

So shown here are three of some of my favorite viruses, I picked them for no apparent reason other than they look really cool. I've scaled them all to about the same size for easy viewing and despite their apparent complexity, the structure of most viruses are actually formed by simple repeats of only a few proteins, sometimes in conjunction with lipids. The individual proteins here are shown in different colors. So this first example is a non-enveloped virus, which means it lacks a lipid component, and the capsid or shell is in the shape of an icosahedron. In geometric terms, an icosahedron is formed by 20 identical triangular faces, five faces meet at each of the twelve vertices forming a pentamer at each apex, and if you look closely, you can see it. Alright, so take a look at your virus models, who has this virus that I'm showing on the screen right now, hold them up. If you're not holding up the red virus, put it down (laughter). So the goal of this exercise is to correspond the images on the screen, which are multi-colored with sort of the solid color here of the virus plastic model. So I printed these on a 3d printer from crystallographic data structures so that they're molecularly accurate, and if you look very carefully you can spot the pentamers at each of the apex's. Now you're playing cards also have more detail on each particular virus. This happens to be a nodavirus. Nodavirus is a small RNA genome virus, the RNA is in two parts, and I think it's kind of cool because it infects both insects and fish, and under these certain, precise conditions can infect mammals, which is sort of, very unusual because there aren't many insect viruses that can infect mammals. And so my suspicion is that there are a lot more nodaviruses out there than we realize and what they're doing in the environment, and what else they infect is going to be an interesting mystery to solve soon. So let's put nodavirus back into the queue here and bring out our next contestant. It's a non-enveloped virus, just like nodavirus with an icosahedral capsid. The pentamers at this case each vertex in this case are fairly easy to see. The Rhinovirus that causes the common cold is an RNA virus, it's a plus strand RNA virus, and once it gets it, it makes more of itself and gets out fast. It's really fast and it does its thing with incredible efficiency. That was rhinovirus, and now I'm just going to move ahead to Dengue virus. Dengue virus is more spherical, but also has an icosahedral structure. In this case, the glycoproteins that are on the surface, float on a lipid membrane that is host derived. So who here has Dengue virus? I better see the blue ones this time. Right, and so as you can see, it's very spherical, but if you rotate it very carefully you can see the pentamers at each of the vertices.