Interview Assessment #3

Professional Name: Professor Jessica Butts

Profession/Title: PHD Researcher at Rice University

Date of Interview: November 18th, 2024

Introduction:

I had the opportunity to speak with Dr. Jessica Butts, a biomedical engineer specializing in neuroengineering, particularly the development of the brainstem and its role in the central nervous system. Dr. Butts' expertise in tissue engineering and cellular analysis of the brainstem inspired me to shift my focus from the mechanical aspects of biomedical equipment to exploring the biological side of the profession. This conversation provided valuable insight into the intersection of engineering and biology, which has sparked my interest in expanding my knowledge in this area.

Educational Background and Projects:

Dr. Jessica Butts received her Ph.D. in Bioengineering from the University of California, San Francisco, and UC Berkeley, with an emphasis on neuroengineering and cellular analysis. She then did her postdoctoral work at Baylor College of Medicine and the Gladstone Institutes, further specializing in neuroengineering and tissue engineering. At Baylor, Dr. Butts worked on projects ranging from the development of the brainstem and its possible regenerative treatments to projects on understanding the way cells in the brainstem are specified and differentiated to form functional units that will aid in the design of new therapeutic strategies for neurodegenerative diseases.

Insights into Dr. Butts' Research and Approach:

During the interview, Dr. Butts described her innovative work combining engineering and biology. She elaborated on how her research focuses on cellular processes of the brainstem and on trying to find out how cells organize and function during the course of development. She also said that it is very important to learn about the brainstem because it forms one part of the brain that controls very important functions of the body, such as respiration and heart rate, which are taken for granted.

Dr. Butts explained how computational analysis does play a significant role in her work, especially when it comes to gene expression and cellular behaviors of the developing brainstem. A large part of her research is focused on studying genes that are turned on within the cells of the developing brainstem and understanding how that affects their function and development. Her approach bridges the gap between engineering principles and biological systems, particularly in the area of tissue engineering. She described how tissue engineering takes a cell and develops it into functioning tissue, which has practical applications for addressing neurological disorders.

The Brain Stem's Role and Importance:

Through our conversation, I learned about the vital role of the brain stem, a part of our body which connects the brain to the spinal cord and controls essential, often overlooked functions like breathing and heart rate. She emphasized that while it is possible for a human to be alive without the brain we cannot survive without our brain stem. This is a concept that peaked Proffesor Butt's interest in neuroengineering, and her interest only deepened after she began understanding and manipulating the brain stem to lead to advancements in treating neurological diseases.

Engineering and Tissue Engineering in Neuroengineering:

Through her research, Dr. Butts merges cellular-level studies of the brain stem with computational analysis. Dr. Butts collects cells from the developing brain stem and studies gene expression to determine which genes are turned on during development. She is able to affect the growth and development of the tissue by exposing it to various materials and chemicals. Dr. Butts explained that tissue engineering takes the individual cells and makes functioning tissue, which can be applied to the study of brain stem development and diseases in the lab.

Cellular Level Research and the Importance of Regeneration:

Dr. Butts was initially interested in regeneration and stem cell research, leading her to take up studies on the regeneration of cells and tissues in the brainstem. She works at the cellular level to better comprehend how the brainstem is developed and functions in regard to its connections with the rest of the nervous system. This work entails much hands-on analysis, from using techniques such as computational analysis and tissue engineering for the elaboration of a better understanding of the brainstem in functioning and to help develop treatments affecting this part of the body.

Reflection:

My conversation with Dr. Butts really gave me a better sense of the research side of biomedical engineering, especially regarding tissue engineering and its applications to the brainstem and central nervous system. I found her work very interesting and an inspiration; she bridged engineering and biology in ways that I had never thought about before. Although I'm still not quite sure which area within biomedical engineering I want to apply for, this conversation led me to become more aggressive with research opportunities. It compelled me to learn more about what actual lab work goes into a research setting and got me to feel out that atmosphere. I had been unsure about pursuing research deeply, but my conversation with Dr. Butts has sparked an interest in exploring this path within biomedical engineering and therefore provided interest in pursuing it a bit.