Amgen Seminar Series in Chemical Engineering

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Cell mechanics and its applications in biomedical engineering

By

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Abstract:
Biophysics and mechanobiology of biological cells are important subjects to not only cellular physiology but also to biomedical engineering, such as nanoparticle-based drug delivery, nanomaterial cytotoxicity, and tissue engineering. Two main load-bearing structures of biological cells are cell membrane and cytoskeleton. These macromolecular structures are regulated by biochemical events when fulfilling their mechanical roles. On the other hand, they also act as mechanosensors to enable the mechanical forces to regulate the biochemical reactions in the cell. Therefore, mechanics and biochemistry are closely coupled for the cell. A better understanding of the complexity of cell mechanics and mechanobiology can help achieve rational design in bioengineering where mechanical properties of engineered materials can be tailored to yield optimal outcomes. In this talk, I will present our recent and ongoing work on mechanobiochemical modeling of several different problems including (1) the endocytosis of nanoparticles, (2) the molecular dynamics modeling of cell membranes, and (3) development of a mechanobiochemical virtual-cell simulation program.

Bio: Dr. Yuan is currently an Assistant Professor in the Department of Mechanical, Industrial & Systems Engineering at University of Rhode Island. Dr. Yuan received his Bachelor's degree from Tsinghua University at Beijing in 2002, his Master's degree from University of Alaska Fairbanks in 2007, and his PhD in Engineering Science and Mechanics from Penn State in 2010. Before joining URI, he did post-doc training in the Solid Mechanics Group at Brown University (2011- 2012) and in the School of Engineering and Applied Science (SEAS) and Wyss Institute at Harvard University (2012-2014). His research interests include computational mechanics, cell and molecular mechanics, and nanomechanics.

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