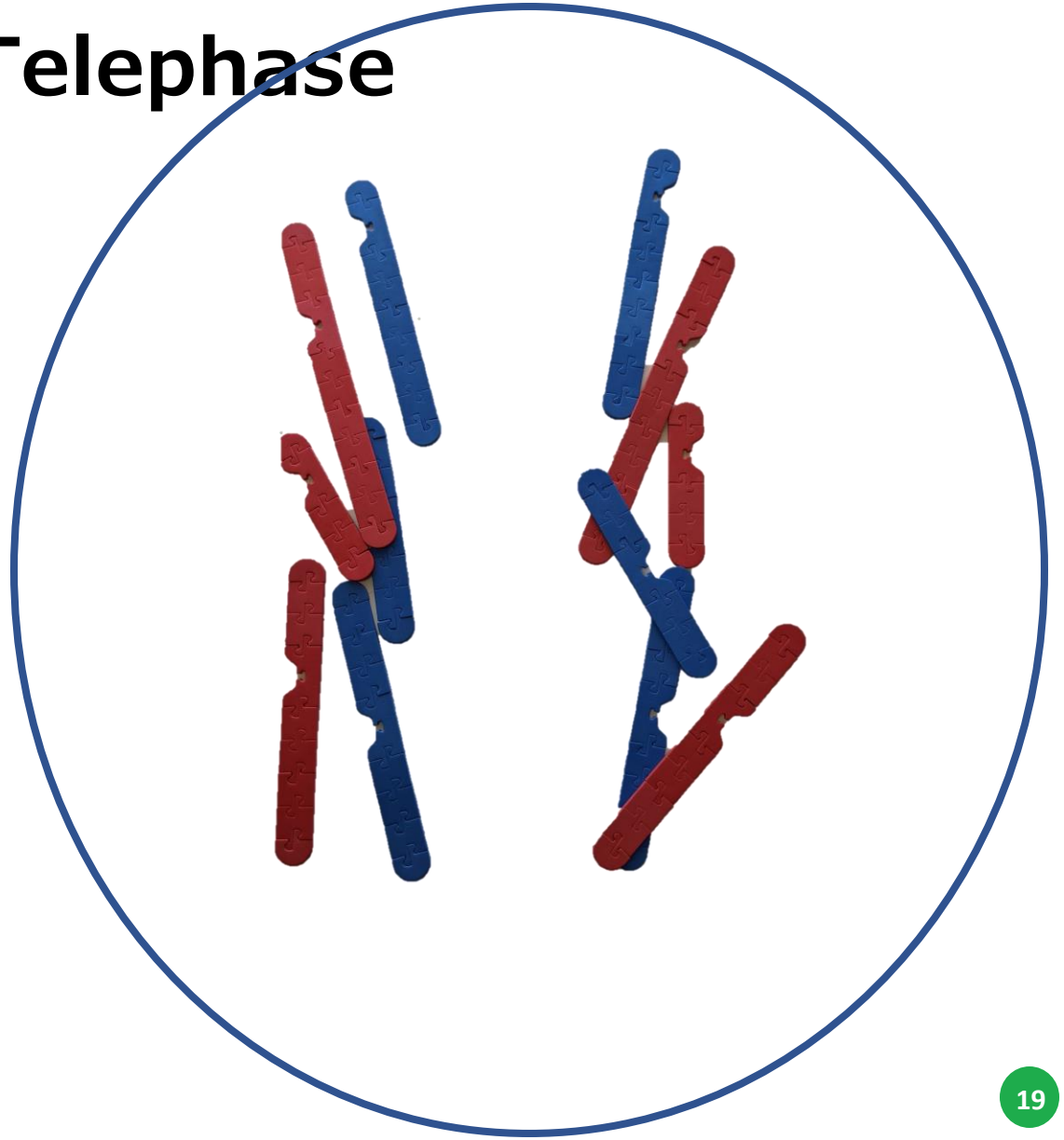
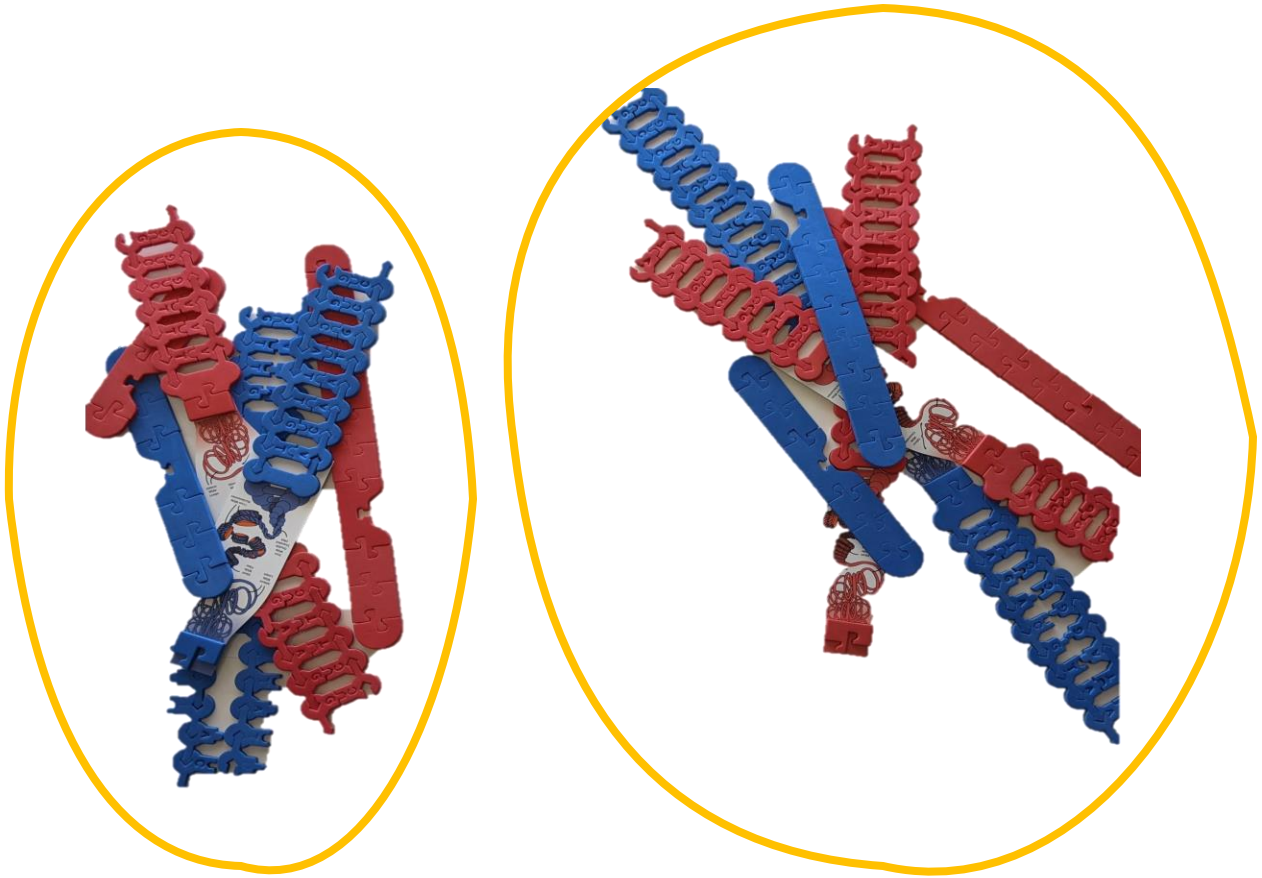


Cell Cycle: Modeling Early Telephase



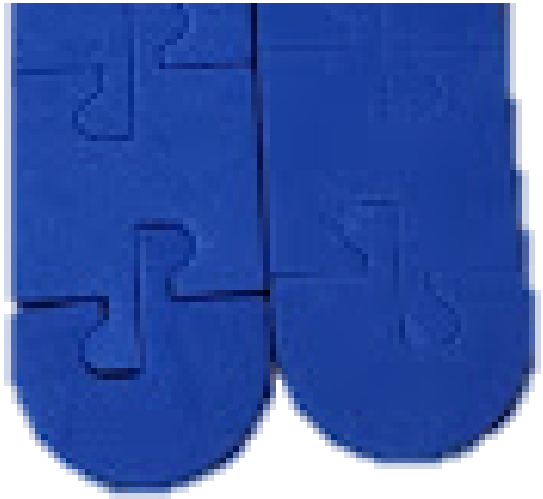


Cell Cycle: Modeling Late Telephase

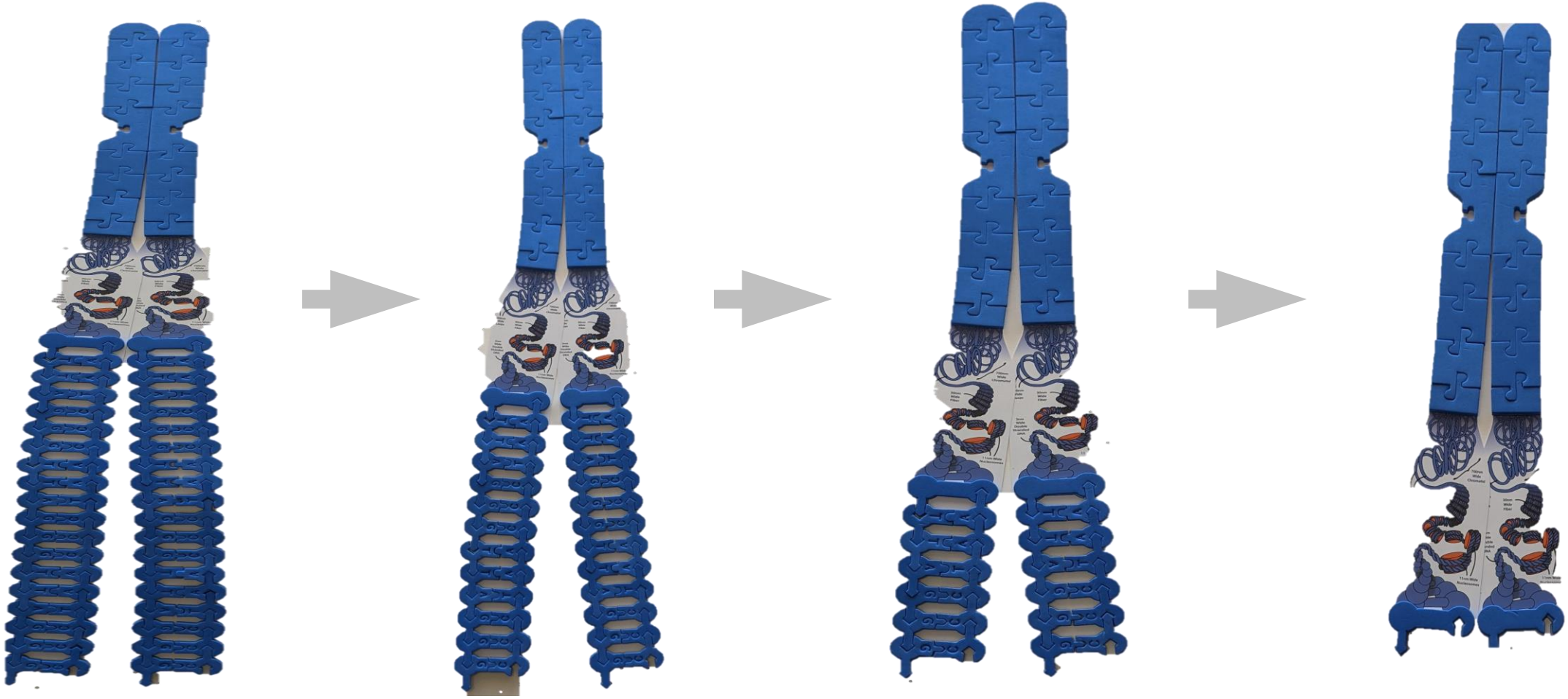


What extensions or phenomenon might help student be interested in this cell process?

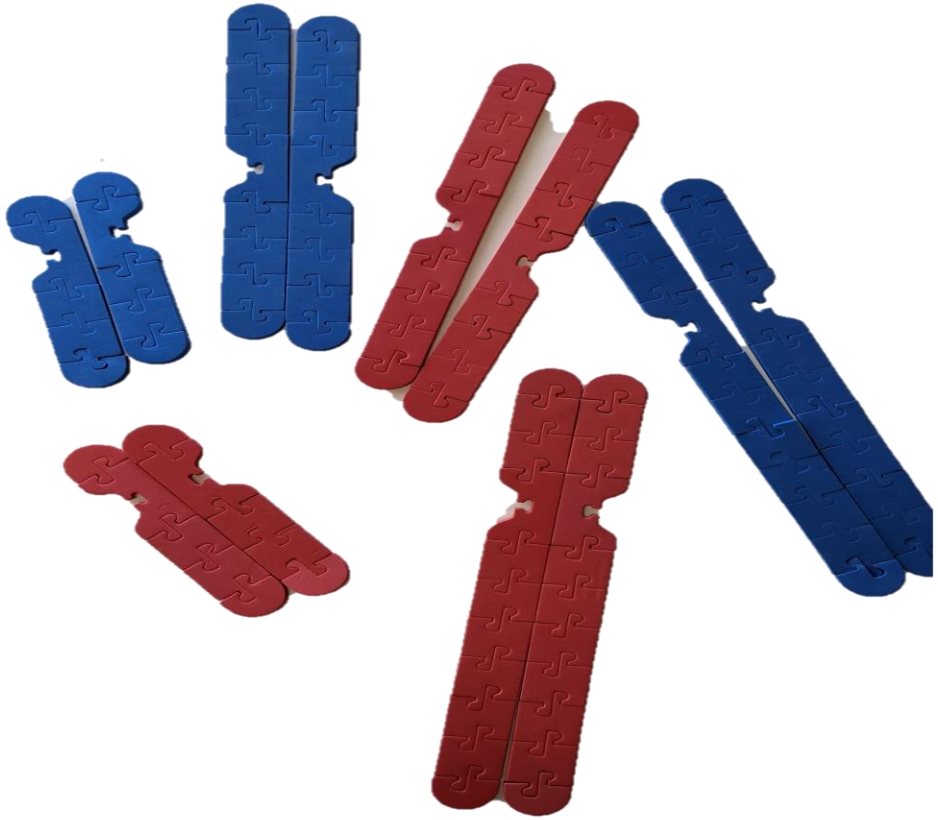
A closer look at the telomere



A closer look at the telomere



Cell Cycle: Modeling Meiosis



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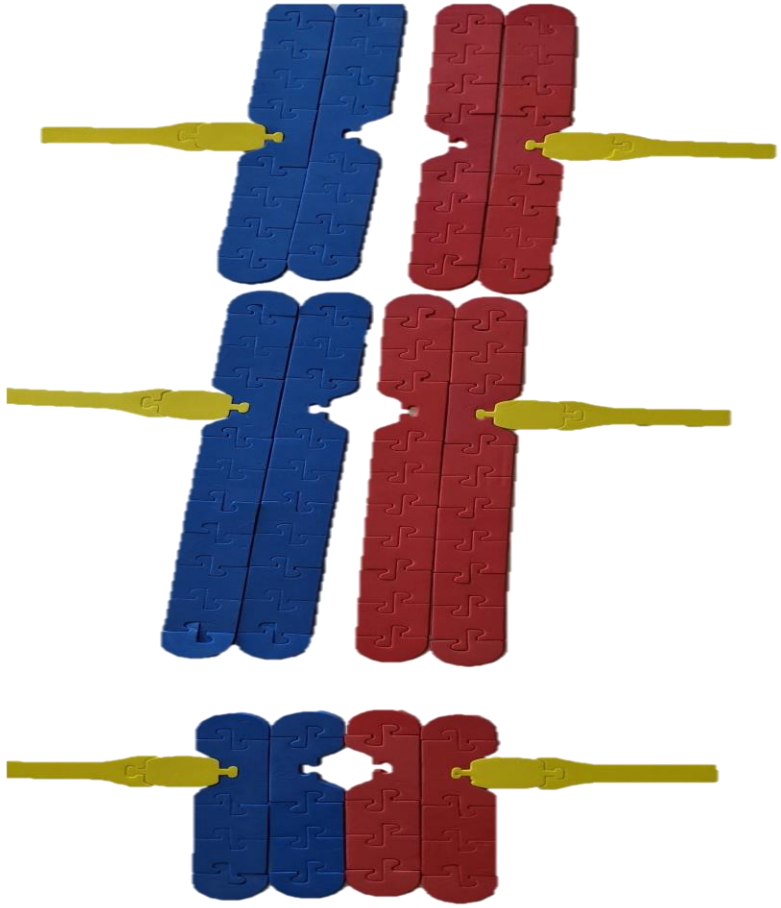

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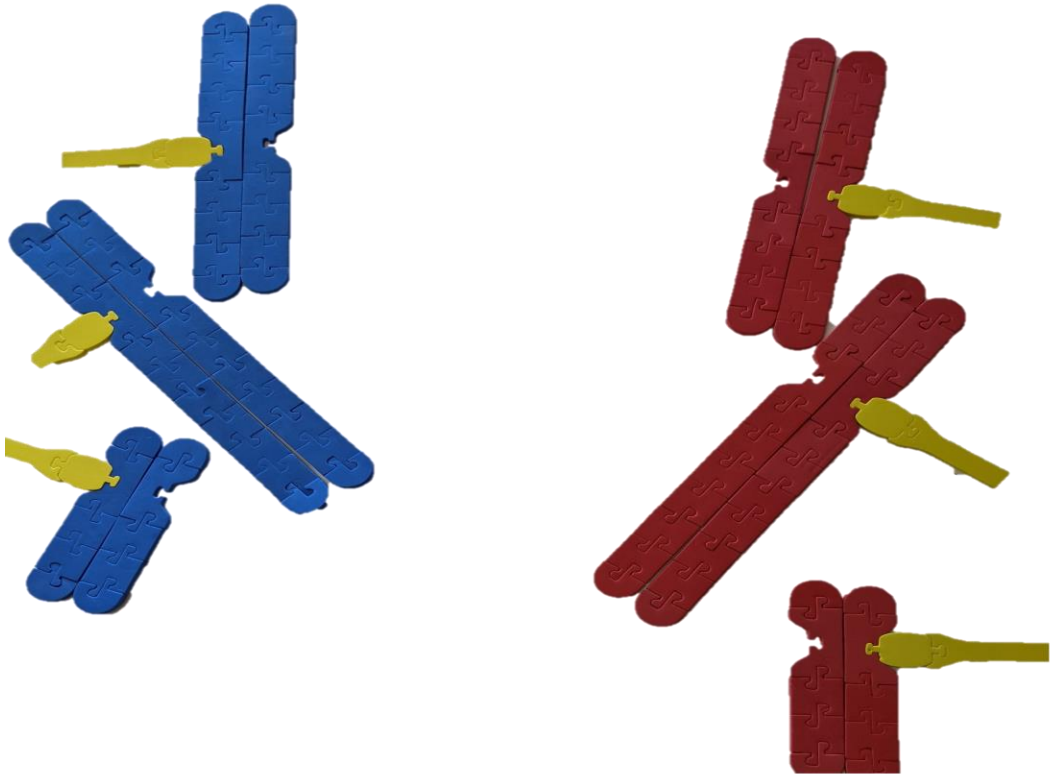
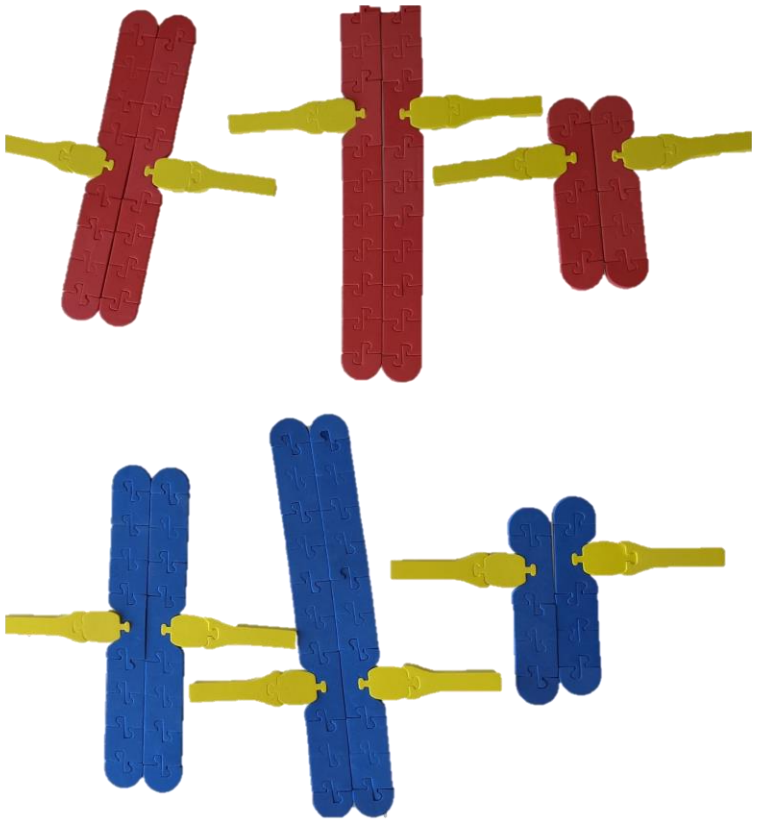
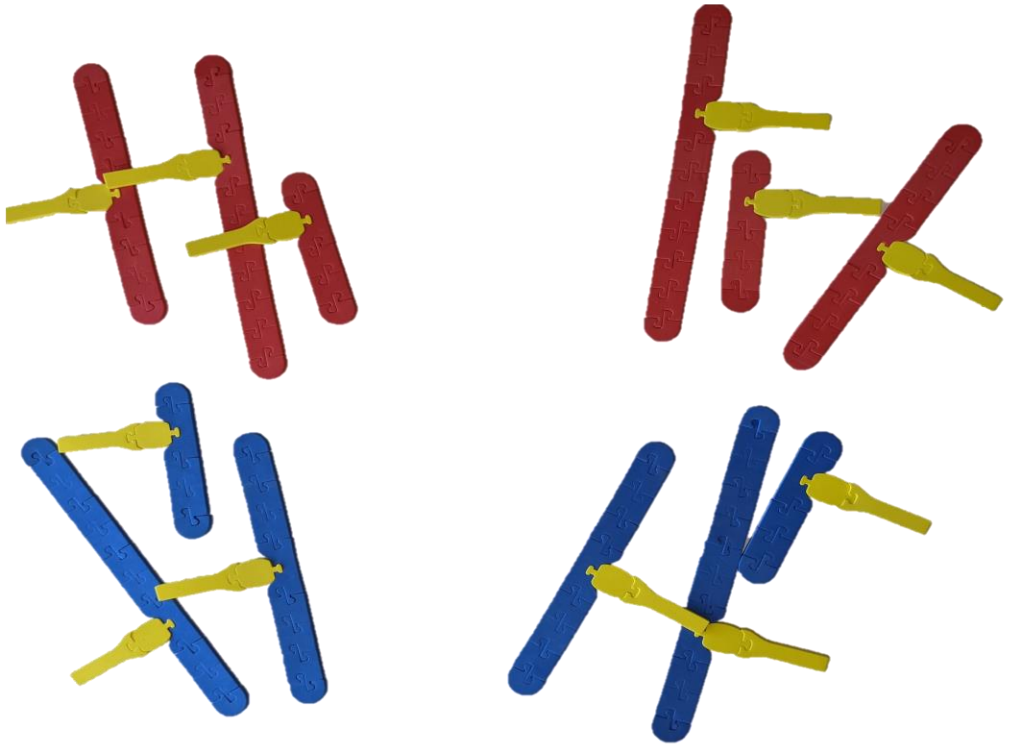


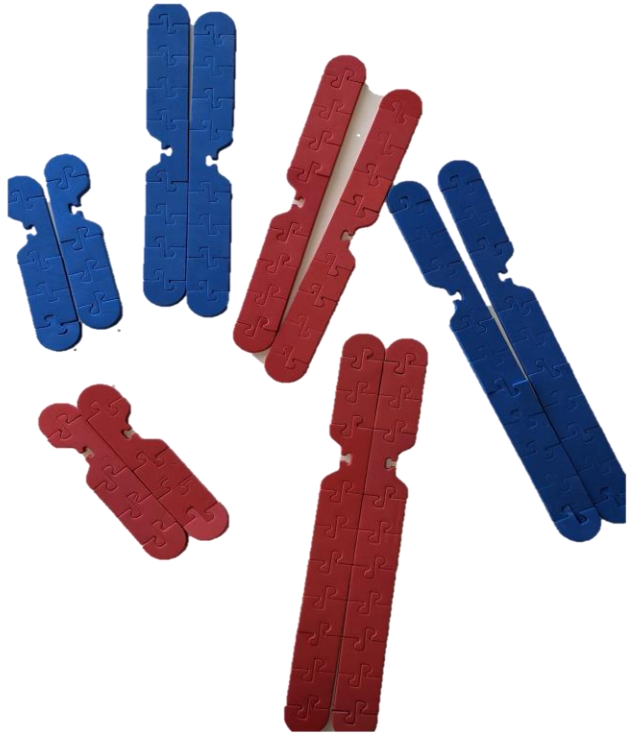
Cell Cycle: Modeling Meiosis



Cell Cycle: Modeling Meiosis

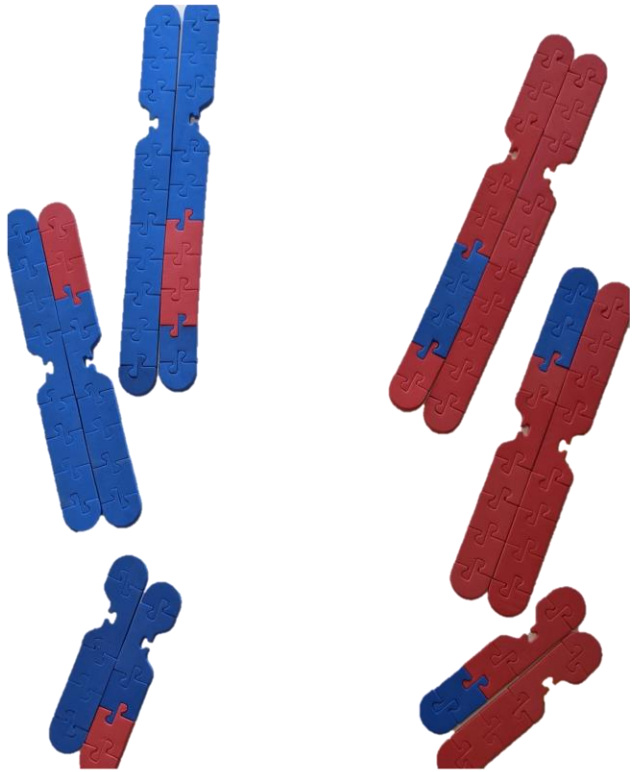


Cell Cycle: Modeling Crossing Over

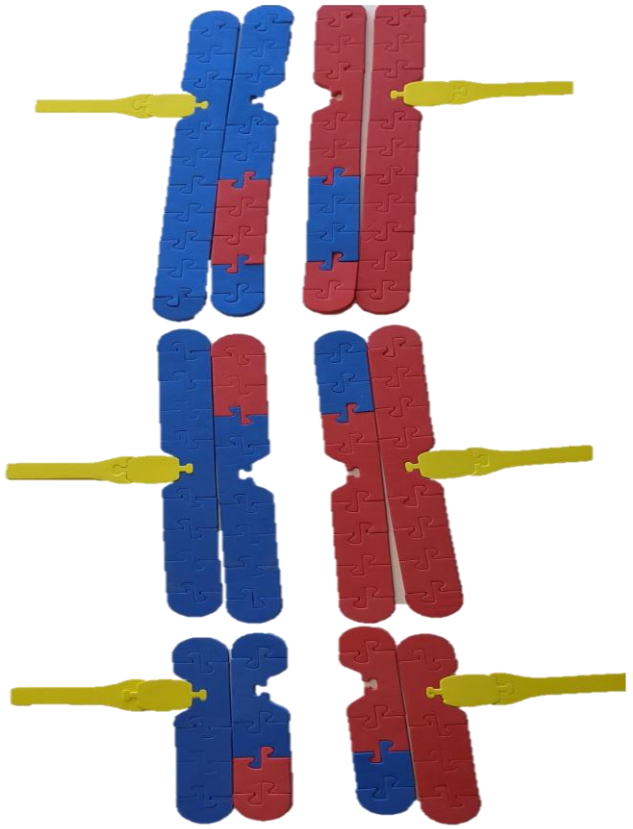


How would you model crossing-over of homologous chromosomes?

Cell Cycle: Modeling Crossing Over



Cell Cycle: Modeling Crossing Over



How would you model anaphase and telophase from this point?

	Mitosis	Meiosis
Location in body	body cells	reproductive cells
Number of chromosomal divisions	one	two
Resulting daughter cells	identical to parent cell	different from parent cell
Comparison to parent cell (number of chromosomes)	same amount	half the amount
Cell components needed	spindle fibers and kinetochore, centromere, chromosomes parts	spindle fibers and kinetochore, centromere, chromosomes parts
Amount of genetic diversity	identical to parent cell	more genetic diversity to parent cell
Presence of tetrad formation	None	Present

Workshop NGSS Connections

(and/or other applicable standards)

SEPs	CCCs	DCIs	TEKS
Asking Questions and Defining Problems	Systems and System Models	HS-LS1-4	Student Expectation-B2.E
Developing and Using Models	Cause and Effect	HS-LS3-2	Student Expectation B.5A
	Scale, Proportion, and Quantity		Student Expectation B.6G

We value your opinion! Let us know what you think.

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