Cornell University
Graduate School

Cornell University Three Minute Thesis (3MT) Competition

Shao-Pei Chou, Genetics, Genomics & Development: “Decoding the 2% That Makes Us Human”

[Clock Ticking]

>> Narrator: Cornell University 2019 Three Minute Thesis finalist. Shao-Pei Chou, Genetics, Genomics & Development: “Decoding the 2% That Makes Us Human.”

>> Chou: The DNA sequence of humans and the chimpanzee are 98 percent identical but we look and behave so differently. What are the 2 percent difference in the DNA sequence that make us human? Many of them are transcription regulatory element. The DNA sequence that do not encode gene but determined when, where, and how much of each gene should be turned on or off. It's like playing a symphony. Yes, we need all the music instruments, the genes. But we tell the music sheet, like the notes, when, where and how each instrument shall be played, there's no symphony. Our understanding of transcription regulatory elements has focused on enhancer. The element that drive expressions of target genes. It works like a gas pedal. Could you imagine a well-functioning car with only gas pedal but no brake? To solve that, the field has hypothesized that there's another kind of regulator element, silencer, that will turn down the expressions of target genes. To start the [inaudible] hypothetical silencer at the [inaudible] to identify them based on their function. So, what's the function of silencer? Silencers work like a brake. So, I would like to identify a region in a genome where higher activity reduced the expression of target genes. To do that I used the [inaudible] genome from our cell. One inherited from our mother, the other from the father. Based on the natural genetic variations between them, I can identify region showing different activity, that's our representative of silencer. Second is to copy of genome as to highway that are very similar. The vehicle [inaudible] that transcribe RNA from DNA. The more traffic means the higher activity of transcription. Based on the traffic pattern, I can identify potential road block and the layer effect on the traffic. For example, stop signs slow traffic down. There's more traffic behind a stop sign and less traffic in front a stop sign. Based on this high low traffic patterns, I can identify the location of stop sign along the highway. Similarly, I can locate silencer and the layered target gene along the genome based on the activity pattern. Using this method, I have identified potential silencers. Next, we can start to ask, what do they look like, how do they work, and finally we can answer the question how the transcription regulator elements create a difference between us and the chimpanzee? Thank you.

[Applause]