**Division of Physical Chemistry**
**American Chemical Society**

# Nanoscale Tools to Understand the Physical Biology of a Cell

Divita Mathur, Alexander Marras,
and Carlos Castro
*Organizers*

**Walter E. Washington Convention Center**
**Room 152B**

## 18-20 August 2025

**PHYS Programs also available online:**

# MONDAY MORNING
## Deciphering Biological Function

C. Castro, *Presiding*

**8:30 AM.** Welcome address.

**8:50 AM.** Development of plasmonic-nanopore sensing for thermally controlled biopolymer sequencing applications. **T. Penkauskas**, A. Sharma, S. Haridas, J. Robertson

**9:10 AM.** Programmable nanoscale tools to sense, control, and enhance molecular activity. **D. Samanta**

**9:40 AM.** Word from Sponsor.

**9:45 AM.** Biobreak.

**10:00 AM.** Exploring uridine-to-cytidine RNA editing with cluster model density functional theory. **O. Sode**

**10:20 AM.** Single-stranded DNA templates pre-functionalized DNA-AgN probes for DNA-PAINT super-resolution microscopy. **A. Segger**, S.M. Copp, D. Morales, M.C. Nevarez Martinez, Y. Zhu

**10:40 AM.** Electrically driven DNA motion for scalable and multiplexed biosensing. **R. Shi**, J. Majikes, A. Balijepalli

**11:00 AM.** DNA-based optoelectronic materials. **G. Schlau-Cohen**

**11:30 AM.** Revealing the energetics of chromatin compaction with DNA nanotechnology. **M. Poirier**

# MONDAY AFTERNOON

## Molecular Organization & Transport Across the Cell

R. Veneziano, *Presiding*

**2:20 PM.** Welcome address.

**2:30 PM.** Controlled presentation of proteins on DNA nano-scaffolds for synthetic nanoscale antibodies and creating asymmetric protein nanostructures. **N. Stephanopoulos**

**2:50 PM.** Glycolipid nanoparticles target the spleen and detarget the liver without charge. **K. Gentry**, L. Lian, H. Kim, O. Celik, C. Jones, A. Podilapu, A. Shakked, D. Loughrey, R. Zenhausern, B. Jang, J. Doan, S. Rudden, J. Dahlman

**3:10 PM.** Advanced fluorescence imaging on self-assembly of mRNA-lipid nanoparticle for clinical formulation design. **J. Guan**

**3:40 PM.** Word from Sponsor.

**3:45 PM.** Word from Sponsor.

**3:50 PM.** Biobreak.

**4:00 PM.** Effect of PNA modifications on incorporation into DNA nanostructures. **V. Walawalkar**, D. Sarabia-Castillo, A. Loas, B.L. Pentelute, R.E. Taylor

**4:20 PM.** Nucleic acids nanoparticles for carrying bioactive ligands and enhancing cellular delivery. **J. Fu**

**4:40 PM.** DNA nanotechnology at the immune interface: Design principles for emerging applications. **L. Chou**

**5:00 PM.** Nucleic acid nanotubes as programmable tools to modulate cellular behavior. **E. Kokkoli**

**5:30 PM.** Manipulating microscale systems with nucleic acid nanotechnology. **R.E. Taylor**

# TUESDAY AFTERNOON

## Programmable Biomaterials

D. Mathur, *Presiding*

**2:00 PM.** Welcome address.

**2:10 PM.** Mapping intercellular mechanical landscapes via cell membrane-anchored DNA nanodevices. **M. You**

**2:30 PM.** Interplay between basepairing and electrostatic interactions determines the phase behaviors of DNA nanostar and polylysine mixtures. **T. Li**, G.R. Abraham, W.M. Jacobs, O. Saleh, A. Nguyen

**2:50 PM.** Shape transforming hybrid materials driven by DNA nanotechnology. A. Hussain, J. Houston, M. Mohammadi, **A. Marras**

**3:10 PM.** Nanostructured DX-DNAns hydrogels to mimic soft tissues. D.V. Scarton, A.B. Coogan, E.O. Tulun, K. Harrison, P.M. Touma, H.G. Mason, C. Hu, **R. Veneziano**

**3:40 PM.** Biobreak.

**3:50 PM.** Investigation of vulvar cancer with three-dimensional surface enhanced Raman scattering spectroscopy. **K. Yokoyama**, N. Mathewson, J. Lewis

**4:10 PM.** Nanorobotic system compatible with cellular environments. **J. Johnson**, R. McKee, S. Mohammadi, M. Alistar

**4:30 PM.** Complex cooperativity in DNA origami measured by design defectivity. **J.M. Majikes**, A. Hasni, S. Haridas, J. Robertson, A. Pintar, M. Zwolak, J. Liddle

**4:50 PM.** Statistical mechanics approaches for DNA nanostructure dynamics: From binding kinetics to motion control. **S. Sensale**

**5:10 PM.** Modeling driven synthesis of DNA origami superlattice and complex finite-size structures. **H. Liu**, T. Diep, M. Matthies, J. Evans, M. Sample, D. Pinto, J. Russo, H. Yan, P. Sulc

**5:30 PM.** Bridging the Nano and meso scales: Modeling the dynamics of DNA origami structures and assemblies. **G. Arya**

# WEDNESDAY MORNING

**Intracellular & Cellular Force Measurements**

A. Marras, *Presiding*

**8:20 AM.** Welcome address.

**8:30 AM.** Magnetic DNA origamis for applying mechanical force to cells. N. Gayathri Srinivasan, K. Huang, A. Kucinic, M. Shahhosseini, C. Castro, **J.O. Winter**

**8:50 AM.** Programmable dynamic self-assembled DNA nanostructures as polymerization motors. **Y. Jiang**, A. Grinthal, R. Schulman

**9:10 AM.** DNA tools for single-molecule mechanobiology. **K. Salaita**, A. Foote

**9:40 AM.** Word from Sponsor.

**9:45 AM.** Biobreak.

**10:00 AM.** Cross-correlation super-resolution optical fluctuation imaging for studying biomolecule conformation and diffusion dynamics in extracellular matrix. **J. Antarasen**, A. Mohapatra, D. Latham, A. Kim, L. Kisley

**10:20 AM.** Folding of a G-quadruplex and i-motif DNA in the nuclei of living cells. B. Patel, M. Burke, **C. Davis**

**10:40 AM.** Targeting DNA origami nanostructures to specific intra- and extra- cellular locations. G. Roozbahani, A. Oravecz, P. Colosi, P. Beshay, Y. Wei, M. Lakadamyali, J. Song, L. Tora, M. Poirier, **C. Castro**

**11:00 AM.** Sensing and applying multi-axial tension to biomolecules using molecular devices built from DNA. G. Wisna, R. Sasmal, D. Karna, **R.F. Hariadi**

**11:30 AM.** Interrogating cell receptors with DNA molecular devices. **Y. Ke**

*The organizers acknowledge the following sponsors for their generous support:*