

2023 NCI IMAT PI Meeting

24th Annual Innovative Molecular Analysis
Principal Investigators' Meeting

December 6 - 8, 2023
Chicago, Illinois

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Technologies Principal Investigators Meeting

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Table of Contents

DAY 1	
Agenda	3
Poster Session	5
DAY 2	
Agenda	7
Poster Session	9
Day 3	
Agenda	11

DAY 1: Wednesday, December 6

8:00 a.m. Breakfast Student Center West, Second Floor

8:30 a.m. **Introduction** Student Center West, Thompson Rooms A, B, & C
Joanna Groden, PhD, Vice Chancellor for Research, *University of Illinois at Chicago*
Jan Kitajewski, PhD, Director, *University of Illinois Cancer Center*
Jeannette Turpin Carter, University of Illinois Cancer Center Research and Patient Advocate
Kelly Crotty, PhD, Program Director, *National Cancer Institute*

9:00 a.m. **Single Cell Analysis Technologies**

Single-Cell Protein Activity Profiling in Breast Cancer Cells and Tissues

Raymond Moellering, *University of Chicago*

Using nanobodies to increase the sensitivity and resolution of chromatin profiling through uliCUT&RUN

Sarah Hainer, *University of Pittsburgh*

Yi Shi, *Icahn School of Medicine at Mount Sinai*

deMULTIPLEX2: Scalable and error-robust sample classification for scRNA- and ATAC-seq multiplexing data

Zev Gartner, *University of California, San Francisco*

Microfluidic tumor tissue processing platform for single cell diagnostics

Jered Haun, *University of California, Irvine*

DNA-Random Access Memory for Iterative Analysis of Single Cell, Spatial, and Cell-free Cancer Genomics

Hanlee Ji, *Stanford University*

10:30 a.m. Coffee break

11:00 a.m. **Pathway Technologies**

A novel method for induced degradation of targeted protein

Fangliang Zhang, *University of Miami School of Medicine*

A cell-cycle induced genetic recorder for simultaneous recovery of cell divisions and lineage

Charles Van De Mark & Ron Weiss, *Massachusetts Institute of Technology*

Carlo Maley, *Arizona State University*

A Bioluminescent Assay for Direct Measurement of Sirtuin Activity in Cancer Cells

Shawn Owen, *University of Utah*

Michael Deininger, *Versiti Wisconsin, Inc & Medical College of Wisconsin*

Super-resolution microscopy for dynamic analysis of focal enhancer amplifications in cancer

Anders Hansen, *Massachusetts Institute of Technology*

Intracellular CRISPR gRNA assembly for massively multiplexed, one pot, (epi)genetic screening

Albert Keung, *North Carolina State University, Raleigh*

12:30 p.m. Lunch Student Center West, Second Floor

1:30 p.m. **Clinical Diagnostic Technologies**

Novel Bisphosphate PET Probes for Myeloma Bone Disease

Kai Chen & Charles McKenna, *University of Southern California*

Optimization and validation of integrated microscale technologies for low-cost, automated production of PET molecular imaging tracers for cancer research

R. Michael van Dam, *University of California, Los Angeles*

Enabling effective anti-tumor immunity from targeted antibodies through dual innate and adaptive immune checkpoint blockade in non-immunogenic cancers

Zachary Hartman, *Duke University*

High-content functional cancer drug testing on micro-cuboidal tumor dissections

Albert Folch & Taran Gujral, *University of Washington*

Nanotechnology Enabled Selection of MHC-Peptide Ligands to Personalize Cancer Therapy

George Alexandrakis, PhD, *University of Texas, Arlington*

3:05 p.m. **Chuck Schmaderer**, Patient Advocate

3:25 p.m. **Poster Session**

5:25 p.m. **NCI's Small Business Innovation Research (SBIR) Center**

Jonny Franca-Koh, *National Cancer Institute*

Panel Discussion on Commercialization of Technologies

Jonny Franca-Koh, *National Cancer Institute*

Rick Drake, *Medical University of South Carolina*

Mary Ozers, *Proteovista LLC*

Moderator: Erin Lavik, *National Cancer Institute*

6:30 p.m. End Day 1

Day 1 Poster Session

- 1 **NCI Technology Research Advocacy Partnership: Enhancing technology grant programs through advocate involvement**
Chuck Schmaderer, *NCI Research Advocate*
- 2 **Accessible high-throughput single-cell genome sequencing**
Andrew Adey, *Oregon Health & Science University*
- 3 **A Novel Fluorescence Imaging Platform to Predict Response to Combinatorial Tyrosine Kinase Inhibitors**
Summer Gibbs, *Oregon Health & Science University*
- 4 **Systematic characterization of cancer variants using single-cell functional genomics**
Thomas Norman & Scott Lowe, *Memorial Sloan Kettering Cancer Center*
- 5 **Engineered CD4 T cells for cell-based delivery of therapeutic proteins**
Parijat Bhatnagar, *SRI International*
- 6 **A micro-dissection platform for generating organoids to model the tumor immune microenvironment**
Sindy Tang, *Stanford University*
- 7 **Single cell modeling of cancer mutations**
Hanlee Ji, *Stanford University*
- 8 **A Novel Assay to Individualize Resensitization of Iodine-Refractory Thyroid Cancer**
Guillem Pratx, *Stanford University*
- 9 **Molecular and cellular imaging of bone biopsies using AI augmented deep UV Raman microscopy**
Vladislav Yakovlev, *Texas A&M University*
Mikhail Berezin, *Washington University in St. Louis*
- 10 **A High Throughput Human Tumor Modeling Technology for Cancer Drug Discovery**
Hosseini Tavana, *University of Akron*
Gary Luker, *University of Michigan*
- 11 **CoreView and FIBI for rapid-onsite evaluation and molecular profiling of core needle breast biopsies**
Richard Levenson, *University of California, Davis*
- 12 **Microfluidic Precision Engineered Artificial Antigen Presenting Cells for Cancer Immunotherapy**
Abraham Lee & Anshu Agrawal, *University of California, Irvine*
- 13 **A highly sensitive linear amplification-based DNA methylation profiling technique for clinical cancer research**
Brian Chiu & Wei Zhang, *University of Chicago*
- 14 **Transfer RNA sequencing and application to cancer research and clinics**
Tao Pan, Marc Bissonnette, & Benjamin Shogan, *University of Chicago*
- 15 **Optogenetic Control of Tumor Initiation and Tumor Progression in vivo**
Andrei Karginov, Jalees Rehman, & Trisha Bansal, *University of Illinois at Chicago*
- 16 **Development of stainless laser capture microdissection system**
Rohit Bhargava, *University of Illinois at Urbana-Champaign*

- 17 **High-throughput inverted reporter assay for characterization of silencers and enhancer blockers**
Alan Boyle, *University of Michigan*
- 18 **Advanced development of a blood brain barrier microfluidic platform**
Sofia Merajver & Christopher Oliver, *University of Michigan*
- 19 **A streamlined, high-throughput platform for validation of cancer antigen presentation and isolation of cancer antigen reactive T cells**
Ning Jenny Jiang, *University of Pennsylvania*
Amy Brock, *University of Texas at Austin*
- 20 **Tissue Photolithography**
Darryl Shibata, *University of Southern California*
- 21 **Efficient, cost-effective, and ultrasensitive sequencing of somatic mutations**
Stephen Salipante, *University of Washington*
- 22 **Detecting diverse nucleic acid biomarkers of cancer with solid-state nanopores**
Adam Hall, *Wake Forest University*
- 23 **Expanding the GoT toolkit to link single-cell genotypes with protein, transcriptomic, epigenomic, and spatial phenotypes**
Dan Landau & Ivan Raimondi, *Weill Cornell Medicine, New York Genome Center*
- 24 **Aliquot-level visual indicators of biospecimen exposure to thawed conditions**
Chad Borges, *Arizona State University*
- 25 **In situ assay imaging nuclear RNA exosome activity for cancer studies**
Vladimir Didenko, *Baylor College of Medicine*
- 26 **Mapping Cancer Metabolism by Mid-Infrared Photothermal (MIP) Microscopy**
Ji-Xin Cheng & Jiaze Yin, *Boston University*
- 27 **Adapting ultra-sensitive sequencing to detect KRAS mutations in a blood draw**
Christopher Counter & James Abbruzzese, *Duke Medical Center*
- 28 **Novel cryopreservation method for stabilization of manufactured therapeutic cells**
Alptekin Aksan, *University of Minnesota*

DAY 2: Thursday, December 7

8:30 a.m.	Breakfast	Student Center West, Second Floor
9:00 a.m.	Introduction	Student Center West, Thompson Rooms A, B, & C Robert Barish, MD, MBA , Vice Chancellor for Health Affairs, <i>University of Illinois at Chicago</i> Mark Rosenblatt, MD, PhD , Executive Dean, <i>University of Illinois College of Medicine</i> , Interim Chief Executive Officer, <i>UI Health</i>
9:10 a.m.	Liquid Biopsy Technologies	<p>Single molecule counting of a methyl CpG-rich cancer DNA biomarker locus reveals potential underestimation by established liquid biopsies Nils Walter & Muneesh Tewari, <i>University of Michigan at Ann Arbor</i></p> <p>Integrative Functional Profiling of Tumor-Derived Extracellular Vesicles Yong Zeng, <i>University of Florida</i> Liang Xu, <i>University of Kansas</i></p> <p>Increased Sensitivity of Minimal Residual Disease Monitoring using Peripheral Blood in Pediatric Patients with Acute Lymphoblastic Leukemia Steven Soper, <i>University of Kansas, Lawrence</i></p> <p>Decoding Individual Exosomes in Cancer Gregory Faris, <i>Numentus Technologies Inc</i></p> <p>Nano-plasmonic technology for high-throughput single exosome analyses Hyungsoon Im, <i>Massachusetts General Hospital</i></p>
10:40 a.m.	Coffee break	
11:10 a.m.	Binding Agents	<p>Chemical Proteomic Identification of Druggable Oncogenic Transcription Factors Liron Bar-Peled, <i>Massachusetts General Hospital</i></p> <p>New Hybrid Molecular Modalities Comprised of DNA-Origami and Interfering Peptides as Inhibitors of Protein-Protein Interactions Amanda Haymond, <i>George Mason University</i></p> <p>Bring the Power of the Antibody to the Bone Han Xiao, <i>Rice University</i></p>
12:05 p.m.	Guest Speakers from University of Illinois Cancer Center	<p>Targeting serine auxotrophy in breast cancer Jonathan Coloff, <i>Assistant Professor, Department of Physiology and Biophysics at UIC</i></p>

2023 NCI IMAT PI MEETING

Quantitative lipid imaging for cancer drug and biomarker discovery

Wonhwa Cho, *Distinguished Professor, Head of Department of Chemistry at UIC*

Understanding extracellular vesicle transport and production in engineering environments

Jae-Won Shin, *Associate Professor, Department of Pharmacology and Regenerative Medicine at UIC*

12:50 p.m. Lunch Student Center West, Second Floor

1:50 p.m. **Poster Session**

3:50 p.m. **Novel Biosensors**

Fluorescent gammaPNA Miniproboscopes for Imaging Telomeric RNA

Bruce Armitage & Huaiying Zhang, *Carnegie Mellon University*

Comprehensive breakpoint analyses for simultaneous quantification of all DNA double strand break repair pathways

Daniel Higginson, *Memorial Sloan Kettering Cancer Center*

Point of Care inflammation assay development using engineering non-canonical amino acid containing nanobodies against InterLeukin-6 and human C-Reactive Protein

Timothy Swager & Bevin Engelward, *Massachusetts Institute of Technology*

Time-resolved FRET-based allosteric sensors for any protein kinase drug target

Nicholas Levinson, *University of Minnesota*

High-throughput Screening Platform for Cancer Drug Discovery

Anne Plochowitz, *Palo Alto Research Center*

Laurie Parker, *University of Minnesota*

Lab on a particle technology for sorting T cells based on cytokine secretion

Jamie Spangler, *Johns Hopkins University*

Dino Di Carlo, *University of California, Los Angeles*

5:40 p.m. End of Day 2 Scientific Sessions

IMAT Researchers Reception

Field Museum, 1400 S Lake Shore Drive

6:00 p.m. Shuttle 1 to Field Museum
6:15 p.m. Shuttle 2 to Field Museum

Picking up at Student Center West

8:45 p.m. Shuttle 1 leaves museum
9:00 p.m. Shuttle 2 leaves museum

Dropping off at Marriott Courtyard, Hyatt, and Student Center West

Day 2 Poster Session

- 1 **NCI Technology Research Advocacy Partnership: Enhancing technology grant programs through advocate involvement**
Chuck Schmaderer, *NCI Research Advocate*
- 2 **A Virion-Display Oscillator Array and Detection Platform for Quantification of Transmembrane Protein Binding Kinetics**
Shaopeng Wang, *Arizona State University*
- 3 **Towards in-depth and label-free proteome profiling of hundreds of single cells per day**
Ryan Kelly, *Brigham Young University*
- 4 **Stitch-seq: A facile and high-throughput method to link pooled genetic perturbations to targeted gene expression**
Paul Blainey, *Broad Institute, Massachusetts Institute of Technology*
- 5 **A Practical Approach to Tumor-Specific Aptamers for B-Cell Hematologic Malignancies**
Qiao Lin, *Columbia University*
- 6 **MousePaint: A massively combinatorial approach for illuminating tumor heterogeneity in True Color**
Josh Snyder, *Duke University*
- 7 **High Quality Proteins with Multiple Post Translational Modifications**
Shuichi Hoshika, *Foundation for Applied Molecular Evolution*
- 8 **DNA Innovations in Cancer Research, Diagnostics, and Therapy**
Steven Benner, *Foundation for Applied Molecular Biology*
- 9 **Liquid biopsy-based toolkits for neoantigen and cognate TCR discovery for cancer immunotherapy**
Wei Wei, *Institute for Systems Biology*
- 10 **Secretion-responsive Hydrogels for Identification of Functional Single T Cells**
Rebecca Schulman & Claire Hur, *Johns Hopkins University*
- 11 **Multiplexed Digital Methylation Analysis for the Detection of Human Cancers**
Jeff Wang & Thomas Pisanic, *Johns Hopkins University*
- 12 **Fourier Imaging System for High-throughput Analyses of Cancer Organoids**
Hakho Lee, *Massachusetts General Hospital*
- 13 **Targeted Isolation and Identification of Sialylated Glycoproteins in Cancer Tissues, Cells, and Biofluids**
Richard Drake, *Medical University of South Carolina*
- 14 **A CRISPR/Cas13 approach for identifying individual transcript isoform function in cancer**
David Knowles, *New York Genome Center, Columbia University*
- 15 **Molecular Sub-typing Breast Cancer Patients Using Liquid Biopsy**
Steven Soper, *University of Kansas*
- 16 **Advances in storage of cancer biomarkers at room temperature utilizing BioCaRGOS: a sol-gel based technology**
Gautam Gupta, *University of Louisville*
Robert Keynton, *University of North Carolina*

- 17 **A synthetic toolkit for the recombinant production of tyrosine phosphorylated proteins and peptides**
Kristen Naegle, *University of Virginia*
- 18 **Single-Cell Protein Activity Profiling in Breast Cancer Cells and Tissues**
Raymond Moellering, *University of Chicago*
- 19 **Enhanced mass-spectrometry-based approaches for in-depth profiling of the cancer extracellular matrix**
Alexandra Naba & Yu Gao, *University of Illinois at Chicago*
- 20 **Novel Bisphosphate PET Probes for Myeloma Bone Disease**
Kai Chen & Charles McKenna, *University of Southern California*
- 21 **Integrative Functional Profiling of Tumor Derived Extracellular Vesicles**
Yong Zeng, *University of Florida*
Liang Xu, *University of Kansas*
- 22 **Phenotypic assay for drug discovery and personalized medicine based on real-time vibrational spectroscopy enhanced by plasmonic metasurfaces**
Gennady Shvets, *Cornell University*
- 23 **High-throughput, purification-free, and ultrasensitive transmembrane nanosensor arrays for digital counting of microRNA biomarkers of intact exosomes**
Rizal Hariadi & Hao Yan, *Arizona State University*
- 24 **Fractionation and Profiling of Heterogeneous Circulating Tumor Cells Using a Hyperuniform Structured Microchip**
Wei Li, *Texas Tech University*
- 25 **High-throughput Screening Platform for Cancer Drug Discovery**
Anne Plochowitz, *Palo Alto Research Center*
Laurie Parker, *University of Minnesota*
- 26 **SNAP-X: Development of a Mutagenesis Strategy and High-Density Protein Array to Comprehensively Display Protein Variants**
Mary Ozers, *Proteovista LLC*
- 27 **Copper-depleting nanotheranostics for treating triple negative breast cancer**
Peter Burke, *University of California, Irvine*

DAY 3: Friday December 8

8:30 a.m. Breakfast Student Center West, Second Floor

9:00 a.m. **Screening Technologies** Thompson Rooms A, B, & C

Development of a high-resolution mapping platform for HPV DNA integration in premalignant lesions

Cristina Montagna & Jack Lenz, *Albert Einstein College of Medicine*

Validating Urine Derived Cancer Cells (UDCC) – Non-Invasive and Living Liquid Biopsies – in Bladder Cancer Clinics

Xuefeng Liu, *The Ohio State University*

Paper-based Breastmilk Collection System for Facile, In-Home Use

Maria Santore, *University of Massachusetts Amherst*

10:00 a.m. Coffee break

10:20 a.m. **Liquid Biopsy Technologies**

High Throughput Digital Droplet ELISA for Ultrasensitive Multiplexed Diagnostics

David Issadore, *University of Pennsylvania*

Plate reader assays to forensically assess exposure of plasma and serum to thawed conditions

Chad Borges, *Arizona State University, Tempe Campus*

Fractionation and Profiling of Heterogeneous Circulating Tumor Cells Using a Hyperuniform Structured Microchip

Wei Li, *Texas Tech University*

Brillouin Flow Cytometry for biomechanical assessment of metastatic potential

Giuliano Scarcelli, *University of Maryland, College Park*
Konstantinos Konstantopoulos, *Johns Hopkins University*
Stuart Martin, *University of Maryland School of Medicine*

11:30 a.m. Coffee break

11:50 a.m. **Spatial Omics Tools**

High-resolution spatial transcriptomics through light patterning

Georg Seelig & David Wu, *University of Washington*

Multiplexed imaging of chromatin folding and RNA profiles in cancer

Siyuan Wang & Mandar Muzumdar, *Yale University*

Enhanced mass-spectrometry-based approach for in-depth profiling of the cancer extracellular matrix

Alexandra Naba & Yu Gao, *University of Illinois at Chicago*

12:50 p.m. Closing Comments, End of Day 3