

# 2021 AFOSR Natural Materials and Systems Annual Program Review

Dr. Patrick Bradshaw | December 6-9, 2021 | Niceville, FL

Doolittle Institute  
1140 E John Sims Pkwy #1 | Niceville, FL 32578

## Day 1 | Monday, December 6, 2021

Time-CST	Title of Project	Speaker
830-900	<b>Set up/Zoomgov login</b>	
900-910	Brief Introduction and Welcome	<b>Patrick Bradshaw</b> AF Office of Scientific Research
910-940	(BRI) Theory-based design of synthetic genetic circuits incorporating biophysical models, stochastic dynamics, and evolutionary robustness	<b>Hal Alper</b> , UT-Austin <b>Howard Salis</b> , Penn State <b>Andy Ellington</b> , UT-Austin
940-1010	(EOARD/ONR-G) Re-Configurable Biocomputing Circuits	<b>Francesc Posas Garriga</b> <b>Javier Macia</b> Universitat Pompeu Fabra
1010-1025	<b>BREAK</b>	
1025-1055	Novel Microbial Chemolithotrophy in Hot, Acidic Biotopes	<b>Robert Kelly</b> , NC State
1055-1125	Regulatory Mechanisms of Radioresistance under Differential Levels of Ionizing Irradiation	<b>Lydia Contreras</b> , UT-Austin
1125-1155	Polyurethane Biodeterioration: From Chemistry to Communities	<b>Wendy Goodson</b> , AFRL/RX <b>Dan Barlow</b> , NRL
1155-1225	(SOARD) Evolving at Life's Limits: Microbial Communities in the Atacama Desert	<b>Eduardo Castro</b> Universidad Andrés Bello
1225-1330	<b>LUNCH</b>	
1330-1400	Self-Assembly of Conductive Fibers from Bioinspired Peptides	<b>Allon Hochbaum</b> UC-Irvine
1400-1430	Controlled assembly and patterning of multifunctional biomaterials on ultrastable protein scaffolds	<b>Douglas Clark</b> , UC-Berkeley <b>Dom Glover</b> , UNSW
1430-1500	De novo design of transmembrane pores and channels	<b>David Baker</b> , U Washington
1500-1515	<b>BREAK</b>	
1515-1545	(OSD-HBCU/MI) Synthetic Carbohydrate Receptors: Tools for Exploring and Exploiting the Most Complex Recognition in Biological Materials	<b>Adam Braunschweig</b> <b>Mateusz Marianski</b> , CUNY
1545-1615	Peptide-driven Exfoliation and Organization of Multi-compositional 2D Nanomaterial	<b>Marc Knecht</b> , University of Miami <b>Tiff Walsh</b> , Deakin
<b>ADJOURNED FOR THE DAY</b>		

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## Day 2 | Tuesday, December 7, 2020

Time-CST	Title of Project	Speaker
830-900	<b>Set up/Zoomgov login</b>	
900-930	(HBCU-MI) Shape-changing, metabolite consuming peptide nanostructures	<b>Rein Ulijn</b> CUNY
930-1000	Inspiration from fungi: Generating tuneable mycelial networks for directed assembly	<b>Carole Perry</b> Nottingham Trent
100-1030	Proto-organelles for Biomineralization	<b>Abby Knight</b> , UNC-Chapel Hill
1030-1045	<b>BREAK</b>	
1045-1115	(YIP) Controlling Material Properties through Extracellular Electron Transfer	<b>Keith Keitz</b> UT-Austin
1115-1145	(YIP) Molecular electronics using bio-derived components	<b>Masha Kamenetska</b> Boston University
1145-1215	Mapping molecular-level dynamics to mesoscale mechanics in composite DNA-based biomaterials	<b>Rae Robertson-Anderson</b> U of San Diego
1215-1315	<b>LUNCH</b>	
1315-1345	(YIP) Structural studies to elucidate the mechanisms of biobased nanoparticle synthesis	<b>Brent Nannenga</b> Arizona State
1345-1415	Exploitation of Natural Processes and Materials – Understanding Biointerfacial Properties and Structure-Function Studies of Biopolymers	<b>Patrick Dennis</b> , AFRL/RX <b>Rajesh Naik</b> , AFRL/711 HPW
1415-1445	(MURI) A 4D Nanoprinter for Making and Manipulating Macroscopic Material	<b>Chad Mirkin</b> , Northwestern
1445-1500	<b>BREAK</b>	
1500-1530	Chiral organization of tailored natural polymers and hierarchical photonic materials	<b>Vladimir Tsukruk</b> Georgia Tech
1530-1600	Towards Advanced Functional Biopolymer Materials	<b>Paul Trulove</b> , <b>David Durkin</b> US Naval Academy
1600-1630	(AOARD) Investigation on the Tuneable Optical Properties of Reformatted Bacterial Cellulose	<b>Sierin Lim</b> Nanyang
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**Day 3 | Wednesday, December 8, 2020**

Time-CST	Title of Project	Speaker
830-900	<b>Set up/Zoomgov login</b>	
900-930	Silk Modifications for Tunable Materials	<b>David Kaplan</b> , Tufts
930-1000	Hierarchical Assembly of Spider Silk Proteins: Exploring the Structural Biology of Natural Materials from the Atomic to the Macroscale	<b>Gregory Holland</b> , San Diego State <b>Nathan Gianneschi</b> , Northwestern
1000-1030	(ONR-G) Correlational investigation of spider silk structure-function relationship	<b>Thomas Scheibel</b> University of Bayreuth
1030-1045	<b>BREAK</b>	
1045-1115	Synthetic Mucins – a versatile new responsive material	<b>Adam Braunschweig</b> , CUNY
1115-1145	Macromolecular Modeling of Biomimetic Assembly	<b>Murugapan Muthukumar</b> UMass-Amherst
1145-1215	(MURI) Reverse and Forward Engineering of Biomolecular Condensates	<b>Cliff Brangwynne</b> , Princeton
1215-1315	<b>LUNCH</b>	
1315-1345	(AFRL-RX) Photonic, Electronic, and Soft Matter Materials to Enable Emerging Air Force Capabilities	<b>Mike Durstock (confirmed)</b> AFRL/RX
1345-1415	(NSF) Overview of biomaterials and related programs in DMRat NSF	<b>Randy Duran (confirmed)</b> NSF/DMR
1415-1545	(Closed) Gov't Reviewer Caucus	
<b>ADJOURNED FOR THE DAY</b>		

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**Day 4 | Thursday, December 9, 2020**

Time-CST	Title of Project	Speaker
830-900	<b>Set up/Zoomgov login</b>	
900-930	Development and Characterization of Novel Bioluminescence Sources	<b>Bruce Branchini</b> Connecticut College
930-1000	Biomimetic optical nanostructures from melanin and melanin composites	<b>Matthew Shawkey</b> Gent
1000-1030	(MURI) Unraveling the Biology, Chemistry and Nanoscience of Natural and Synthetic Melanins	<b>Nathan Gianneschi</b> Northwestern
1030-1045	<b>BREAK</b>	
1045-1115	Engineering and Evolution of Avian Eggshell: Insights from the Emu Egg	<b>Cassie Stoddard</b> , Princeton <b>Ling Li</b> , Virginia Tech
1115-1145	Characterization of Phononic Behavior in Biomaterials	<b>Horacio Espinosa</b> , Northwestern
1145-1215	(MURI) Convergent Evolution to Engineering- Multiscale Structures and Mechanics in Damage Tolerant Functional Biocomposite and Biomimetic Materials	<b>David Kisailus</b> , UC-Irvine <b>Pablo Zavattieri</b> , Penn State
1215-1315	<b>LUNCH</b>	
1315-1345	(YIP) Biokleptic and Biomimetic Assembly of Nanomaterials	<b>Rob MacFarlane</b> , MIT
1345-1415	(YIP) Fluorescent conformation-sensors for DNA and PNA nanostructures	<b>Rebecca Taylor</b> , CMU
1415-1445	Reconfigurable Matter from Programmable Atom Equivalents	<b>Chad Mirkin</b> , <b>Vinayak Dravid</b> , <b>Koray Aydin</b> , Northwestern
1445-1500	<b>BREAK</b>	
1500-1530	State of the NMS Program	<b>Pat Bradshaw</b> AF Office of Scientific Research
	<b>REVIEW ADJOURNED</b>	

Key:

BRI – Basic Research Initiative

EOARD – European Office of Aerospace Research and Development (a part of AFOSR)

ONR-G – Office of Naval Research Global

SOARD – Southern Office of Aerospace Research and Development (a part of AFOSR)

OSD – Office of the Secretary of Defense

YIP – Young Investigator Program

MURI – Multidisciplinary University Research Initiative

AOARD – Asian Office of Aerospace Research and Development (a part of AFOSR)

RX – Materials and Manufacturing Directorate of AFRL

711 HPW – 711<sup>th</sup> Human Performance Wing, co-located with AFRL