

Einladung zum V O R T R A G

The Rational and (Sometimes) Irrational Design of Biomaterials for Medical Applications

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Abstract: Hip implants, synthetic heart valves, and drug eluting wafers for the brain. What do these all have in common? Each one is a biomaterial that is designed to interact with a biological system. Physicians often seek to cure ailments or improve a patient's quality of life by employing biomaterials. Classically, the process of biomedical device innovation is driven by clinical demand. Yet, it is here that the development of new biomaterials diverges. The first path to a new biomaterial includes clearly defining a medical need and then rationally designing a material based on the need. This has resulted in the development of common products such as contact lenses and surgical sutures. The second path involves developing unique materials that often do not have clearly defined medical applications or have failed in their original application. From this latter path, we can explore the potential of the new material in irrational applications. For example, modern contact lenses were inspired by a physician who observed that WWII aviators suffered no long-term eye damage from embedded plastic windshield fragments. As another example, the field of modern tissue engineering stemmed from one physician taking left over biodegradable surgical suture off the operating room floor post-surgery, fraying the threads, and growing cells on this 3D scaffold. This talk will cover the creation of biomaterials throughout the speaker's career that were rationally designed for a specific medical application and then repurposed for a completely different, sometimes irrational, application.

CV: Dr. Jennifer Weiser is an Associate Professor of Chemical Engineering at the Cooper Union for the Advancement of Science and Art in New York City. Her research focuses on drug delivery, wound healing, and developing polymeric biomaterials for medical applications. Professor Weiser earned degrees in Chemical Engineering (B.S. 2006, Rensselaer Polytechnic Institute) and Biomedical Engineering (M.S. 2010, Ph.D. 2012, Cornell University). Industrially, she worked as an exploratory medicinal chemist at Wyeth Pharmaceuticals and as a research associate at the startup iFyber. Dr. Weiser was further trained through a postdoctoral fellowship in Biomedical Engineering (2014-2017, Yale University). This work led to her appointment as a Visiting Assistant Professor in the Department of Surgery at the Yale School of Medicine (2017-2018). She held the title of Visiting Assistant Professor of Clinical Medical Sciences (2018-2019) at the Columbia University Medical Center at Columbia University. Recently, Dr. Weiser was awarded the 2024-2025 Fulbright-Graz University of Technology Visiting Professorship.

Since joining the full-time faculty of The Cooper Union in 2017, Dr. Weiser has engaged in numerous research and educational collaborations, including with institutes in the USA such as the Icahn School of Medicine at Mount Sinai, Montefiore Einstein, Columbia University, the University of Wisconsin, and Rowan University. Internationally she has worked with the AO Research Institute (CHE), ETH Zurich (CHE), Riga Technical University (LVA), Politecnico di Milano (ITA), and the Italian Consiglio Nazionale delle Ricerche (ITA).

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