S100: Science: a foundation course
S100/05: Science Course Unit 5

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Clip transcript: A demonstration of Brownian motion.

Gerald Elliott:
But first I want you to look at a phenomenon which was first seen by the botanist Robert Brown looking down his microscope at suspensions of pollen grains some hundred years ago. He saw that they were constantly in motion, jiggling around in this way, and he asked himself whether this was because there was a living system, so he did an experiment with suspensions of non-living particles of about the same size, gold particles in fact, and convinced himself that it wasn't a function of whether the thing was living or not, he could get just the same molecular motion going on with gold particles. So he said there must be some sorts of forces which were causing these particles in suspension to jiggle around like this.

What then are these forces? To show this I've set up an analogy using our old friend, the air table. You see the motion of this white puck. It's moving in a random way around the field of view and there are apparently no forces to cause this motion. But if we change the illumination conditions we will see that the motion of the white puck is in fact caused because round it there are lots of other black pucks and these are impacting with it in a random way and it's the motion of the black pucks which is forcing the random motion of the white puck in the system. This is, of course, a straight analogy with Brownian motion as Brown saw it in his microscope. You'll see that the particles are moving about at random as they moved about at random in our analogue. You'll see that they are going in and out of focus in our microscope as they go up and down in the solution. So we see that the effect of Brownian motion is caused by the impact of literally billions of billions of atoms and what we're seeing here is the influence of the atomic motion of the molecules in our fluid, the gas or the liquid.