



JUST RIGHT: SEARCHING FOR THE GOLDILOCKS PLANET

Radial Velocity Activities

“Some stars seem to wobble at us—wobbling slightly one way and then the other—as if trying to get our attention. Wobbling tells us that an orbiting planet is tugging the star around and around with its gravity, like a puppy on a leash running circles around you. This is the radial velocity method of finding exoplanets.”

—**Just Right: Searching for the Goldilocks Planet**

Gravity & Student Wobble

The radial velocity method of detecting exoplanets is based on the way a star's planet(s) affect the star's movements. A star and its planet(s) orbit around their common center of gravity, which is not located in the very center of the star—and so the star seems to wobble as the planet(s) go around it. Sometimes people refer to this method as looking for a “gravity wobble” in the star’s movements. Author Curtis Manley helps readers visualize this by describing radial velocity as being “like a puppy on a leash running circles around you.”

You could also liken it to an adult twirling a child. The child spins free with their feet off the ground, but their weight pulls on the adult so that the adult must constantly shuffle his/her feet to try and stay in position.

You can physically demonstrate radial velocity by having two students hold hands and then spin together. They will be rotating around a common center of gravity as they twirl. Mark that center between them with a colored object that is easy for the other students to observe. (Perhaps the gym teacher can loan a rubber base from a ball game.) Ask the pair to try and keep the marker between them as they spin. When they twirl, they will also be pulling each other slightly off balance. This is what happens as a planet orbits around a star. They influence each other and the planet causes a slight wobble in the star. It is best to do this outside on a soft, grassy area in case anyone becomes a little dizzy.

Walking & Watching the Wobble

Astronomers looking at distant stars may not even realize a star has a “wobble” until they are able to take detailed measurements of its movements. Let’s return to the puppy on a leash example. Have you ever seen someone in the distance who seemed to be walking a bit off balance? Then, when the person drew closer, you could see that this person was actually walking their dog. The dog pulling at the leash was affecting the way the person moved, but without more observation, the reason for the “off-balance” style of walking was not obvious.

You can physically demonstrate this concept with a hula hoop with a 5-foot rope tied to one side. Have one student put the hula hoop around their waist. Have another student hold the free end of the rope and run around the first student. What do the two observe? What do your other students observe?

Explore “NASA: Watching for Wobble” at <https://exoplanets.nasa.gov/alien-worlds/ways-to-find-a-planet/#/>