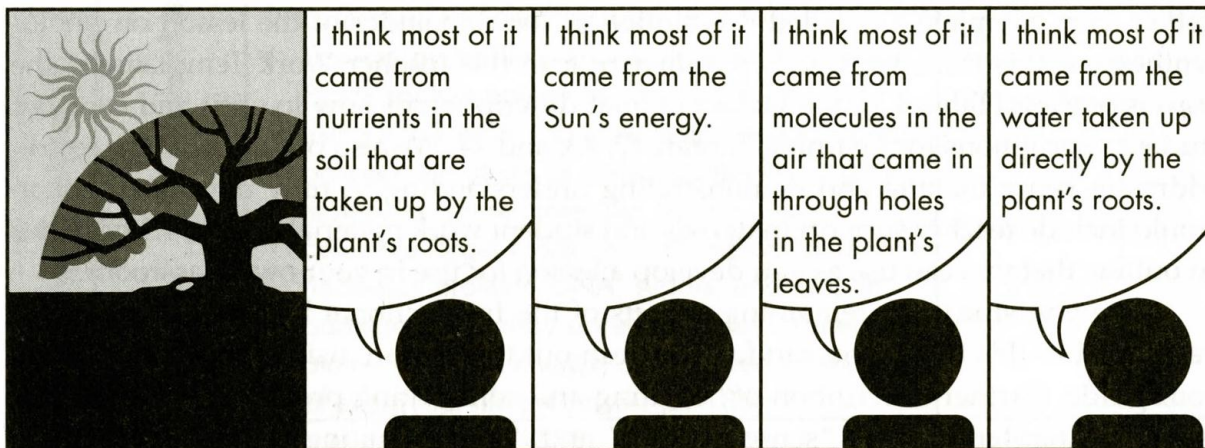


Where Does a Plant's Mass Come From?

by Dr. Ingrid Waldron, Department of Biology, University of Pennsylvania, 2011

Question: This large tree started as a little seed. What provided most of the mass that made the tree grow so large?



(from "Hard-to-Teach Biology Concepts" by Susan Koba with Anne Tweed, NSTA Press)

1. Which opinion or opinions do you agree with?
2. The atoms in H₂O and organic molecules provide almost all of a plant's mass. How does the plant get or make these molecules?

Major Type of Molecule in Plants	How does the plant get or make these molecules?
H ₂ O	
Organic molecules such as cellulose (a polymer of glucose)	

3. An experimenter grew a willow tree in a pot from 1642 through 1647. Only water was added during the five years of the experiment. The experimenter found these results:

	Weight of Tree	Weight of Dried Soil
1642	5 pounds	200 pounds
1647	169.1 pounds	199.9 pounds

Based on this evidence, did most of the mass of the organic molecules in the tree come from nutrients in the soil? Explain your reasoning.

4. During photosynthesis one type of energy is converted to another type of energy, and two kinds of molecules are converted to two different kinds of molecules. Complete this chart to show the changes during photosynthesis. Use the terms: chemical energy, CO₂, glucose, H₂O, O₂ and sunlight.

Energy Input _____	~~~~~ >	Energy Output _____
Matter Inputs _____ _____	Photosynthesis	Matter Outputs _____ _____
	----- >	

Based on this chart, where do the atoms in the organic molecules in the tree come from?

5. Scientists have shown that:

- Most of the mass of the glucose molecules produced by photosynthesis comes from CO₂ and very little from H₂O.
- Energy is not converted to matter in biological processes like photosynthesis.

Use all the information in this activity to think about each of the opinions in the cartoon. Explain why you agree or disagree with each of these opinions.

Opinion	Agree or Disagree	Reason You Agree or Disagree
Much of the mass of the tree came from nutrients in the soil that were taken up by the plant's roots.		
Much of the mass of the tree came from the sun's energy.		
Much of the mass of the tree came from molecules in the air that came in through holes in the plant's leaves.		
Much of the mass of the tree came from water taken up by the plant's roots.		