Edinburgh International Book Festival

Interview with Emily Dodd

Author and science communicator Emily Dodd talks to the Book Festival team about the awesome power of nature

Q: What's wind power, and why should we use it instead of other forms of power?

A: Wind power is electricity that we can make using the wind. We use the energy that comes from the wind as the wind blows, so it's a type of energy which won't run out which is why we call it renewable energy. That's great because we're not using up any resources when we use wind power because the wind is just going to blow all the time. Especially in Scotland where it's really windy! So it's a type of energy we can use to make electricity without having to burn coal or do mining or burn anything. It's a great type of power.

Another reason that it's a great one to use in Scotland is we have the most wind energy in Europe because of the coastline. We're an island so we've got sea all around us, and if you look at the edge of Scotland it's very wiggly so there's a lot of coast, so that's a lot of wind compared to other countries. We are the wind capital of Europe!

Q: Where in the world do you get the most or the biggest volcanoes and tsunamis? Why?

A: The most dangerous volcanoes and tsunamis happen around the Pacific Ocean. If you were looking at the Pacific there's an area called the Ring of Fire, which is all the countries that go around the Pacific Ocean, making a kind of circle. It's not exactly a ring, it's more like a diamond shape. If you've got a map or a globe in the classroom, you can take a look.

All of the earth's surface is made up of big pieces of rock called plates and they all move around in different directions at about the speed your fingernails grow at, so a few centimetres a year. The Pacific Ocean is an area where there are plates moving towards each other, so what happens is a thinner plate in the ocean pushes down and gets pulled below a thicker plate where the land is. As it goes down, the plate starts to melt and seawater goes down and the pressure changes. Over millions of years this movement pushes up mountains so there's lots of volcanoes around this Ring of Fire and sometimes they explode. There's one called Mount St Helens which has exploded into a cloud of ash. All of the rock just changed into volcanic ash in mid-air.

This is also the area where we get lots of earthquakes because of these movements. An earthquake happens when the two plates are trying to push and they get stuck and then as they ping back the ground shakes in an earthquake. It's those earthquakes which normally cause a tsunami.

Tsunamis can be caused by landslides, volcanoes and earthquakes but the most common way we get a tsunami is when there's an earthquake under the sea. The edge of one of these plates jumps up in the sea and it pushes the water up and then the water moves in all directions and creates these big waves called tsunamis. When you're out at sea you wouldn't know it was a tsunami, if you were on a rowing boat out at sea it would just seem like a normal wave. It's a bit like when you cycle uphill on a bike, you start to slow down, it's the same with a tsunami wave, as it goes up the coast onto land, onto the beach, it starts to slow down and the bit against the land slows down but the rest of the water is rushing over the top of it. That movement of the water pushing over the top makes these giant waves. They can be up to 10 metres high and usually it's a series of waves, not just one. They come in fast and there's a lot of water behind them so they come in and flood. Occasionally you might just get one giant wave, which is called a bore, which can be 50 metres, but usually it's a series of waves which are quite high. All around the pacific this happens because of these movements of plates.

Here in Scotland, in Edinburgh, we do have our very own volcano, Arthur's Seat. That is an extinct volcano so thankfully there is no danger of it erupting now!

Q: Where do volcanoes/tsunamis/wind power get their energy from?

A: All the energy that we have in the universe began at the Big Bang, an explosion of light and matter which flew in all directions, because energy can't be created or destroyed, it just changes from one type to another. That explosion helped produce things like planets and stars and that same energy just keeps changing. Everything we do, every time we move, every time anything happens that is energy, that comes right back from the Big Bang. That's really exciting - it just changes from one type to another!

With wind power, the energy comes from the wind and the wind is the air moving because of the sun heating up the planet. It heats up the water and it heats up the land. Warm air starts to move and rise and colder air moves and that's why we get wind. So that energy comes from the sun, and the sun's energy comes all the way back from the Big Bang. You can trace it all back.

With volcanoes, the energy comes from the movement of the plates and the heat that's inside the earth. Part of that heat comes from when the earth was first formed. Some of the energy's coming from friction as the plates move past each other.

For tsunamis, that energy's coming from movement of the earth's plates which becomes movement of the earthquake which becomes movement of the water. It just keeps changing form.

So when we use wind power, the movement energy of the wind we can convert to another type of energy which is electricity and then it becomes light in a lightbulb or heat in your house. It just keeps changing.

Q: What's your favourite way to bring these powerful forces to life in the classroom?

A: There's a force which is with us all of the time, a very powerful force called gravity. Big things have a pull on smaller things and planet earth is really big and it's pulling stuff towards it and that's called the force of gravity.

We all have this powerful force acting on us all the time, even though it probably doesn't feel like it. If you're sitting in a chair right now, then the force of gravity is pushing you down, but the force of the chair is pushing up and they're balanced, because if they weren't balanced then you would fall through your chair or your chair would push you up into the air. The forces are balanced and that's why you can't really feel it but your body is really aware of it. Every time you move it's balancing around something called your centre of gravity which makes sure your body weight, your mass (mass is weight x the force of gravity), is spread out evenly. So, if you lean forward your body will automatically push your bum out backwards, otherwise you'd fall forwards because too much of your body mass has gone one way.

Here are a couple of experiments to show you that's true:

Experiment one:

- Stand up straight with your back, bum and heels against a wall.
- Slowly try to lean over.
- What you'll find is because the wall is stopping you sticking your bum out backwards, you can't lean forwards. You would fall over if you tried. Normally your body would move backwards with your bum and it would balance you out so that you can stay balanced.

Experiment two:

- Stand up straight facing a wall, with your toes and forehead against the wall.
- Keeping everything against the wall, try to stand on your tip toes.
- You can't do it! In just that tiny upwards movement, your body again tries to balance your centre of gravity but can't because you're against the wall.