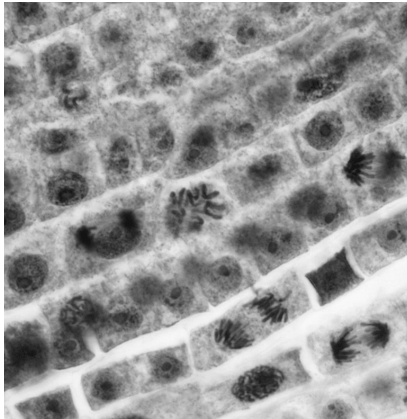


Lab 3. Cell Cycle: Do Plant and Animal Cells Spend the Same Proportion of Time in Each Stage of the Cell Cycle?

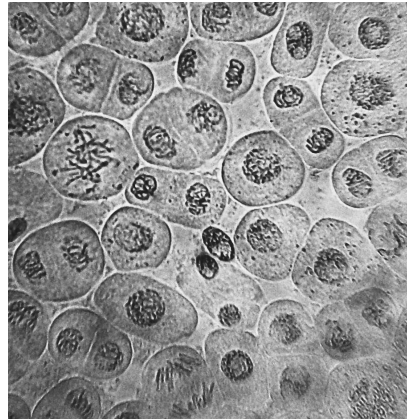
Introduction

The cell cycle is an important process, and we need to understand it to appreciate how animals and plants are able to grow, heal, and reproduce. The figure below provides pictures of plant and animal cells in various stages of the cell cycle.

The cell cycle of (a) plant cells and (b) animal cells



(a)



(b)

The picture of the plant cells was taken from the cells in the tip of an onion root. The roots of plants are good for studying the cell cycle because they are constantly growing and, as a result, many of the cells in the tip of the root are in the process of dividing. To create the picture in the figure (a) above, a very thin slice of onion root was placed onto a microscope slide. The root was then stained with a dye that made the chromosomes visible. These photos provide us with a clear view of the various stages of the cell cycle, yet this information tells us little about how long a cell spends in each stage and if the amount of time in each stage is different for plants and animals.

To figure out how long cells spend in each stage of the cell cycle, we need to look at the proportion of cells in a given area that are in each phase. From this information you can then determine the relative amount of time a cell spends in each stage. The portion of cells in each phase should correspond closely with the amount of time spent by each cell in each phase.

Your Task

Determine the proportion of time animal and plant cells spend in each phase of the cell cycle.

The guiding question of this investigation is, **Do plant and animal cells spend the same proportion of time in each stage of the cell cycle?**

Materials

You may use any of the following materials during your investigation:

- A prepared slide from an onion root tip
- A prepared slide from a whitefish blastula
- Microscope

Safety Precautions

1. Glass slides can have sharp edges—handle with care to prevent cutting of skin.
2. Use caution when working with electrical equipment. Keep away from water sources in that they can cause shorts, fires, and shock hazards. Use only GFI-protected circuits.
3. Wash hands with soap and water after completing this lab.
4. Follow all normal lab safety rules.

Getting Started

To answer the guiding question, you will need to design and conduct an investigation. You will be presented with slides that you can use to see the cells in the tip of an onion root and in a whitefish

blastula. Both slides will have cells in various stages of the cell cycle. To accomplish this task, you must determine what type of data you will need to collect, how you will collect it, and how you will analyze it. To determine *what type of data you will need to collect*, think about the following questions:

- What type of measurements or observations will you need to record during your investigation?
- How will you quantify any differences or similarities you observe in the different cells?

To determine *how you will collect your data*, think about the following questions:

- How will you determine how many cells are in each stage on each slide (i.e., how many cells are in interphase, how many cells are in metaphase, and so on)?
- How will you make sure that your data are of high quality (i.e., how will you reduce error)?
- How will you keep track of the data you collect and how will you organize the data?

To determine how you will analyze your data, think about the following questions:

- What type of calculations will you need to make? (Hint: You will need to determine the number of cells in each stage and the total number of cells you counted and use those numbers to predict how much time a dividing cell spends in each phase.)
- What type of graph could you create to help make sense of your data?

Investigation Proposal Required? ☐ Yes ☐ No

Connections to Crosscutting Concepts and to the Nature of Science and the Nature of Scientific Inquiry

As you work through your investigation, be sure to think about

- the importance of identifying and explaining patterns,
- why it is important to look for proportional relationships,
- how living things move through stages of stability and change,
- the difference between observations and inferences in science, and
- how scientific knowledge can change over time.

Argumentation Session

Once your group has finished collecting and analyzing your data, prepare a whiteboard that you can use to share your initial argument. Your whiteboard should include all the information shown in the figure to the right.

To share your argument with others, we will be using a round-robin format. This means that one member of your group will stay at your lab station to share your group's argument while the other members of your group go to the other lab stations one at a time to listen to and critique the arguments developed by your classmates.

The goal of the argumentation session is not to convince others that your argument is the best one; rather, the goal is to identify errors or instances of faulty reasoning in the arguments so these mistakes can be fixed. You will therefore need to evaluate the content of the claim, the quality of the evidence used to support the claim, and the strength of the justification of the evidence included in each argument that you see. In order to critique an argument, you will need more information than what is included on the whiteboard. You might, therefore, need to ask the presenter one or more follow-up questions, such as:

- How did you collect your data? Why did you use that method? Why did you collect those data?

Argument presentation on a whiteboard

The Guiding Question:	
Our Claim:	
Our Evidence:	Our Justification of the Evidence:

- What did you do to make sure the data you collected are reliable? What did you do to decrease measurement error?
- What did you do to analyze your data? Why did you decide to do it that way? Did you check your calculations?
- Is that the only way to interpret the results of your analysis? How do you know that your interpretation of your analysis is appropriate?
- Why did your group decide to present your evidence in that manner?
- What other claims did your group discuss before you decided on that one? Why did your group abandon those alternative ideas?
- How confident are you that your claim is valid? What could you do to increase your confidence?

Once the argumentation session is complete, you will have a chance to meet with your group and revise your original argument. Your group might need to gather more data or design a way to test one or more alternative claims as part of this process. Remember, your goal at this stage of the investigation is to develop the most valid or acceptable answer to the research question!

Report

Once you have completed your research, you will need to prepare an investigation report that consists of three sections that provide answers to the following questions:

1. What question were you trying to answer and why?
2. What did you do during your investigation and why did you conduct your investigation in this way?
3. What is your argument?

Your report should answer these questions in two pages or less. This report must be typed, and any diagrams, figures, or tables should be embedded into the document. Be sure to write in a persuasive style; you are trying to convince others that your claim is acceptable or valid!