

MARTY MORGAN, COOKE COUNTY AG AGENT
TEXAS A&M AGRILIFE EXTENSION SERVICE



What do Plants Know?

How do plants know which way is up or which way is down? It is a fact of life that most plants need light to grow and keep them healthy, but not all plants need light to germinate, some seeds find light a hindrance. It's dark down there in the potting soil. There's no light, no sunshine. So how does it know which way is up and which way is down? It does know! Seeds routinely send shoots up toward the sky, and roots the other way. Darkness doesn't confuse them. Somehow, they get it right... Gee I wonder how?---It always amazes me how God our Creator, made the plants and animals to know what to do without being educated or trained. He made animals with basic instincts they use to hunt, raise their young, and survive. He made plants to know which way is up and which way is down, otherwise they would be growing every which of way, and one can only imagine the mess that would be. If you turn a seedling (or a whole bunch of seedlings) upside down, as Thomas Andrew Knight of the British Royal Society did around 200 years ago, the tips and roots of the plant will sense, "Hey, I'm upside down," and will wiggle their way to the right direction, doing a double U-turn if necessary. How exactly does The Creator make them to know which way to go? According to botanist Daniel Chamovitz, Thomas Knight 200 years ago assumed that plants must sense gravity. They feel the pull of the Earth. Knight proved it with a crazy experiment involving a spinning plate. He attached a bunch of plant seedlings onto a disc (think of a 78 rpm record made of wood). The plate was then turned by a water wheel powered by a local stream, "at a nauseating speed of 150 revolutions per minute for several days." He wondered, would the plants respond to the centrifugal pull of gravity and point their roots to the outside of the spinning plate? When he looked that's what they'd done. Every plant on the disc had responded to the pull of gravity, and pointed its roots to the outside. The roots pointed out, the shoots pointed in. So Thomas Knight proved that plants can and do sense gravitational pull.

We humans have teeny crystalline stones floating in our ear cavities that literally sink in response to gravity, telling us what's up and what's down. What do plants have? We still don't know the science of how plants do it. There is a team of botanists who have a promising idea, but at the moment it's just a very educated guess. Plants have special cells right down at the tip — the very bottom — of their roots. And if you look closely, inside these cells there are dense, little ball like structures called "statoliths" which comes from the Greek, meaning "stationary stone." You can see them here. Basically these little pebbly things respond to gravity. In a plant cell, gravity pulls them to the "bottom," and once they find a resting place, they can send signals to neighboring cells in the plant essentially saying, "OK guys! We now know where Down is. Those of you that need to go down (root cells), go this way! Those of you who need to go up (the shoot on top), go the other way!" The botanists suggest this is how plants figure out where "down" is. They use little statolith balls as gravity receptors. Their idea got a boost when they sent some seedlings into space (to the space station) where the pull of gravity is close to zero, figuring if the statoliths just float randomly and don't drop to the bottom of their cells, the plants won't know which way is down. And sure enough the plants growing in space did not send their roots in any specific direction. The roots just went every which way. So the next time you pass a tree, a flower, a grape vine, grasses, bushes, vegetables, any plant that seems to be reaching for the sky, that plant may be going up not just because it wants to be kissed by the sun, but also because down at its bottom, in cells rooted in the Earth, it's got itty bitty rocks installed by our Creator telling it, "go thattaway!"