2023

Dec 18-20 | Columbus, OH, USA

4th Conference on Biomotors, Virus Assembly, and RNA Nanobiotechnology

Conference Registration: https://rnanano.osu.edu/Guo/Biomotor2023/Biomotor2023.html

Hosted by
The Ohio State University
University of North Carolina Charlotte

Welcome Letter

Dear colleagues,

It's our great pleasure to welcome you to the 4th Conference on Biomotors, Virus Assembly, and RNA Nanobiotechnology (https://rnanano.osu.edu/Guo/Biomotor2023/Biomotor2023.html) hosted by the International Society of RNA Nanotechnology and Nanomedicine (ISRNN). We are excited to continue this conference series on the first three conferences that brought together leading scientists working in the diverse fields of chemistry, biochemistry, biophysics, structural biology, microbiology, cell biology, materials, single pore technology, RNA nanotechnology, pharmacology, cancer biology and nanotechnology to drive this fascinating inter-disciplinary scientific endeavor.

As a continuation of the previously three conferences, we are excited to bring together more than 50 distinguished speakers from 8 countries again for this third conference. These speakers represent academia, government agencies, and industry to provide unique perspectives in multidisciplinary research. Our hope is to facilitate the translation of knowledge from fundamental studies on biomotors, viral structure, viral assembly, DNA/RNA structure and chemistry into practical nanotechnology applications. We believe this conference will foster communication between researchers from many different backgrounds, so please take the opportunity to interact with the leading scientists in the field and establish collaborations to promote this field into new and exciting directions.

Each day the conference will be hosted by Zoom, using the following link (https://charlotte-edu.zoom.us/j/92583381501). We ask that you ask all questions using the chat function of Zoom and they will be addressed at the end of each presentation either verbally or through Zoom chat by each speaker. Additionally, we will provide a breakout room each day for attendees to have the ability to socialize and further interact with speakers beyond their allotted times. We ask that you respect the confidentiality of this meeting and refrain from recording or taking pictures of any presentation, as all material presented during this conference is privileged to its attendees and intended to only be shared during the conference.

Finally, we would like to raise attention to the ISRNN council meeting that is scheduled for Thursday 12.21.23 at 11:00 am EST, and highly encourage all council members to attend to discuss updates with the Society and future directions. We sincerely hope that you will find the presentation insightful. If you feel there is anything we can do to make the conference more interesting or enjoyable, please feel free to contact the conference organization staff. Thank you for taking the time to attend this meeting.

Sincerely,

Conference Chair:

Peixuan Guo, The Ohio State University, USA

Conference Co-chair:

Kirill Afonin, University of North Carolina-Charlotte, USA

Gino Cingolani, Thomas Jefferson University, USA

Sara Woodson, Johns Hopkins University, USA

4th Conference on Biomotors, Virus Assembly, and RNA Nanobiotechnology

Conference Committee

Peixuan Guo (Chair)
The Ohio State University, USA

Kirill Afonin (Co-Chair)
University of North Carolina at Charlotte, USA

Gino Cingolani (Co-Chair)
Thomas Jefferson University, USA

Sara Woodson (Co-Chair)
Johns Hopkins University, USA

Host Committee

Daniel Binzel
The Ohio State University, USA

Kai Jin
The Ohio State University, USA

Cheyenne Wagner
The Ohio State University, USA

Yelixza Avila
University of North Carolina at Charlotte, USA

Elizabeth Skelly
University of North Carolina at Charlotte, USA

Laura Rebolledo
University of North Carolina at Charlotte, USA

Scientific Program (Dec. 18 – 21, 2023)

All times listed in Eastern Standard Time (EST)

MONDAY, DECEMBER 18, 2023

Biomotors and Biomachines

9:00-9:30 am EST	2:00-2:30 pm GMT	10:00-10:30 pm Beijing
09:00 am – 09:20 am	*Opening Remarks: The dialectic relationship between fundamental and application studies of biomotor, viral assembly, and RNA nanotechnology* **Peixuan Guo;** Fellow of the National Academy of Inventors, Sylvan G. Franks Endowed Chair, The Ohio State University, USA	
9:20 am – 9:30 am	*Meeting Logistics* **Yelixza Avila and Daniel Binzel**	
SESSION 1: Single Molecule Sensing of DNA, RNA, & Proteins by Biological Nanopores		
Session Moderator: Yi-Tao Long and Haichen Wu		
9:30-10:50 am EST	2:30-3:50 pm GMT	10:30 pm -11:50 am Beijing
9:30 am – 9:50 am	**Haichen Wu;** Institute of High Energy Physics, China *Nanopore-based protein sequencing*	
9:50 am – 10:10 am	**Yi-Tao Long;** Nanjing University, China *Nanopore Beyond DNA Sequencing*	
10:10 am – 10:30 am	**Ya-Ming Hou;** Thomas Jefferson University, USA *Reading RNA modifications by an RNA-dependent RNA polymerase*	
10:30 am – 10:50 am	**Liqun (Andrew) Gu;** University of Missouri, USA *RNA-small molecule interaction study in the nanopore*	
10:50 am – 11:00 am	**Break**	
SESSION 2: Designing Nanodevices		
Session Moderator: Kirill Afonin and Nikolay Dokholyan		
11:00 am -12:20 pm EST	4:00-5:20 pm GMT	12:00-1:20 am Beijing
11:00 am – 11:20 am	**Hui Wei;** Nanjing University, China *Nanozymes for translational medicine: several cases of studies.*	
11:20 am – 11:40 am	**Nikolay Dokholyan;** Penn State University, USA *NanoComputing Agents: Hacking Cellular Behavior*	
11:40 am – 12:00 pm	**Kirill Afonin;** University of North Carolina Charlotte, USA *Locking and unlocking biological functions of extracellular proteins with immunoquiescent nucleic acid nanoparticles*	
12:00 pm – 12:20 pm	**Cheemeng Tan;** University of California Davis, USA *Designer Artificial Micro-Nano Devices: Fusing Synthetic Biology and Nanoengineering*	
12:20 pm – 12:30 pm	**Break**	
KEYNOTE TALK: Nils Walter; University of Michigan, USA		

12:30 pm – 1:00 pm	*A nascent riboswitch helix acts as fulcrum to integrate ligand, template, polymerase and cofactor signals for robust transcription regulation*

SESSION 3: RNA Structure to Build Biomotors		
Session Moderator: David Lilley and Sarah Woodson		
1:00-2:20 pm EST	6:00-7:20 pm GMT	2:00-3:20 am Beijing
1:00 pm – 1:20 pm	**David Lilley**; University of Dundee, UK *Expanding the chemical limits of RNA catalysis*	
1:20 pm – 1:40 pm	**Sarah Woodson**; Johns Hopkins University, USA *Co-transcriptional assembly of RNA*	
1:40 pm – 2:00 pm	**Deepak Koirala**; University of Maryland, Baltimore County, USA *Structural basis for RNA structure-mediated enteroviral genome replication*	
2:00 pm – 2:20 pm	**Emil Khisamutdinov**; Ball State University, USA *Toehold-Mediated Shape Transition of Nucleic Acid Nanoparticles*	
2:20 pm – 2:30 pm	**Break**	

SESSION 4: RNA Processing and Regulation		
Session Moderator: Tianmin Fu		
2:30-4:10 pm EST	7:30-9:10 pm GMT	3:30-5:10 am Beijing
2:30 pm – 2:50 pm	**Tianmin Fu;** The Ohio State University, USA *Molecular mechanisms of Holliday junction branch migration catalyzed by an asymmetric RuvB hexamer*	
2:50 pm – 3:10 pm	**Irina Artsimovitch;** Ohio State University, USA *Oligomerization as a stress response mechanism*	
3:10 pm – 3:30 pm	**Michelle Scott;** Université de Sherbrooke, Canada *How do specific small nucleolar RNAs promote cancer proliferation and survival?*	
3:30 pm – 3:50 pm	**Walter Zahurancik;** The Ohio State University, USA *Modulation of Archaeal Ribonuclease P Ribozyme Activity by Temperature- and Metal-ion–dependent Phase Separation*	
3:50 pm – 4:10 pm	**Robert Batey;** University of Colorado Boulder, USA *Flipping the script: understanding riboswitch regulatory mechanisms from the perspective of their expression platform*	

TUESDAY, DECEMBER 19, 2023

RNA Biology, Nanotechnology, & Therapeutics

SESSION 5: RNA with Unique Functionality		
Session Moderator: Hirohide Saito		
9:00-10:20 am EST	2:00-3:20 pm GMT	10:00-11:20 pm Beijing

9:00 am – 9:20 am	**Hirohide Saito;** Kyoto University, Japan *Synthetic RNA and RNP technologies to manipulate cells*
9:20 am – 9:40 am	**Yan Zhao;** Iowa State University, USA *Molecularly Imprinted Nanoparticles (MINPs) as Highly Selective Artificial Receptors and Enzymes*
9:40 am – 10:00 am	**Shi-Jie Chen;** University of Missouri, USA *An Enhanced Knowledge-Based Approach for Screening RNA-Targeted Drugs*
10:00 am – 10:20 am	**Kevin Li;** University of Cincinnati, USA *Ocular Delivery of Angiogenesis-inhibiting RNA Nanoparticles*
10:20 am – 10:30 am	**Break**
KEYNOTE TALK: Bruce Shapiro; National Cancer Institute, USA 10:30 am – 11:00 am	A Brief History of "My" Time: The Path from RNA Structure Prediction and Analysis to RNA Nanobiology
SESSION 6: RNA Therapeutics Delivery and Exosomes	
Session Moderator: Rajgopal Govindarajan and Tae Jin Lee	
11:00 am-1:00 pm EST | 4:00-6:00 pm GMT | 12:00-2:00 am Beijing	
11:00 am – 11:20 am	**Juan Vivero-Escoto;** University of North Carolina Charlotte, USA *Multimodal Mesoporous Silica Nanoparticles for the Efficient Delivery of Nucleic Acids to Treat Cancer*
11:20 am – 11:40 am	**Rajgopal Govindarajan;** Ohio State University, USA *Increased renal elimination of endogenous and synthetic pyrimidine nucleosides in concentrative nucleoside transporter 1 deficient mice*
11:40 am – 12:00 pm	**Aijun Wang;** University of California Davis, USA *Engineering extracellular vesicles and lipid nanoparticles for targeted delivery*
12:00 pm – 12:20 pm	**Xiaoming He;** University of Maryland, USA *Cold Responsive Nanotechnology-Potentiated Cryoimmunotherapy for Combating Cancer Metastasis*
12:20 pm – 12:40 pm	**Tae Jin Lee;** University of Texas Health Science Center at Houston, USA *Extracellular vesicle based Targeted modulation of tumor suppressive miRNAs in glioblastoma*
12:40 pm – 1:00 pm	**Daniel Binzel;** Ohio State University, USA *Controlled siRNA and miRNA delivery by exosomes to overcome drug resistance in cancers*
1:00 pm – 1:10 pm	**Break**
SESSION 7: RNA Nanotechnology & Therapeutics	
Session Moderator: Wayne Miles and Xiaoting Zhang	
1:10-2:30 pm EST | 6:10-7:30 pm GMT | 2:10-3:30 am Beijing	
1:10 pm – 1:30 pm	**Renata de Freitas Saito;** University of Sao Paulo, Brazil *Anticoagulant RNA-DNA biomolecular platform for the management of cancer-associated thrombosis*

1:30 pm – 1:50 pm	**Wayne Miles**; Ohio State University, USA *Conversion of Chemical Antagonists into Small Cell Lung Cancer Ligands for RNA Nanoparticle Delivery*
1:50 pm – 2:10 pm	**Yuanpei Li**; University of California Davis, USA *One-component new-chemical-entity nanomedicine for cancer treatment*
2:10 pm – 2:30 pm	**Xiaoting Zhang**; University of Cincinnati, USA *Overcoming Breast Cancer Therapeutic Resistance by RNA Nanotherapeutics*
2:30 pm – 2:40 pm	**Break**

SESSION 8: Viral Assembly		
Session Moderator: Gino Cingolani and Holland Cheng		
2:40-4:20 pm EST	7:40-9:20 pm GMT	3:40-5:20 am Beijing
2:40 pm – 3:00 pm	**Dorothy Hawkins;** University of York, UK *The HK97 Packaging Termination Assembly*	
3:00 pm – 3:20 pm	**Chunyan Wang;** Yale, USA *Structural insights into inner core remodeling of bacteriophage T7 during infection initiation*	
3:20 pm – 3:40 pm	**Jing Jin, Wah Chiu**; Stanford University, USA *Structural insights into the modulation of coronavirus spike tilting and infectivity by hinge glycans*	
3:40 pm – 4:00 pm	**Holland Cheng**; University of California Davis, USA *Noninvasive PPM: cryoEM-guided design of a modular biocapsid for precision and personalized nanomedicine*	
4:00 pm – 4:20 pm	**Margaret Bohmer, Peixuan Guo**; The Ohio State University, USA *Confirmation of a Hexameric Stoichiometry of Motor pRNA Using a Chimeric pRNA Derived From Two Bacteriophages*	

WEDNESDAY, DECEMBER 20, 2023

Virus Assembly and Vaccines

SESSION 9: Biomotors and Motion		
Session Moderator: Youdong Mao and Hiroyuki Noji		
9:00-11:00 am EST	2:00-4:00 pm GMT	10:00-12:00 pm Beijing
9:00 am – 9:20 am	**Youdong Mao**; Peking University, China *Watching molecular machines in action by AI-enhanced 4D cryo-EM*	
9:20 am – 9:40 am	**Shuo Huang;** Nanjing University, China *Multi-scale Nanopore Analysis*	
9:40 am – 10:00 am	**Hiroyuki Noji;** University of Tokyo, Japan *Molecular mechanism of Maxwell's demon-like inhibitor, IF1 of mitochondrial ATP synthase*	
10:00 am – 10:20 am	**Dmitri Kudryashov;** Ohio State University, USA *Under the influence: reversal of the actin filament motor polarity by Vibrio VopF/VopL effectors*	

10:20 am – 10:40 am	**Gino Cingolani;** University of Alabama Birmingham, USA *Nuclear Import of Hepatitis B Virus (HBV) nucleocapsid*
10:40 am – 11:00 am	**Haoyun Yang, Mark Foster;** Ohio State University, USA *Nearest-neighbor cooperativity in the Bacillus ring-shaped trp RNA binding attenuation protein (TRAP) from protein engineering and cryo-EM*
11:00 am – 11:10 am	**Break**
KEYNOTE TALK: Brett VanVeller; Iowa State 11:10 am – 11:40 am *New peptide bond isosteres provide more intuitive hydrogen-bonding rules*	
SESSION 10: RNA Computational Biology for Therapeutic Applications	
Session Moderator: Elisa Franco and Daniel Binzel	
11:40 am-1:20 pm EST	4:40-6:20 pm GMT | 12:40 am-2:20 am Beijing
11:40 am – 12:00 pm	**Janusz Bujnicki;** International Institute of Molecular and Cell Biology, Poland *Conserved Structures and Dynamics in 5'-Proximal Regions of Betacoronavirus RNA Genomes*
12:00 pm – 12:20 pm	**Richard Lease;** Ohio State University, USA *Optimized nucleic acid structured-antisense fingerloop probes for improved target-mismatch discrimination, increased antisense length, and selectivity.*
12:20 pm – 12:40 pm	**Morgan Chandler;** MIMETAS, USA *3D Model Systems for Developing Therapeutic Nucleic Acids*
12:40 pm – 1:00 pm	**Elisa Franco;** UCLA, USA *Building artificial RNA organelles via phase separation*
1:00 pm – 1:20 pm	**Kai Jin, Peixuan Guo;** The Ohio State University, USA *Using RNA nanoparticles to solubilize chemical drugs and targeted-deliver hydrophobic SN38 for colorectal cancer treatment with undetectable toxicity*
1:20 pm – 1:30 pm	**Break**
SESSION 11: RNA and Vaccines	
Session Moderator: Karin Musier-Forsyth and Joanna Sztuba-Solinska	
1:30-2:50 pm EST	6:30-7:50 pm GMT | 2:30-3:50 am Beijing
1:30 pm – 1:50 pm	**Karin Musier-Forsyth;** Ohio State University, USA *How a two-nucleotide difference in a 9.4 kilobase genome dictates HIV-1 viral RNA fate*
1:50 pm – 2:10 pm	**Robin Stanley;** National Institutes of Environmental Health Sciences, USA *SARS-CoV-2 Nsp15 Can't Take Its Eyes off U*
2:10 pm – 2:30 pm	**Joanna Sztuba-Solinska;** Pfizer, USA *Connecting the dots: how RNA biology dictates mRNA vaccine efficacy*
2:30 pm – 2:50 pm	**Madeline Sherlock;** New York Structural Biology Center, USA *Viral RNA structures induce downstream reinitiation through dynamic ribosome interactions*
2:50 pm – 3:00 pm	**Closing Remarks: Peixuan Guo**; Sylvan G. Franks Endowed Chair, College of Pharmacy, OSU, USA

THURSDAY, DECEMBER 21, 2023

International Society of RNA Nanotechnology and Nanomedicine Council Meeting		
Session Moderator: Peixuan Guo		
11:00 am-12:00 pm EST	4:00-5:00 pm GMT	12:00-1:00 am Beijing
11:00 am – 12:00 pm	**International Society of RNA Nanotechnology and Nanomedicine Council Meeting**	

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