Explaining Carbon Capture at 3 Different Difficulty Levels

To a 6-year-old child:

Carbon is a really, really small thing that helps make up the air we breathe. Though each piece is super duper small, we have a lot of it in our air outside. I like to think of carbon as one giant blanket for the earth, because it helps keep us warm. If we didn't have carbon, all the warmth from the sun would hit the ground and then just bounce right up, and it would keep going until it was back in space! We need this warmth to survive, and the carbon wraps around the earth like a blanket and helps trap all the heat in. Over the past few years, though, a bunch of new carbon has gotten into our air, so the Earth has been getting extra warm. It's kind of like wearing a big bulky sweater in the middle of August-not comfy at all! Since our world has been heating up lately, a lot of people have been trying really hard to think of new ways to get that carbon out of the air and make it go somewhere else (and unfortunately, it's not as easy as just taking off your sweater). We know that plants eat up carbon from the air, because they need it to grow, so we've been working on figuring out ways that plants can take in a little more carbon, give it to the dirt they're planted in, and keep that carbon locked away so that it won't go back into our air for a really long time.

To an adult not involved in STEM:

I've been doing a lot of work with an environmental science lab on campus, and we've been trying to develop some ways to hold carbon in the soil to keep it out of our atmosphere. Carbon dioxide, as you may have heard before, is known as a "greenhouse gas". This essentially means it causes the effect you'd see in a greenhouse or a car on a summer day, where sunlight can get into a building and heat it up, but the heat can't escape. A little bit of that greenhouse effect is essential to life on Earth, because without it, it would be too cold here to sustain life. However, in recent years, we've been using a lot of coal, natural gas, and oil, which all leave behind CO_2 in the air after being burnt. This has made the greenhouse effect a little too successful, so we've reached a point where the temperatures on Earth are getting hotter than what some species can handle.

That's where carbon capture comes in—scientists lately have been putting a lot of time and effort into looking for ways to get that CO_2 back out of the atmosphere. The environmental science lab on campus has been looking at soils as a potential spot to store some carbon, and we've done this by looking at a couple proteins and carbohydrates that we think have potential.

Plants naturally make all sorts of molecules like proteins and carbohydrates, and eventually some of those end up in the soil, either during the plant's life or as the plant material decomposes and goes back to the earth. Little microorganisms that live in the soil then go and eat up those molecules and, just like us, they breathe out that carbon dioxide into the air. If we want to keep carbon in the soil, we need to look for molecules that these microbes can't eat. In

particular, we've looked at this one protein called Ure2p, which is native to yeast cells. This protein tends to clump together and form really large chunks, which are hard for microbes to eat because of their size and how much they resist being taken apart. The researchers in our lab have been looking at this protein and seeing what happens when we give it to microbes to eat, with hopes that we can eventually stick it in our soils and use it to hold carbon.

To a third-year college student studying Ecosystem Science at CSU:
(Luckily for me, I know someone at this level, so I chose to actually record a real conversation I had with my friend Elsa rather than typing out what I would've said to her. I put the audio recording as a separate file on my Canvas submission.)