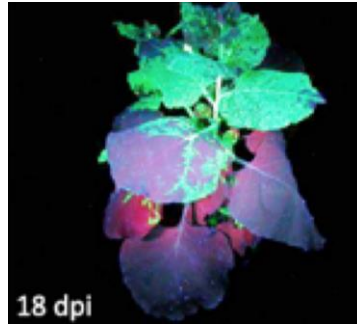
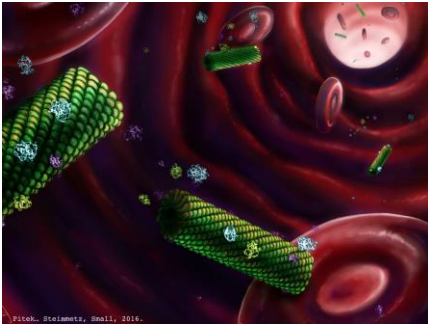


Abstract | Science

Nanomanufacturing gone viral – virus-based supra-assemblies

Nicole F. Steinmetz | Case Western Reserve University | School of Medicine



Nanoscale engineering is revolutionizing the materials, biotechnology, and medicine. Viruses are playing a special role in these developments because they can function as prefabricated nanoparticles naturally programmed to self-assemble into discrete nanoparticles and higher-order structures. My laboratory has developed a library of plant virus-based nanoparticles; through structure-function studies we are beginning to understand how to tailor these materials appropriately for medical vs. materials applications. On the one hand, through synthetic biology, we have developed virus-based delivery system carrying contrast agent and/or therapeutic cargo enabling therapeutic applications targeting cancer and cardiovascular diseases. On the other hand, we have programmed virus-templated films and supra-assemblies for potential applications as bioreactors and photonic or electronic devices. In this lecture, I will highlight engineering design principles employed to nanomanufacture the next-generation of virus-based supra-assemblies.

Biosketch: Nicole F. Steinmetz, Ph.D.

Dr. Steinmetz is an Associate Professor of Biomedical Engineering at **Case Western Reserve University School of Medicine**, Cleveland, OH, where she is leading a research laboratory interfacing bio-inspired, molecular engineering approaches with medical research and technology development. Dr. Steinmetz holds secondary and trainer appointments in the Departments of Radiology, Materials Science and Engineering, Macromolecular Science and Engineering, Pathology, Pharmacology, Molecular Virology, and Division of General Medical Sciences-Oncology; she is a member of Case Center for Imaging Research and Case Comprehensive Cancer Center.



Dr. Steinmetz trained at **The Scripps Research Institute**, La Jolla, CA where she was a NIH K99/R00 awardee and AHA post-doctoral fellow (2007-2010); she obtained her PhD in Bionanotechnology from the University of East Anglia where she prepared her dissertation as a Marie Curie Early Stage Training Fellow at the **John Innes Centre**, Norwich, UK (2004-2007). Her early training was at the **RWTH-Aachen University** in Germany, where she obtained her Diploma (Masters) in Molecular Biotechnology (2001-2004) after completing her pre-Diploma from the **Ruhr University Bochum**, Germany (1998-2001).

Dr. Steinmetz serves on the Editorial Board of Wiley Interdisciplinary Reviews (WIREs) on Nanomedicine and Nanobiotechnology; she serves on the Advisory Editorial Board for the ACS journal Molecular Pharmaceutics. Dr. Steinmetz has chaired symposia at American Chemical Society, Materials Research Society, and Foundations of Nanosciences; and she served as Chair of the Gordon Conference of Physical Virology (2015).

Dr. Steinmetz has authored more than 100 peer-reviewed journal articles, reviews, book chapters, and patents; she has authored and edited books on Virus-based nanotechnology. Research in the Steinmetz Lab is funded through grants from federal agencies, including National Institute of Health, National Science Foundation, and Department of Energy, as well as private foundations, including Susan G. Komen Foundation, American Cancer Society, and American Heart Association. Over the past 5 years, Dr. Steinmetz has been awarded grants as PI and Co-PI totaling \$8 million in total costs.

Awards

- 2016 Daniela Pucci Prize at NanoPlasm 2016
- 2016 American Cancer Society (ACS) Research Scholar Award
- 2015 CWRU's Bruce Jackson, MD, Award for Excellence in Undergraduate Mentoring
- 2015 National Science Foundation (NSF) CAREER Award
- 2015 YoungInnovator of Cellular and Molecular Bioengineering, Biomedical Engineering Society
- 2015 Chair of Gordon Research Conference of Physical Virology
- 2014 Susan G. Komen Career Catalyst Grant
- 2014 Crain's Cleveland Business Forty under 40 Awardee
- 2011 Mt.Sinai Scholar, Case Western Reserve University
- 2009 K99/R00 Pathway to Independence Award (NIH/NIBIB)
- 2008 American Heart Association Postdoctoral Fellowship
- 2007 British Science Federation Communication Award, Category New Researcher
- 2006 Finalist for the European Young Chemists Award, Budapest, Hungary
- 2006 Awarded Participation at Meeting of Nobel Prize Winners in Lindau, Germany
- 2006 Bryan Harrison Award, International Conference on Advances in Plant Virology, Warwick, UK
- 2004 Marie Curie Early Stage Training Fellowship
- 2004 Awarded Springorum Denkmuenze, RWTH Aachen University, Germany

