To figure out how plants meet their needs, José Dinneny studies plant roots at the level of cells and even individual protein molecules.

Meet a Scientist Who Studies How Plants Find Water Underground

Have you ever spotted a plant growing in an unlikely place? Some plants can thrive in surprising environments, from cement sidewalks to dry, cracked deserts. How do these plants get the water they need to survive? How do plant roots find water underground? Biologist José Dinneny is trying to find out.

Dinneny says studying plant roots can be challenging in their natural environments, "because soil is hard to see through." With his team of researchers, Dinneny brings plants into his lab at Stanford University. Here, he grows plants in special environments so that he can observe the growth of their roots. Sometimes he grows plants in transparent gel that gives a clear view of the roots. Dinneny has also developed a way to make plant roots produce light like fireflies do! This causes the roots to glow in the dark, so that they can be observed and photographed.

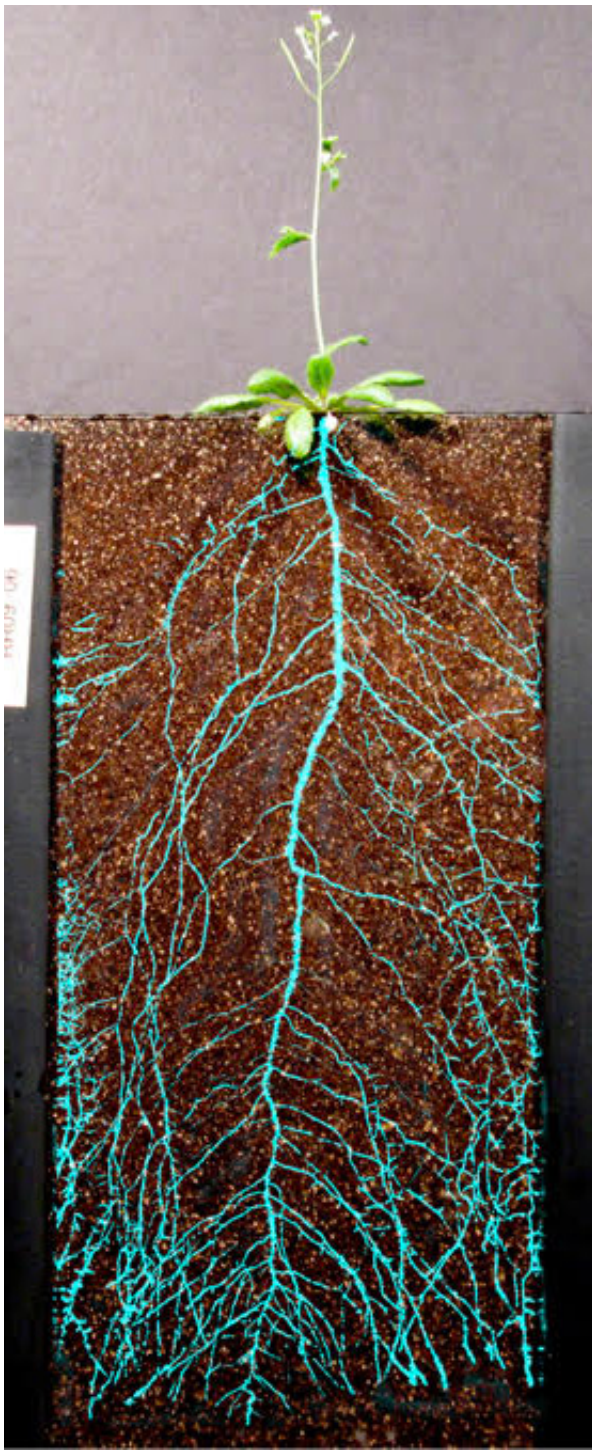
Through his research of plants, both in the lab and in nature, Dinneny has made exciting discoveries. He says that plants can detect water in the soil and grow roots in the direction of the water. Dinneny has

also learned interesting things about the growth of roots during a drought, when there is very little water in the soil. He says plant roots grow deeper during drought. They also grow more slowly, to help keep the plant from using up all the available water before rain comes again.

Dinneny and his team know that plants can change the direction they grow in and how fast they grow, depending on their environment. What is most surprising is that plants do all this without eyes, a brain, or a nervous system! To find out how this works, Dinneny zooms in with powerful microscopes and other tools. He observes plants at the scale of plant cells, and even at the scale of individual protein molecules. He is still investigating to find out more about how plants do what they do.

Learning more about how plants find and conserve water is especially important because people use a tremendous amount of water to raise plants for food. It takes a whole gallon of water to grow the plants that produce a heaping teaspoon of sugar! Eighty percent of the freshwater people use goes to watering crops. Figuring out how plants survive in times of drought will help farmers make decisions about the best ways to grow crops during water shortages.

Dinneny grew up in the San Fernando Valley of California. His grandparents had come there from Mexico in the 1950s. As a kid, Dinneny loved dinosaurs, and watching the movie *Jurassic Park* showed him the power of molecular biology. He says, "I always wanted to be a scientist, though I certainly experienced my share of hard times that made me question whether I was able to be a successful scientist. Science is challenging, because you have to work hard and there are many failed experiments. Sometimes it is not clear why you are wrong or why the experiment did not work. The magic comes when you are wrong and it becomes immediately clear why. This is when you get to learn something new about the way that nature works."



This photo shows a plant with glowing roots in Dinneny's lab.