JOANNE STUBBE: When I went to graduate school, which was in the late 1960s, I didn't even know what an enzyme was, because back in those days I'd never had a biology course. They didn't do biochemistry back in those days. And I think I heard a lecture by Van Tamelen at Stanford. He was interested in steroid structures, steroids that have four rings and it's the basis for sex hormones and for cholesterol biosynthesis. They're all sort of made through a common biosynthetic pathway that we don't really talk about.

These are these five carbon units to form carbon-carbon bonds that I mentioned earlier. Anyhow, what he showed was you could take 30 carbon strung together in a linear form. And then somehow these 30 carbons folded up with one enzyme to form these four rings, putting in eight asymmetric centers in a single step at pH7 in 100% yield.

Once I saw that, I said man I don't want to be a chemist. If you could see how nature designed this, and what is the basis for being able to make these molecules, it was sort of mind boggling to me. And I think enzymes are like that. What they do is they've evolved for billions of years to accelerate rates of reactions by factors as much as 10 to the 20th. So that's really fast, like a bat out of hell.

And so nature has figured out how to control all of this. But again, she has a limited repertoire of reactions that she catalyzes, but she's extremely good at it. And so understanding people have studied enzymes forever because I'd like to understand the basic principles of catalysis. And then if you understood those, can the chemist then take this understanding and translate it into the bigger repertoire of the periodic table you have to be able to do these transformations? So the mechanisms of rate acceleration, which we talk about in some detail in a lecture, what causes these catalysts to work, and the way you describe how these catalysts work.

It doesn't matter whether you're using a small inorganic molecule or small organic molecules or a protein, the basic principles and thinking about catalysis is exactly the same, except nature has figured out how to do this better than anything man can do. But again, she's limited in terms. She's had a billions of years to evolve these catalysts, but then she's limited in the repertoire of reactions that she needs to catalyze. So how can you not think enzymes are cool?