In This Realm, Seeing Isn't Believing

An interview with **Alannah Hallas**, Assistant Professor, UBC Physics & Astronomy, Stewart Blusson Quantum Matter Institute

One of the first topics that people learn when they start studying physics is classical mechanics. You know, I can throw a ball, what's its velocity, what's its acceleration, what's its position as a function of time? And that's extremely intuitive because you can do any number of experiments to understand classical mechanics; you can drop a ball and watch it accelerate towards the ground.

But with quantum mechanics it's not that easy for most people to just go home and do an quantum mechanics experiment. There isn't anything that you can see with your naked eye that tells you that quantum mechanics is true. There's this leap that you have to make of just accepting that that's the way the universe is, and we have to develop a lot of very special tools to study the quantum properties of materials.

What's a project you're currently working on?

Almost from the first day I arrived here, I got involved with this Grand Challenge, which is about using disorder as a design principle to find new materials. There is no such thing as an absolutely perfect material. Every material has some level of defects and disorder. And so the idea of this Grand Challenge is to use disorder as the intrinsic physics, so instead of disorder being something that's hampering our understanding of the material, it's something that's actually causing the property that we're interested in.

There's lots of different lenses on that problem, but the one that I'm interested in is a class of materials known as high entropy oxides. They're

very new, and this is a class of materials where we're actually mixing together five different chemical elements into one material and they're completely randomly distributed, so it's about as disordered as you could imagine a material being, but they do really interesting things. They do things that are completely different than any of those one elements in isolation.