

Ballet

Connectome: dancing through neuronal circuits



"I am more than my genes! What am I? I am my connectome." Such were the words of computational neuroscientist Sebastian Seung (Princeton Neuroscience Institute, Princeton, NJ, USA) in his TED Conference speech in 2010. He proposed that our connectome, the particular wiring of our brain, is what shapes our identity. Even though part of this neuronal map is programmed by our genes, Seung argued that neural activities—"encoding our thoughts, feelings, perceptions, and mental experiences"—can cause these connections to change, which makes each individual's connectome unique.

Inspired by Seung's theories, Alastair Marriott's four-part ballet was a bold attempt to explore how a woman's identity is shaped by her interactions with two men as she journeys through life. Marriott's choreography and Arvo Pärt's music together created an expressive work of art. But the performance was not only about the emotional aspects of life—the happiness and excitement of being in relationships, and the sadness and pain when these relationships end. The ballet went beyond what we can see on the surface to explore how neural connections are formed, detached, pruned, and re-formed over time, and how these changes in connectivity are intimately related to our experiences.

The stage opened with a forest of silver poles, shimmering with light, hanging from the ceiling. Running from this dense network of lights to centre stage was the central female figure played by Lauren Cuthbertson. She was joined by two men with whom she crossed paths, with a chorus of four men who danced in the background to reinforce the connections between the principal dancers and sometimes stepped forwards to interact with the trio as the journey went on.

The stage designs by Es Devlin (set), Bruno Poet (lighting), and Luke Halls (video projection) were simply stunning. Glittering images of a connectome projected onto the network of poles set the scene for the most emotionally gripping part of the performance, the *pas de deux* in the penultimate section. The rolls, spins, and lifts between the two principal dancers were a joy to watch, and the ability of the pair to infuse intense emotions into an abstract work of ballet was impressive. Not only did the fluid movement between the couple speak of the close relationship they had developed, but it also resembled the changes in neural pathways—the constant evolution of synapses that defines and redefines the connectome. The visual design echoed the dancers' movements and portrayed the unseen forces that shaped the protagonist's connectome and, ultimately, her identity. The clever use of lights and shadows, with

video projections displaying a white network of changing neural wiring in the background, intensified the emotion and energy on stage.

The neural wiring that had been white throughout the performance changed into a mesh of colourful wires in the final scene. As Cuthbertson interacted with the six male dancers, the connections in the background continued to grow in size and complexity. The ballet ends with her looking back at the mesh and a beautiful solo, almost as if she was pondering how her connectome, and her identity, evolved during her journey and how it was influenced by the interactions she had with other people in her life.

According to Seung, "the connectome is where nature meets nurture". Marriott's work is where ballet and neuroscience, two seemingly distinct disciplines, meet—in an elegant and poignant exploration of what defines one's identity. The physical and emotional experiences that shape our identity are all related to a complex and intricate network of neurons in our brains. Seung likens the constantly changing neural activity to water in a stream, "the connections of the brain's neural network determine the pathways along which neural activities flow, and so the connectome is like the bed of the stream". It is our connectome that enables us to think, perceive, feel, remember, and express ourselves, each in our unique way, in the lifelong exploration of our identities. And it is this physical structure of the human brain—all 100 trillion connections between the neurons—that Seung is seeking to map and understand, to reveal what makes us who we are beyond our genes.

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For more on **Connectome** see <http://www.roh.org.uk/productions/connectome-by-alastair-marriott/>

For **Sebastian Seung's TED talk** see https://www.ted.com/talks/sebastian_seung/



ROH, 2015. Photographed by Bill Cooper