

**Pace University Chem Seminar  
NY ACS MetroWomen Chemists' Committee Seminar**

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***The Power of Amino Acids:  
Arginine as a 'Molecular Glue' for Fragile Supramolecular Miracles.***

**Date:** Tuesday 10<sup>th</sup> November 2026  
**Time:** 3:25 pm  
**Location:** Pace University

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**Abstract:** Robustness is not simply resilience to changing conditions, rather, it is the ability of a system to respond adaptively to changes in its environment while maintaining its functionality. In Nature, robust solutions already exist. Hierarchical supramolecular self-assembly—weak non-covalent interactions resulting in materials ordered over multiple length scales—is nature's most successful design principle for robust functional systems. Robust light-harvesting complexes found in photosynthetic bacteria [1], for example, consist of fragile hierarchical supramolecular assemblies embedded in a dynamic protein scaffold that is thought to be fundamental to the organism's overall functionality, and its robustness. Translating Nature's successful design principle to large-scale applications—ranging from renewable energy, information technology to nanomedicine—has not been accomplished yet due to lack of the assemblies' robustness.

Inspired by nature's robust architectures, the fundamental question arises, can we utilize nature's protein building blocks—amino acids—to support robust hierarchical supramolecular assembly? With our bioinspired approach employing amino acids, we provide proof-of-concept on how to address this fundamental question. We show how to employ amino acids to provide robust assemblies by utilizing an artificial model system, that is, supramolecular nanotubes from cyanine dye molecules [2]. In contrast to neat nanotubes, optical spectroscopy, cryogenic-electron, atomic-force and confocal-optical microscopy combined with density-function theory revealed that upon hierarchically self-assembly via amino acids, nanotubes remain robust, even under extreme heat stress or complete drying upon solid-substrate deposit. Our bioinspired design approach—using amino acids—may be applied widely to other solution-based dye supramolecular assemblies, polymer assemblies as well as to colloidal nanoparticles and provides a basis for robust next generation organic devices.

[1] Orf, G.S. and Blankenship, R.E., *Photosynth. Res.* 2013; Scholes, G.D., *et al. Nat. Chem.* 2011.

[2] Eisele, D.M., *et al., Nat. Chem.* 2012; Eisele, D.M., *et al., et al. J. Am. Chem. Soc.* 2010; Eisele, D.M., *et al., Nat. Nanotech.* 2009; Eisele *et al., PNAS* 2014; Eisele, D.M., *et al. Nat. Chem.* 2020; Pshenichnikov, M.S., *et al. J. Am. Chem. Soc.* 2023; Eisele, D.M., *et al. J. Phys. Chem. B* 2024; Caram, J.R., *et al. Nat. Chem.* 2024.

**Biography:** Dr. Eisele was born and educated in Germany. She received her B.S. and M.S. in Physics from Technical University of Berlin, Germany, and her Ph.D. in Physics (Dr. rer. nat.) from Humboldt University of Berlin, Germany, in close collaboration with David Vanden Bout (University of Texas at Austin, USA) and Jasper Knoester (University of Groningen, The Netherlands). From 2010-2014, she conducted her postdoctoral research at the EFRC *Center for Excitonics* at MIT with Mounqi Bawendi, Keith Nelson, Andrei Tokmakoff, and the late Robert Silbey. In 2014, she joined CCNY-CUNY as a faculty member. Her laboratories are located at [CUNY's new science campus](#) and combine solution-based materials nanosynthesis with time-resolved optical spectroscopy and super-high resolution nanoscopy methods. As an Associate Professor for Physical Chemistry and Nanoscience, her research is concerned with low-dimensional quantum material systems at the intersection of Chemistry, Physics and Materials Science. For her research, she received awards such as the Feodor-Lynen Research Fellowship Award of the Alexander von Humboldt Foundation, NSF CAREER Faculty Early Career Development Award, CUNY Junior Faculty Research Award in Science and Engineering (J-FRASE), Felix Gross Award of CUNY Academy for the Humanities and Sciences.

