

EARLY CAREER  
RESEARCHER  
SYMPOSIUM  
**2018**

**ECRS**  
BROOKHAVEN NATIONAL LABORATORY

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October 11, 2018

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**PROGRAM**

# LETTER FROM THE ORGANIZERS

Dear Guest,

Welcome and thank you for participating in the seventh annual Early Career Researcher Symposium (ECRS), presented by the Association of Students and Postdocs (ASAP).

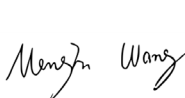
This symposium is a showcase of the exceptional research that is performed by students and postdocs at Brookhaven National Laboratory (BNL). Today the BNL early career researcher community will present their recent work through 32 oral presentations and 21 posters. A career panel and two distinguished keynote lectures will complement this display of work.

In the morning, we will hear from Dr. Andrei Kolmakov from Center for Nanoscale Science and Technology, National Institute of Standards and Technology. In the afternoon, Dr. Michael Thoennessen, Editor in Chief from American Physical Society, will address the symposium. The career panel will feature numerous professionals across a wide range of scientific backgrounds where students and postdocs will have the opportunity learn from their experience. Laboratory Director Doon Gibbs will deliver the award ceremony and closing remarks, which will be followed by a networking reception.

The symposium was organized by a group of students and postdocs whose work and generous donation of time show great dedication to their fellow researchers. Financial support was provided by the sponsors listed on the back cover of this program. We encourage you to visit their booths throughout the day and explore the links provided on the ECRS website (<https://www.bnl.gov/ecrs2018/sponsors.php>). ASAP is an organization dedicated to ensuring a high quality of life for early career researchers at BNL. It is funded by Brookhaven Science Associates and supported by senior staff members. The ASAP board recognizes the importance of professional development to its members and it is in this spirit that we present the ECRS. Thank you for your participation and support for the ECRS. We hope that you enjoy your day.

Sincerely,

The ASAP Board



Mengen Wang



Nusnin Akter



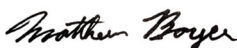
Matthew Musgrave



Lei Wang



Kyle Capobianco-Hogan



Matt Boyer

# PROGRAM SCHEDULE

8:00-8:45	<b>Registration</b> <b>Poster Hanging</b> <b>Breakfast</b>	Lobby
8:45-9:00	<b>Opening Remarks</b> Dr. Robert Tribble	Auditorium
9:00-10:20	<b>Parallel Oral Sessions</b>	A, B, C, Auditorium
10:30-11:30	<b>Career Panel</b> Dr. Gabriella Carini Dr. Kathleen Flint Ehm Dr. Ashley Head Gail Mattson Dr. Yonko T. Millev	Auditorium
11:30-12:15	<b>Morning Keynote Address</b> Dr. Andrei Kolmakov	Auditorium
12:15-2:00	<b>Poster Session</b> 12:15-1:05 – Odd numbered 1:05-1:55 – Even numbered <b>Exposition</b> <b>Lunch (on your own)</b>	Lobby
2:00-3:20	<b>Parallel Oral Sessions</b>	A, B, C, Auditorium
3:20-3:45	<b>Coffee Break</b>	Lobby
3:45-4:30	<b>Afternoon Keynote Address</b> Dr. Michael Thoennessen	Auditorium
4:30-5:00	<b>Closing Remarks</b> Dr. Doon Gibbs <b>Awards Presentation</b>	Auditorium
5:00-7:00	<b>Reception</b>	Lobby

PARALLEL ORAL SESSIONS: MORNING

	<div>Room A</div> <div>Session Chair: Lei Wang</div>	<div>Room B</div> <div>Session Chair: Maria Torres Arango</div>	<div>Room C</div> <div>Session Chair: Vanessa Sanders</div>	<div>Auditorium</div> <div>Session Chair: John Burke</div>
9:00-9:20	<div>Unconventional Relation Between Charge Transport and Photocurrent via Boosting Small Polaron Hopping for Solar Water Splitting</div> <div>Wenrui Zhang Center for Functional Nanomaterials</div>	<div>The implication of ferroelectricity during the growth of ferroelectric superlattices and heterostructures</div> <div>Rui Liu National Synchrotron Light Source II</div>	<div>Anomalous phonons in <math>\text{Pb}_{0.3}\text{Sn}_{0.7}\text{Te}</math></div> <div>Aashish Sapkota Condensed Matter Physics and Materials Science Department</div>	<div>Essential Role of Spinell <math>\text{ZnFe}_2\text{O}_4</math> Surfaces during Lithiation</div> <div>Haoyue Guo Chemistry Department</div>
9:20-9:40	<div>Synthesis of hybrid nanocomposite resists using infiltration synthesis for next-generation lithographic patterning</div> <div>Nikhil Tiwale Center for Functional Nanomaterials</div>	<div>Growth Behavior and Chemical Evolution of Zn-Based Anti-Corrosion Coating</div> <div>Xiaoyang Liu National Synchrotron Light Source II</div>	<div>Neutron scattering and transport studies of micro-structured quantum materials</div> <div>Yangmu Li Condensed Matter Physics and Materials Science Department</div>	<div>Effects of doping on cycling stability of cathode materials for Li-ion batteries: insights from DFT simulation.</div> <div>Xuelong Wang Chemistry Department</div>
9:40-10:00	<div>Improving the Responsivity of Hybrid Graphene-Conductive Polymer Photodetectors via Nanowire Self-assembly</div> <div>Mingxing Li Center for Functional Nanomaterials</div>	<div>3D-morphology of Bimodal Porous Cu Bulk Fabricated via de-alloying Method</div> <div>Lijie Zou National Synchrotron Light Source II</div>	<div>Development of the AGS Booster ac dipole for Polarized <math>^3\text{He}</math></div> <div>Kiel Hock Collider Accelerator Department</div>	<div>Direct Observation of the Sulfur-Based Chemical Species in High Energy Li-S Batteries by Spatially-Resolved X-ray Absorption Spectroscopy and X-ray Fluorescence Microscopy</div> <div>Zulpiya Shadlike Chemistry Department</div>
10:00-10:20	<div>Quantifying the Mechanisms of Strain Delocalization in Metallic Glass Matrix Composites through Nanoindentation</div> <div>Jonathan Gentile Center for Functional Nanomaterials</div>	<div>Operando Chemical and Structural Evolution of <math>\text{TiS}_2</math> in Li-ion and Na-ion batteries</div> <div>Cheng-Hung Lin National Synchrotron Light Source II</div>	<div>A Polarized <math>^3\text{He}^{++}</math> Ion Source for an EIC</div> <div>Matthew Musgrave Collider Accelerator Department</div>	<div>Cationic Ordering Coupled to Reconstruction of Basic Building Units during Synthesis of High-Ni Layered Oxide Cathodes</div> <div>Mingjian Zhang Sustainable Energy Technologies Department</div>

# PARALLEL ORAL SESSIONS: AFTERNOON

Room A	Room B	Room C	Auditorium
Session Chair: Sherzod Inomomov	Session Chair: Thomas Flynn	Session Chair: Matthew Muggrave	Session Chair: Zulpiya Shadlike
New Chromophores for Photochemical Water Oxidation at Low pH <i>Lei Wang</i> Chemistry Department	Development of Lanthanide-Binding Tags (LBTs) for Nanoscale X-Ray Imaging of Proteins in Cells and Tissues <i>Tiffany Victor</i> National Synchrotron Light Source II	Ultra-peripheral collisions in STAR <i>Jaroslav Adam</i> Nuclear and Particle Physics Directorate	Metal-support interactions over $\gamma$ -Mo <sub>2</sub> N: Immobilized sub-nm Co clusters as a highly selective and stable catalyst for CO <sub>2</sub> hydrogenation <i>Siyu Yao</i> Chemistry Department
Solid-State NMR study on the Effect of modified H-ZSM-5 on Methanol-To-Aromatics Conversion <i>Wei Liu</i> Chemistry Department	Understanding Additive Manufacturing in the Light of NSLS-II: Operando Studies of Continuous Direct-Write 3D Printing Using Coherent X-ray Scattering <i>Maria Torres Arango</i> Photon Sciences	Experimental Aspects of Jet Physics at a Future Electron Ion Collider <i>Xiaoxuan Chu</i> Physics Department	Optimizing Oxygen Reduction Reaction (ORR) activity by tuning Ag Surface enrichment in bimetallic Pd@Ag/C and Ag@Pd/C catalysts in alkaline media <i>Luis Betancourt De Leon</i> Chemistry Department
Time Series Modeling for Dynamic Thermal Rating of Overhead Lines <i>Junpeng Zhao</i> Sustainable Energy Technologies Department	Bi-continuous Pattern Formation in Solid-State Thin Films via Solid-State Interfacial Dealloying <i>Chonghang Zhao</i> Photon Sciences	Tree Rings on LSST production sensors: its dependence on radius, frequency, and back bias voltage <i>Hyeyun Park</i> Physics Department	PdNS@PtML nanoparticles on carbon-supported WNI substrates for oxygen reduction reaction <i>Liang Song</i> Chemistry Department
Monolithic MEMS-based multilayer Laue lens nanofocusing optics for X-ray microscopy <i>Wei Xu</i> National Synchrotron Light Source II	Study of photocathode surface damage due to ion back-bombardment in high current DC gun <i>Jyoti Biswas</i> Collider Accelerator Department	Jet Measurements in Longitudinally Polarized proton-proton Collisions at STAR <i>Zilong Chang</i> Physics Department	Promoted Rh-based Catalysts for Ethanol Synthesis <i>Patricia Carrillo</i> Chemistry Department
2:00-2:20			
2:20-2:40			
2:40-3:00			
3:00-3:20			

## MORNING KEYNOTE SPEAKER



### **Dr. Andrei Kolmakov**

Dr. Andrei Kolmakov is a Project Leader at the Center for Nanoscale Science and Technology at NIST. He received an M.S. in Physics from the Moscow Institute of Physics and Technology, Russia and a Ph.D. in Physics from the National Research Center, Kurchatov Institute, Russia. Following his postdoctoral work at the ELETTRA and HASYLAB synchrotrons, he joined the research staff at Texas A&M University conducting in situ STM studies on supported metal clusters under reaction conditions. Continuing as a researcher at the Department of Chemistry and Biochemistry at UC-Santa Barbara, he performed seminal research in the field of gas sensors with low dimensional oxides. Prior to joining the CNST at NIST, Andrei was a tenured Associate Professor in the Department of Physics at Southern Illinois University, Carbondale, where his group developed new device architectures and principles for chemical sensing with low dimensional materials. His group also employed modern synchrotron radiation based spectromicroscopy techniques such as SPEM, PEEM and X-ray microdiffraction as well as scanning probe microscopy for in situ and in vivo characterization of individual working nanodevices. He has published over 150 research papers, several review articles and book chapters, co-authored three patents and has co-edited a book on nanostructured metal oxide sensing systems. Andrei's current research interests are in the developing of the methodology and instrumentation for in situ electron and X-ray microscopies, (photo-)electron spectroscopy of interfaces and nanodevices in operando mode under realistic environments, including liquid, dense gaseous and plasma media. More recently his group has pioneered the application of ultra-thin 2D materials as electron transparent membranes for (photo-)electron (SEM, SPEM, PEEM, AES, XPS, XAS) spectromicroscopy in liquids and dense gases.

## AFTERNOON KEYNOTE SPEAKER



### **Dr. Michael Thoennessen**

Michael Thoennessen is the Editor in Chief of the American Physical Society. He received his Diploma degree from the University of Cologne in 1985 and obtained his Ph.D. in experimental nuclear physics from the State University of New York in Stony Brook in 1988. From 1988 to 1990, he was a research associate at Oak Ridge National Laboratory, after which he joined the physics faculty of Michigan State University. In 2015, Dr. Thoennessen was named University Distinguished Professor and became Associate Director of the MSU Facility for Rare Isotope Beams. From 2004 to 2016, he was Supervisory Editor of the journal Nuclear Physics A. He is a Fellow of the APS and has been recognized as a Physical Review Outstanding Referee, as well as for his work in science outreach and education. He joined APS as Editor in Chief in September 2017.

Dr. Thoennessen's research focuses on the study of extremely neutron-rich nuclides. While normal neutron-rich nuclei decay by converting a neutron into a proton in milliseconds or longer, these nuclides contain so many neutrons that they decay by emitting one or two of the excess neutrons in a zeptosecond, or one sextillionth of a second. The exploration of these very exotic nuclides helps to understand the nature of the nuclear force that binds protons and neutrons into stable nuclei and rare isotopes. His group performs their experiments as part of the Modular Neutron Array (MoNA) collaboration at the National Superconducting Cyclotron Laboratory, one of the few facilities in the world where these nuclei can be explored.

## CAREER PANEL SPEAKERS



### **Dr. Gabriella Carini**

Dr. Gabriella Carini is the Deputy Division Head of Instrumentation and a Senior Scientist at Brookhaven National Laboratory.

Dr. Carini is an expert in semiconductor detectors for x- and gamma ray radiation. During her Ph.D. she performed most of the research at Brookhaven National Laboratory, where she developed instrumentation and technique for materials and detectors characterization at the micron

scale by using synchrotron radiation.

Dr. Carini has extensive research experience in advanced instrumentation, system development and technology. She serves in several panels for detectors and instrumentation strategic development and has collaborations with many institutions - national labs, industry and academia.



### **Dr. Kathleen Flint Ehm**

Kathleen Flint Ehm, PhD, is Director for Graduate and Postdoctoral Professional Development in the Graduate School at Stony Brook University. In this role, she fosters initiatives at the intersection of the university's research and education missions for students and postdocs, and directs the Office of Postdoctoral Affairs. She also teaches science communication for the Alan Alda Center for Communicating Science. Dr. Flint Ehm specializes in postdoctoral policy and professional development for PhDs, including issues related

to responsible conduct of research training, program and policy development, and fostering the advancement of postdoc women in academic science. She spent six years at the National Postdoctoral Association in Washington, DC, serving as project manager for grant-funded initiatives. In 2004, she spent a year in residence at the National Science Foundation where she was a Science and Technology Policy Fellow sponsored by the American Association for the Advancement of Science. There she specialized in issues concerning early-career scientists and helped manage one of NSF's newest postdoctoral fellowship programs. An astronomer by training, Dr. Flint Ehm was a Postdoctoral Fellow at Gemini Observatory North and a Carnegie Fellow at the Carnegie Institution of Washington's Department of Terrestrial Magnetism. She holds a Ph.D. in Astronomy and Astrophysics from the University of California, Santa Cruz, and a B.S. in Math and Astronomy from the University of Arizona.



## CAREER PANEL SPEAKERS



### Dr. Ashley Head

Ashley Head is a staff scientist at the Center for Functional Nanomaterials. She supports users of infrared spectroscopy and ambient pressure X-ray photoelectron spectroscopy instrumentation. Additionally, she conducts her own research program focused on understanding atomic layer deposition mechanisms and heterogeneous catalysis with metal organic frameworks.

Ashley received her Bachelor of Science degree in chemistry from James Madison University in 2005. For a year she worked in the quality control lab of a milk and dairy creamer factory before returning to graduate school. In 2006 she received her PhD in physical chemistry, studying the gas phase electronic structure of molecules. Exhausted from graduate school, she taught general chemistry lab courses at Howard County Community College in Maryland for a year. Refreshed from a break in research, Ashley spent 2 years as a postdoc in at Lund University in Sweden learning about synchrotrons and surface science. Wanting to return to the US, Ashley accepted a second postdoctoral position at Lawrence Berkeley National Laboratory where she studied how nerve agent simulants adsorbed onto model systems of gas mask filtration materials. She also had a daughter during this three-year postdoc appointment. In January 2018, she joined Brookhaven National Laboratory at the CFN.

She is passionate about communicating science to a variety of audiences and mentoring young scientists.

## CAREER PANEL SPEAKERS



### **Gail G. Mattson**

Gail Mattson is a registered professional engineer in 8 states and a certified project management professional with over 35 years' experience in environmental engineering, safety, radiological control, project management, business development and corporate relations. She has a BS in Chemistry and Biology, and received her MSE in Environmental Engineering from the University of Washington.

Presently, Ms. Mattson has authority and responsibility over all of the operations of the ES&H Directorate with 130 personnel and \$30M budget at Brookhaven National Laboratory. During her career, she has been responsible for leading major technical proposal efforts winning over \$175M in new contract awards over 4 years; managed a \$200M/ 5year environmental remediation program at a USDOE site that encompassed operations of nuclear facilities; and had been responsible the \$200 M/year USDOE waste management program to safely store and treat hazardous, mixed, transuranic and low level radioactive wastes.

In addition to 30 years of involvement with the Society of Women Engineers at the section, region and national levels, including the FY01 National President, Ms. Mattson is a founding member of the International Network of Women Engineers and Scientists (INWES) and the INWES Education and Research Institute, and is currently serving as the INWES President for 2018-2020. She has also served in various local, regional and national positions with the American Society of Civil Engineers, the American Association for the Advance of Science, the Alliance of Hazardous Materials Professionals, Girl Scouts of USA, Girls, Inc., and American Association of University Women.

## CAREER PANEL SPEAKERS



**Dr. Yonko Millev**

Yonko Millev is associate editor with the APS Editorial Office in Ridge, NY. He first joined Physical Review Letters in 2003 and moved to Physical Review B in 2017.

Yonko received his Ph.D. degree in condensed matter physics from the Bulgarian Academy of Science, where he later became a senior research associate with the Institute of Solid State Physics.

In the 1990s, a Humboldt Fellowship enabled a long-term collaboration with the Max Planck Institutes in Stuttgart, Leipzig, and in Halle, where he was a staff scientist. He holds a visiting appointment at ICTP in Trieste and an honorary fellowship with Queen's University of Belfast.

At different times and for more than ten years on aggregate, Yonko has also been a college professor of physics. Editorial work, research, and teaching have all played significant parts in his career in physics. He has authored over 50 articles in magnetism, superconductivity, phase transitions, and mathematical physics.

# POSTERS

1. **Layer-Dependence of Electron Transfer Kinetics in Molybdenum Disulfide and Lead Sulfide Hybrid**  
*Jia-Shiang Chen*
2. **Unusual Strain Effect of Pt-Based LI0 FCT Core in Core/Shell Nanoparticles for Oxygen Reduction Reaction**  
*Mingjie Liu*
3. **Stabilization of DNA Origami with Tunable Cationic and Poly(Ethylene Glycol)-like Peptoid Modifiers**  
*Shih-Ting Wang*
4. **Graphene Oxide Nanocomposites for Cancer Remediation Applications**  
*Shruti Sharma*
5. **Effects of Molecular Structure in  $\text{CoO}_x/\text{CeO}_2$  Catalysts on NO Reduction by CO**  
*Shuhao Zhang*
6. **Overcoming Attraction: Charge Separation in Organic Solar Cells**  
*John Burke*
7. **Structural Origin of Oxygen Redox Activity in Li-rich Layered Oxide Cathodes for Li-ion Batteries**  
*Chong Yin*
8. **Investigation of long, intense  $\text{CO}_2$  laser pulse instabilities in plasmas**  
*Jiayang Yan*
9. **Radiolabeling NOTA Derivatives with Generator Eluted Scandium-44**  
*Vanessa Sanders*
10. **The application of polyoxometalates to thorium debulking studies for actinium-225 production**  
*Jasmine Hatcher*
11. **Online Change Detection with the Kernel Cumulative Sum Algorithm**  
*Thomas Flynn*
12. **Experimental warming in the Arctic can alter vegetation phenology**  
*Daryl (dedi) Yang*
13. **Structural Characterization of Hafnia-Zirconia Dielectrics for Higher-K and Ferroelectric Applications**  
*Vineetha Mukundan*
14. **Computer Security-Spontaneous AI Computer Defense to Mitigate Attack**  
*Sherzod Inogomov*

# POSTERS

- 15. **Gamma Ray Assay of Radioisotopes for Medical Imaging**  
*Lemise Saleh*
- 16. **Modeling Framework of Level Densities for Near-Closed-Shell Nuclei**  
*Alec Golas*
- 17. **Understanding the Relationship between Copper Elevation and Amyloid Deposition in Cerebral Amyloid Angiopathy Using the X-ray Fluorescence Microscopy**  
*Ashwin Ambi*
- 18. **The eRHIC Interaction Region Design**  
*Wan Chang*
- 19. **Weighing the fgas Giants**  
*Lucie Baumont*
- 20. **Epitaxial growth of  $\text{SrCrO}_3$  thin films and  $\text{SrCrO}_3/\text{SrTiO}_3$  bilayers and superlattices via off-axis magnetron sputtering**  
*Giulia Bertino*
- 21. **Chiral Magnetic Photocurrent in Dirac and Weyl Materials**  
*Evan Philip*

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# THANK YOU

John Burke  
Maria Torres Arango  
Sherzod Inogomov  
Vanessa Sanders  
Zulipiya Shadike  
Thomas Flynn

Tiffany Bowman  
Doon Gibbs  
Will Safer  
Robert Tribble  
Chris Weaver  
Shruti Sharma

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## JUDGES

Dario Stacchiola  
David Grills  
Weiguo Yin,  
Guillaume Robert-Demolaize  
Mingzhao Liu  
Dmitriy Polyanskiy  
Deyu Lu  
Andre Barboza Formiga  
Kathleen Amm  
Jin Huang

Igor Zaliznyak  
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Nathalie Bouet  
Anibal Boscoboinik  
Bjoern Schenke  
David J. Schlyer  
Nicholas Camillone  
Tadesse Assefa  
Jerzy Sadowski

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## GUESTS

Michael Thoennessen  
Andrei Kolmakov  
Gail Mattson  
Gabriella Carini  
Ashley Head  
Kathleen Flint Ehm  
Yonko T. Millev

## ORGANIZING COMMITTEE

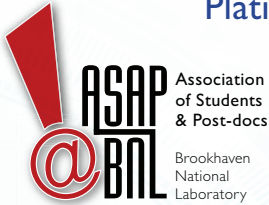
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