

Middle School Science Experiment

Understanding Cell Division

During this experiment, you will use the ProScope Digital USB Microscope and a computer to collect microscopic images from a prepared microscope slide of an onion root tip. When you examine and manipulate the images, you will be able to demonstrate your understanding of the events happening in mitotic cell division. You will also be able to use the computer to point out the various parts of the cell.

Objectives

In this experiment, you will:

- Collect images from an onion root tip
- Use the images you collect to illustrate the sequence of events in cellular division (mitosis)
- Learn how to identify various cellular structures

Materials

- Power Macintosh G3 or better
- ProScope Digital USB Microscope with c-mount adapter and software
- Compound microscope with 400X objective
- Onion root tip prepared slide

Procedure

- 1** Prepare the microscope by removing the eyepiece and attaching the ProScope with c-mount adapter. (Your teacher will demonstrate this procedure.) Prepare the computer for data collection by opening the USB Shot software and connecting the ProScope to one of the computer's USB ports.
- 2** Place your onion root tip slide on the stage of the microscope.
- 3** Using the low power lens of the microscope, use the coarse and then the fine adjustment knobs of the microscope to bring the image into focus.
- 4** Locate an area that appears to have many cells in various stages of mitosis. Use the USB Shot software to create a still image. Create a folder to store your images.
- 5** Increase the magnification to 400X by rotating the revolving objectives on the microscope. Focus the image and then use the USB Shot software to capture an image and save it on your computer's desktop.

Data

- 1 Using a word-processing application, create a data table to present your images with a description of each.
- 2 Using the Lasso tool in AppleWorks or another paint application, select and copy varied cells' images and then paste them into your data table. Include images of cells that are engaged in a particular event of mitosis.

Processing the data

Label your specimens according to their stage and place the pictures in the correct sequence in your data table.

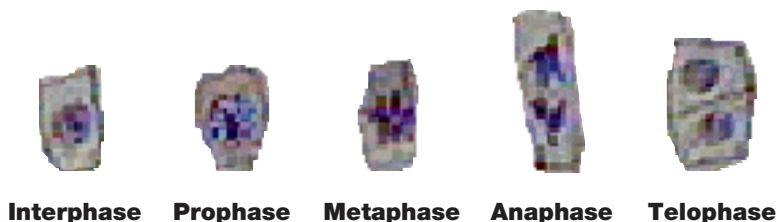
Extensions

1. In what other areas of a plant would you expect to see many cells undergoing the process of mitosis?
2. In what regions of your own body would you expect to observe many cells involved in mitosis?
3. During your life span, when would you expect to observe many cells involved in mitosis?

Teacher information

Overall, this experiment is directed to the need for students to recognize that life processes occur in a predictable series of events. In the case of mitosis or cell division, each stage of mitosis represents significant changes in the shape, number, and arrangement of chromosomes as the cells duplicate themselves. In the past, students have had to rely on their own artistic abilities to demonstrate their understanding of this sequence of events. Technology now enables students to go beyond the limits of artistic ability, allowing them to microdissect a digital sample of dividing cells and arrange the collection in the correct sequence.

Sample results



Answers to questions—Extensions

1. Wherever there is vigorous growth, one would expect to see many cells dividing, such as at the tips of twigs and in the tissues of fruits as they begin to develop. Answers will vary, but regions of growth are generally found in the root tips, apical meristems or tips of the stems, and also in the cambium or the sheath of cells surrounding the margin of the stem (produces the annual rings in perennial plants).
2. In the bone plates during childhood, the bones are really elongating and other cells must be replenished in the germative layer of the skin, in bone marrow, and in lymph nodes. And how about our brains? We are supposed to add neural connections as our brains develop.
3. This depends a bit on age, but students might note that hair is always growing as well as skin in areas where there might have been an injury. It has been suggested that we don't grow additional muscle cells but rather improve on the ones that we have as well as provide for them to become larger as needed.

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