

# 2024 AFOSR Biophysics Program Review

Dr. Sofi Bin-Salamon | November 18-22, 2024 | Washington, DC

Johns Hopkins University

Bloomberg Center

555 Pennsylvania Avenue NW, Washington, DC 20001

Day 1 - Monday, 18 November 2024

TIME	TOPIC	SPEAKER
0830-0850	REGISTRATION	
0850-0900	Remarks	<b>Dr. Sofi Bin-Salamon</b> Program Manager Air Force Office of Scientific Research
0900-0930	Understanding the “Mission Versatility” of Membrane Proteins and Cells by All-Scale Nanoscopic Imaging	<b>Prof. Qian Chen</b> Department of Materials Science University of Illinois Urbana-Champaign
0930-1000	Elucidating the Biophysical Mechanisms of Protein-Lipid Interactions in Nanodiscs	<b>Prof. Aditi Das</b> Parker H. Petit Institute for Bioengineering and Biosciences Georgia Tech Research Corporation
1000-1030	Deciphering and Orchestrating Dendritic Cell Membrane-Material Interactions for Immunotherapy	<b>Prof. Hua Wang</b> Department of Materials Science University of Illinois Urbana-Champaign
1030-1100	BREAK	
1100-1130	Nanomanufacturing Program	<b>Dr. Khershed Cooper</b> Program Director National Science Foundation
1130-1200	Innovation in Multi-functional Materials via Scalable Additive Manufacturing	<b>Prof. Jochen Mueller</b> Department of Civil and Systems Engineering Johns Hopkins University
1200-1230	Towards the study of the impact of environmental mechanostimulus on oligodendrocyte precursor differentiation and myelination	<b>Dr. Ana Pêgo</b> Institute of Biomedical Engineering i3S/University of Porto
1230-1330	LUNCH	
1330-1400	Quantum Coherence and Quantum Interactions in Microtubules and Surrounding Environment	<b>Prof. Vladislav Yakovlev</b> Department of Biomedical Engineering Texas A&M University

<b>1400-1430</b>	Modulation of astrocytes as new paths to dialogue with the brain - ASTROTALK	<b>Dr. Valentina Benfenati</b> Institute of Synthesis and Photoreactivity National Research Council of Italy
<b>1430-1500</b>	From bio-nanomaterials to quantum dots for biosensing and modulating cellular response	<b>Dr. Maria Grazia Raucci</b> Institute of Polymers, Composites and Biomaterials National Research Council of Italy
<b>1500-1530</b>	Quantum control of biomolecular vibrations	<b>Prof. Warwick Bowen</b> Department of Physics University of Queensland
<b>1530-1600</b>	<b>BREAK</b>	
<b>1600-1630</b>	Dissecting the physical principles that control the spatial organization of intracellular signaling	<b>Prof. Lindsay Case</b> Department of Biology Massachusetts Institute of Technology
<b>1630-1700</b>	Chemotactic Movement and Organization of Membranes and Protocells	<b>Prof. Ayusman Sen</b> Department of Chemistry Pennsylvania State University
<b>1700-1730</b>	Influence of Hydration and Protein Collective Motions on Biological Activities	<b>Prof. Vinh Nguyen</b> Department of Physics Virginia Tech University
<b>1730-1800</b>	Optical analysis of biological aerosols for intraoperative tissue characterization	<b>Dr. José Rafael Guzmán Sepulveda</b> Biophotonics and Optical Sensing Laboratory Cinvestav Unidad Monterrey
<b>1800</b>	<b>MEETING ADJOURNED</b>	

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**Day 2 - Tuesday, 19 November 2024**

TIME	TOPIC	SPEAKER
0830-0900	<b>REGISTRATION</b>	
0900-0930	An Integrated Technology Platform with Photoelectrical and Electromagnetic Stimulator Arrays for Neuromorphic Vision	<b>Prof. Jian-Ping Wang</b> Department of Electrical and Computer Engineering University of Minnesota
0930-1000	Leveraging AI and computational methods for translational biophysics	<b>Prof. Tinen Iles</b> Department of Surgery University of Minnesota
1000-1030	Pixelated artificial retina models and biomodulation via organic semiconductors and light	<b>Prof. Thomas Brown</b> Department of Electronic Engineering University of Rome, Tor Vergata
1030-1100	<b>BREAK</b>	
1100-1130	Quantum Coherence and Dynamics in Biological Processes: Molecular Isomerization in Vision	<b>Prof. Paul Brumer</b> Department of Chemistry University of Toronto
1130-1200	Quantum correlation microscopy: progressing nanoscopy	<b>Prof. Andrew Greentree</b> ARC Centre of Excellence for NanoBiophotonics Royal Melbourne Institute of Technology University
1200-1230	Microwave and nano diamonds to dialogue with astrocytes	<b>Dr. Andrea Candini</b> Institute of Synthesis and Photoreactivity National Research Council of Italy
1230-1330	<b>LUNCH</b>	
1330-1400	Opportunities for creating Japan-US research collaboration	<b>Prof. Larry Nagahara</b> Vice Dean for Research and Translation Whiting School of Engineering Johns Hopkins University <b>Dr. Takeshi Usami</b> Director, Washington, D.C. Office Japan Science and Technology Agency

		<b>Ms. Yuko Tsuda</b> Deputy Director, Washington, D.C. Office Japan Science and Technology Agency
<b>1400-1500</b>	Label-free, high-speed quantitative imaging of astrocyte-neuron networks with optical diffraction tomography and machine learning	<b>Prof. Ishan Barman</b> Department of Mechanical Engineering Johns Hopkins University <b>Dr. Emanuela Saracino</b> Institute of Synthesis and Photoreactivity National Research Council of Italy
<b>1500-1530</b>	Investigation on co-cultured astrocyte and neuron populations by recording ultra-low signals with nanostructured electrodes	<b>Dr. Annalisa Convertino</b> Institute for Microelectronics and Microsystems National Research Council of Italy
<b>1530-1600</b>	Reconstruction of neuron potentials with convolutional neural networks trained on nanoelectrode recordings	<b>Prof. Zeinab Jahed</b> Department of Nanoengineering University of California, San Diego
<b>1600-1630</b>	<b>BREAK</b>	
<b>1630-1700</b>	Strategic Foresight - Helping Aviation Find Problems Worth Solving	<b>Dr. Vikram Shyam</b> Futurist Aeronautics Research Mission Directorate National Aeronautics & Space Administration
<b>1700-1730</b>	Entangled Quantum Sensors in Biology	<b>Prof. Peter Burke</b> Department of Integrated Nanosystem Research University of California, Irvine
<b>1730-1800</b>	Engineering nanodiamonds for superior sensing performance and future scalability	<b>Prof. Philip Hemmer</b> Department of Electrical and Computer Engineering Texas A&M University
<b>1800</b>	<b>MEETING ADJOURNED</b>	

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**Day 3 - Wednesday, 20 November 2024**

TIME	TOPIC	SPEAKER
0830-0900	REGISTRATION	
0900-0930	Universal Quantum Standards for Stochastic Biophysics	<b>Prof. James Brozik</b> Department of Chemistry Washington State University
0930-1000	Stochastic Biophysical Interactions within Aquaporin-4 Assemblies	<b>Prof. Grazia Paola Nicchia</b> Department of Bioscience, Biotechnology and Biopharmaceutics University of Bari
1000-1030	Label-free, sub-diffraction identification of biomolecules	<b>Prof. Somin Lee</b> Department of Electrical Engineering and Computer Science University of Michigan
1030-1100	BREAK	
1100-1130	Bio-imaging, Bio-sensing, and Quantum Sensing at ORNL	<b>Dr. Ali Passian</b> Senior Research Staff Computational Sciences and Engineering Division Oak Ridge National Laboratory
1130-1200	Oxygen controlled hydrogel to uncover cellular responses to rapid hypoxia	<b>Prof. Larry Nagahara</b> Whiting School of Engineering Johns Hopkins University <b>Prof. Sharon Gerecht</b> Department of Biomedical Engineering Duke University
1200-1230	Applying Artificial Intelligence Techniques to Biophysics in the Air Domain	<b>Mr. George Hellstern</b> Senior Manager of the Artificial Intelligence Pillar Lockheed Martin Corporation
1230-1330	LUNCH	

<b>1330-1400</b>	Biomolecular condensates as mediators of non-classical sensing at the molecular scale: The microtubule +TIP network	<b>Prof. Holly Goodson</b> Department of Chemistry and Biochemistry University of Notre Dame
<b>1400-1430</b>	Hybrid quantum biosensing platforms	<b>Prof. Brant Gibson</b> ARC Centre of Excellence for NanoBiophotonics Royal Melbourne Institute of Technology University
<b>1430-1500</b>	Exploring New Biophysical Processes with Quantum Entanglement	<b>Prof. Theodore Goodson</b> Department of Chemistry University of Michigan
<b>1500-1530</b>	Fundamental Biophysics Investigations on Upconversion Nanoparticles Modified Photoreceptive Composite Architectures for Enhanced Quantum Optoelectronics	<b>Prof. Bed Poudel</b> Department of Materials Science and Engineering Pennsylvania State University
<b>1530-1600</b>	<b>BREAK</b>	
<b>1600-1630</b>	Investigating Quantum Techniques for Breakthrough Solutions in Aerospace and Defence	<b>Dr. Massimiliano Dispenza</b> Head of Quantum Technology, Optronics and Advanced Materials Labs Leonardo SpA
<b>1630-1700</b>	Investigating Novel Materials and Processes for Breakthrough Solutions in Aerospace and Defence	<b>Dr. Abhishek Kumar</b> Advanced Materials Labs Leonardo SpA
<b>1700-1730</b>	Quantum biotechnologies	<b>Dr. Nicolas Mauranyapin</b> Department of Physics University of Queensland
<b>1730-1800</b>	Understanding Cell Morphology Using Neural Radiance Fields and Optical Diffraction Tomography	<b>Dr. Orlando Avila Garcia</b> ARQUIMEA Research Center
<b>1800</b>	<b>MEETING ADJOURNED</b>	

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**Day 4 - Thursday, 21 November 2024**

TIME	TOPIC	SPEAKER
0830-0900	<b>REGISTRATION</b>	
0900-0930	Photothermal label-free dynamic probing and modulation of astrocytes and fibroblast cell models	<b>Prof. Michelle Sander</b> Electrical and Computer Engineering Boston University
0930-1000	Astrocytes neural network multiscale response to extracellular sensing cues	<b>Dr. Valentina Benfenati</b> Institute of Synthesis and Photoreactivity National Research Council of Italy
1000-1030	Radiation Research Program	<b>Dr. Jeffrey Buchsbaum</b> Program Director National Cancer Institute National Institutes of Health
1030-1100	<b>BREAK</b>	
1100-1130	Aquaporin-4 as intelligent system in astrocytes to sense extracellular environmental clues	<b>Prof. Grazia Paola Nicchia</b> Department of Bioscience, Biotechnology and Biopharmaceutics University of Bari
1130-1200	Sensing extracellular matrix analogues to modulate astrocytes response	<b>Prof. Luigi Ambrosio</b> Institute of Polymers, Composites and Biomaterials National Research Council of Italy
1200-1230	Italy-US bilateral cooperation in Science & Technology	<b>Prof. Maurizio Biasini</b> Science Attaché Embassy of Italy <b>Mr. Giulio Busulini</b> Scientific Advisor Italian Institute of Technology
1230-1330	<b>LUNCH</b>	
1330-1400	Computing with Controllable Neuro-Glial Networks	<b>Prof. Wolfgang Losert</b> Department of Physics University of Maryland

<b>1400-1430</b>	Collective Information Processing of Astrocytes	<b>Dr. Kate O'Neill</b> Department of Physics University of Maryland
<b>1430-1530</b>	Astrocyte Augmented Machine Learning	<b>Dr. Corey Hart</b> Advanced Development Programs Lockheed Martin Corporation <b>Dr. Christopher Yang</b> Advanced Technology Laboratories Lockheed Martin Corporation
<b>1530-1600</b>	<b>BREAK</b>	
<b>1600-1630</b>	Real-time monitoring of aquaporin-4 dependent astrocyte biophysical parameters using multi-dimensional optical imaging and deep learning	<b>Prof. Bahram Javidi</b> Department of Electrical and Computer Engineering University of Connecticut
<b>1630-1700</b>	Lensless Computational Microendoscopy for Minimally-Invasive Hyperspectral Bio-imaging	<b>Prof. Mark Foster</b> Department of Electrical and Computer Engineering Johns Hopkins University
<b>1700-1730</b>	<b>DISCUSSION</b>	
<b>1730</b>	<b>MEETING ADJOURNED</b>	



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**Day 5 - Friday, 22 November 2024**

TIME	TOPIC	SPEAKER
0830-0900	REGISTRATION	
0900-0930	Measurement of Cellular Viscosity and Mitochondrial Dynamics using Ultrasensitive Imaging Methods	<b>Prof. Yun Chen</b> Department of Mechanical Engineering Johns Hopkins University
0930-1000	Imaging the living activity of cells	<b>Prof. Warwick Bowen</b> Department of Physics University of Queensland
1000-1030	Biotransfer Printing of Nanopatterns on Tissue and Single Cells	<b>Prof. Luo Gu</b> Department of Materials Science and Engineering Johns Hopkins University
1030-1100	BREAK	
1100-1130	Investigations of Cell Responses to Extreme Environments Created by 3D Printing	<b>Prof. Zhijian Pei</b> Department of Industrial and Systems Engineering Texas A&M University
1130-1200	Biophysical responses of lung cells to extreme environments created by 3D printing	<b>Prof. Hongmin Qin</b> Department of Biology Texas A&M University
1200-1230	Biophysical responses of brain cells to extreme environments created by 3D printing	<b>Dr. Ana Pêgo</b> Institute of Biomedical Engineering i3S/University of Porto
1230-1300	Biophysical responses of brain cells to extreme environments created by 3D printing	<b>Prof. Vladislav Yakovlev</b> Department of Biomedical Engineering Texas A&M University
1300-1400	LUNCH	
1400-1430	Measuring Plasticity in Integrated Quantum-Enabled Neural Networks (IQ-NNs)	<b>Prof. Wolfgang Losert</b> Department of Physics University of Maryland
1430-1500	Biological Control of IQ-NNs	<b>Prof. Kan Cao</b> Dept. of Cell Biology and Molecular Genetics University of Maryland

<b>1500-1530</b>	Engineering IQ-NN topologies	<b>Prof. John Fourkas</b> Department of Chemistry and Biochemistry University of Maryland
<b>1530-1600</b>	Harnessing IQ-NNs as a Quantum Biosensing Testbed	<b>Prof. Cheng Gong</b> Department of Electrical and Computer Engineering University of Maryland
<b>1600-1630</b>	<b>BREAK</b>	
<b>1630-1700</b>	NIH quantum opportunities	<b>Dr. Geetha Senthil</b> Deputy Director, Office of Special Initiatives National Center for Advancing Translational Sciences National Institutes of Health
<b>1700-1730</b>	Quantum Signatures in Redox Cell Biology	<b>Prof. Robert Usselman</b> Department of Chemistry and Chemical Engineering Florida Institute of Technology
<b>1730-1800</b>	Multiscale Electrical Mapping of Biosystems	<b>Prof. Jinglei Ping</b> Department of Mechanical and Industrial Engineering University of Massachusetts Amherst
<b>1800-1830</b>	Scalable nanophotonic source of squeezed light towards quantum- and bio-sensing	<b>Prof. Avik Dutt</b> Department of Mechanical Engineering University of Maryland
<b>1830</b>	<b>MEETING CONCLUSION</b>	