





**C**omplex organisms consist of many different types of specialized cells, such as chloroplasts in plants and red blood cells in animals. All different types of cells descend from the single generalized cell from which the organism begins independent life. **Differentiation** is the process of progressive changes through which a cell or an organism becomes transformed into a specialized one.

In a plant, growing cells are differentiated into the different cells that make up the leaves, stems, roots, flowers, and seeds. In this activity you will observe differentiation in the cells of a grass seedling root.

## CHALLENGE

What evidence of cell differentiation can be observed?

MATERIALS		
	<i>For the class</i> grass sprouts bottles of Balanced Salt Solution single-edged razor blades petrolatum plastic picks	
		<i>For each team of students</i> 1 microscope 1 microscope slide 1 cover slip

## PROCEDURE

1. Obtain a grass seedling from your teacher and place it on a plastic slide.
2. Place one or two drops of Balanced Salt Solution on the seedling.
3. Carefully use the single-edged razor blade to cut off the root of the seedling and transfer it to a cover slip.
4. Place one or two drops of Balanced Salt Solution on the root.
5. Prepare a sealed mount as follows:
  - a. Sketch a square on a piece of paper slightly smaller than the square plastic cover slip.
  - b. Place a clean slide on the paper centering it over the sketch.
  - c. Use a plastic toothpick to place a thin line of petrolatum around the edges of the square you sketched on the slide.
  - d. Carefully lift up the slide, turn it over, and lower it carefully over the cover slip which has the root on it so that the petrolatum outline on the slide matches up with the edges of the cover slip.
  - e. Press down lightly on the slide, making sure not to crush the root tip, and then turn the slide and attached cover slip right side up.
6. Place the slide you prepared on your microscope then carefully observe it until you locate
  - a. the cells of the very end of the root, called the root cap.
  - b. the meristem cells, which are next to the root cap cells.
  - c. the root hairs. [If you observe carefully and patiently, you can actually see them growing!]
  - d. the cells in the region between the meristem and the beginning of the root hairs.
  - e. two dark streaks further back in the root.
7. Sketch the entire grass root tip. Include details of the areas you were asked to observe in Step 6. Label your sketch as completely as possible.

## ANALYSIS

1. What do you think the function of the root cap is? Support your answer with evidence.
2. Describe the meristem cells.
3. What evidence did you observe that cell differentiation is beginning to take place in the region between the meristem and the root hairs?
4. What evidence did you observe that the two dark streaks farther back in the root are the beginnings of xylem tissue?
5. How does differentiation take place in the root?
6. What fundamental problems does this activity leave unanswered?