



NATIONAL CANCER INSTITUTE

# **2018 NCI IMAT PI Meeting**

**19th Annual Innovative Molecular  
Analysis Technologies Principal  
Investigators Meeting**

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**November 28 - 30, 2018**

**Hilton Washington DC/Rockville  
Rockville, MD**

# Welcome

Welcome to the National Cancer Institute's (NCI) **19th Annual Principal Investigators' (PI) Meeting** for the **Innovative Molecular Analysis Technologies (IMAT) program**, being held November 28-30, 2018, at the Hilton Hotel & Executive Meeting Center in Rockville, MD.

Since 1998, the IMAT program (<http://innovation.cancer.gov>) has been a key component of NCI's strategy for supporting innovative and emerging technologies advancing cancer research and clinical care capabilities. This annual meeting is organized to address two important aims of the IMAT program:

- Provide NCI program staff a chance to interact directly with PIs and receive an update on progress to date of supported research;
- Provide opportunities for interactions and exchange of ideas among meeting participants, which is critical to sparking potentially transformative project collaborations, receiving critical feedback and guidance from the community, and fostering dissemination of the exciting technologies emerging from IMAT-supported research.

There are always more exciting active research projects in the IMAT portfolio than we have timeslots to accommodate at the meeting. As has been done for prior years, podium presentation slots have been prioritized for projects nearing the end of their IMAT award period and projects fitting selected themes followed by those indicating noteworthy progress. We also select several investigators to offer "Poster Highlight" presentations to further capture some of the exciting progress being presented in the poster sessions, involving very short overview talks on this research, noting that more detailed information may be gleaned from their posters.

On behalf of the NCI program staff and everyone involved in the planning for this meeting, I thank you for your participation, your interest, and the important work you all do to assist in our collective mission against cancer. I look forward to an exciting and productive meeting.

Kind Regards,



**Tony Dickherber, Ph.D.**

*Program Director, IMAT*

Center for Strategic Scientific Initiatives

National Cancer Institute, National Institutes of Health

U.S. Department of Health & Human Services



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For CSSI Information and Resources: <https://cssi.cancer.gov>


The views expressed in the materials or by presenters or participants at the event do not necessarily reflect the official policies of the U.S. Department of Health & Human Services, the National Institutes of Health, the National Cancer Institute, or any of their components.

# Agenda

## Day 1 - Wednesday Nov. 28

9:00am **Welcome and Program Update/Overview** – Tony Dickherber, National Cancer Institute (NCI)

### 9:15am **Molecular Pathway Tools**

 9:15	<b>Cancer Moonshot – Fusion Oncoproteins for Childhood Cancer Network (FusOnC<sup>2</sup>)</b> Keren Witkin, <i>NCI</i>
9:25	<b>Protein Painting: Identification of Protein-Protein Interfaces for Drug Discovery</b> Lance Allen Liota, <i>George Mason University</i>
9:45	<b>Multiplex In-Solution Protein Array (MISPA) for high throughput, quantitative profiling of protein interactions in B-cell receptor pathway and detection of immune responses to multiple serotypes of HPV</b> Joshua Labaer, <i>Arizona State University</i>
10:05	<b>An optimized design for single copy short hairpin RNAi</b> Scott M Hammond, <i>University of North Carolina, Chapel Hill</i>
10:25	<b>Development of proteasome adaptors to catalytically deplete specific proteins from cells</b> Andreas Matouschek, <i>University of Texas, Austin</i>
10:35	<b>Novel Bi-functional Inhibitors Blocking OncomiR Biogenesis</b> Fu-Sen Liang, <i>University of New Mexico</i>

10:45am **Break**

### 11:00am **New approaches for Sample Preparation and Preservation**

11:00	<b>Development of Enhancer RNA-based Biomarkers in FFPE Tissue</b> Jason Gertz, <i>University of Utah</i>
11:20	<b>Living Tumor Biopsies to Interrogate Immune Function and Response to Therapy</b> Matthew Krummel, <i>University of California, San Francisco</i>
11:40	<b>Validation of a Room-Temperature Storage Technique for Plasma/Serum Biospecimens</b> Al Aksan, <i>University of Minnesota</i>
12:00	<b>μSHEAR Technology for Cancer Cell Purification</b> Andrés Garcia and Susan Thomas, <i>Georgia Institute of Technology</i>
12:10	<b>Label-free microfluidic enrichment of cancer cells from noncancer cells in ascites fluid</b> Todd Sulchek, <i>Georgia Institute of Technology</i>
12:20	<b>Next-generation MOWChIP-seq for high-throughput epigenomic profiling using clinically relevant samples</b> Chang Lu, <i>Virginia Tech</i>

# Agenda

## Day 1 - Wednesday Nov. 28 (cont.)

12:30pm Lunch (on your own)

1:45 **Invited Speaker**  
Sean Khozin, MD, MPH, *Associate Director, Oncology Center of Excellence, Food and Drug Administration*


2:15pm **Panel Discussion on Technology Translation and Transfer**

**Panelists:**

- **Sean Khozin**, Assoc Dir, *FDA/OCE*
- **Michael Weingarten**, Director, *NCI Small Business Innovation Research Development Center*
- **Tiffany Wilson**, Executive Director, *Global Center for Medical Innovation*
- **Sergei Nachaev**, ICorps PI, *University of North Dakota*
- **Mei Hei**, ICorps PI, *Clarivate Inc & University of Kansas*
- **Matt Young** (moderator), Program Director, *NCI Division of Cancer Prevention*

3:00pm Coffee Break

3:15pm **miRNA Detection Approaches**

 3:15	<b>Cancer Moonshot – Immuno-Oncology Translational Science Network (IOTN)</b> Elad Sharon, <i>NCI</i>
3:25	<b>Noninvasive detection of circulating RNAs via tethered cationic lipoplex nanoparticles (tCLN) biochip for lung cancer early detection and prognosis</b> Yun Wu, <i>State University of New York at Buffalo</i>
3:45	<b>A Solid-State Nanopore miRNA Quantification Technology</b> Hsueh-Chia Chang, <i>University of Notre Dame</i>
4:05	<b>High Specificity MicroRNA Microarray Analysis without PCR for Cancer Screening and Research</b> Ravi Saraf, <i>University of Nebraska, Lincoln</i>
4:25	<b>Single-molecule counting of cancer biomarker miRNAs in human biofluids</b> Nils Walter, <i>University of Michigan</i>

# Agenda

## Day 1 - Wednesday Nov. 28 (cont.)

### 4:35pm Poster Session I Highlights

	<b>Single-molecule mechanical detection of protein and microRNA cancer biomarkers</b> Wesley Wong, <i>Boston Children's Hospital</i>
	<b>Nanoneedle microrobots for single cancer cell manipulation and genome editing</b> Rahim Esfandyarpour, <i>Stanford University</i>
	<b>High resolution cell lineage tracking and isolation</b> Amy Brock, <i>University of Texas, Austin</i>
	<b>High Content Screening of Multicellular Invasion with 3D Traction Force Microscopy</b> Ian Wong, <i>Brown University</i>
	<b><math>\mu</math>Coil NMR platform for robust and high-throughput analysis of <i>in vitro</i> metabolic flux on living cells</b> Kayvan Keshari, <i>Sloan-Kettering Institute for Cancer Research</i>

5:00-  
7:00pm

### Poster Session I

*Advanced Imaging, -omic Profiling, Macromolecular Interaction Tools, Sample QA/QC, Synthetic Biology Tools, Novel Biosensors, Sample Preparation Tools*

Dinner (on your own)

# Agenda

## Day 2 - Thursday Nov. 29

9:00am Patient Research Advocacy and the IMAT Program  
Brittany Avin, *Johns Hopkins University*

### 9:05am Technologies to improve Drug Discovery and Development

 9:05	<b>NCI Specialized Programs of Research Excellence (SPORE) Program</b> Peter Ujhazy, <i>NCI</i>
9:20	<b>Advanced Development and Validation of 3-Dimensional Spheroid Culture of Primary Cancer Cells using Nano3D Technology</b> Timothy Spicer, <i>Scripps Florida</i>
9:40	<b>High-Throughput Screening Under Static or Dynamic Hypoxia</b> Michael Gamcsik, <i>North Carolina State University Raleigh</i>
10:00	<b>Charge sensitive optical detection for high-throughput study of small molecules</b> Nongjian Tao, <i>Arizona State University</i>
10:20	<b>Genome-wide identification and targeting of resistance to cancer therapy</b> Eytan Ruppin, <i>NCI</i>

10:30am Break

### 10:45am Next Generation Clinical Diagnostic Technologies

10:45	<b>High Throughput GO Chip isolation of Lung CTCs for Molecular Diagnosis and Drug Testing</b> Sunitha Nagrath, <i>University of Michigan</i>
11:05	<b>Analysis of scant cancer cells in fine needle aspirates</b> Ralph Weissleder, <i>Massachusetts General Hospital</i>
11:25	<b>Validation of a Microdissection Method to Advance Precision Medicine</b> Donald Johann and Michael Tangrea, <i>University of Arkansas for Medical Sciences</i>
11:45	<b>A Novel Molecular Assay for Early Detection and Assessment of Cancer Risk</b> Lurdes Queimado, <i>University of Oklahoma Health Sciences</i>
12:05	<b>Validating Rapid Microfluidic Isolation of Personalized Aptamers for Monitoring Minimal Residual Disease in Multiple Myeloma</b> Qiao Lin, <i>Columbia University</i>

12:15pm Lunch (on your own)


# Agenda

## Day 2 - Thursday Nov. 29 (cont.)

### 1:30pm Cancer Modeling Advances

 1:30	<b>Cancer Moonshot – Pediatric Immunotherapy Discovery and Development Network (P-IDDN)</b> Nita Seibel, <i>NCI</i>
1:40	<b>Bioengineered Lung Tumor Organoids For Development Of Personalized Medicine</b> Aleksander Skardal, <i>Wake Forest University Health Sciences</i>
2:00	<b>A Genetic Toolbox for the Identification and Interrogation of Tumor Cells of Origin, Propagation, and Recurrence From Patient-derived Oncogenic Drivers</b> Joshua Breunig, <i>Cedars-Sinai Medical Center</i>
2:20	<b>LETSSGo: Lymphoma-on-chip Engineered Technology for Single-Organoid Sequencing and Genomics</b> Ankur Singh, <i>Cornell University</i>

### 2:30pm Imaging Probes I

 2:30	<b>Cancer Moonshot – Human Tumor Atlas Network (HTAN)</b> Sean Hanlon, <i>National Cancer Institute</i>
2:45	<b>Combinatorial Fluorescence with Spectral Imaging</b> Marc Birtwistle, <i>Clemson University</i>
3:05	<b>A Highly Multiplexed Gene Expression Platform for Fixed Tissue Specimens</b> H. Benjamin Larman, <i>Johns Hopkins University</i>
3:25	<b>Transforming FLIM into a high-content molecular analysis platform</b> Jered Haun, <i>University of California-Irvine</i>

### 3:35pm Coffee Break (20 min)

### 3:55pm Imaging Probes II

3:55	<b>No-Carrier Added Electrochemical Radio-Fluorination</b> Saman Sadeghi, <i>University of California Los Angeles</i>
4:10	<b>High-throughput radiochemistry platform for accelerated discovery and development of novel PET imaging agents for cancer</b> Michael van Dam, <i>University of California Los Angeles</i>
4:25	<b>GESI: a novel technology for functional imaging in living cells</b> Kit Lam, <i>University of California at Davis</i>
4:35	<b>Translational Molecular and Cellular Imaging Technologies for Prostate Tumor Pathology</b> Andrew Smith, <i>University of Illinois at Urbana-Champaign</i>



# Agenda

## Day 2 - Thursday Nov. 29 (cont.)

### 4:45pm Poster Session II Highlights

	<b>A novel time-resolved fluorescence-based high-throughput screening technology for discovering allosteric kinase inhibitor</b> Nicholas Levinson, <i>University of Minnesota</i>
	<b>Monitoring Recurrent Bladder Cancer with Electro-Phage Biosensors</b> Gregory Weiss, <i>University of California-Irvine</i>
	<b>Multiplex FRET Imaging of Kinase-Epigenome Interregulations in Live Cancer Cells</b> Yingxiao Wang, <i>University of California, San Diego</i>
	<b>A Self-Assembling Peptide Nanofiber Matrix for Prostate Cancer Cell Organoid Growth</b> Donald Vander Griend, <i>University of Chicago</i>
	<b>Development of Novel Chemical Probes to Map S-Nitrosylation in Cancer</b> Jason Held, <i>Washington University</i>
	<b>Tunable Fluorescent Organic Nanoparticles for Cancer Imaging Applications</b> Aaron Mohs, <i>University of Nebraska Medical Center</i>

5:15-  
7:00pm

### Poster Session II

*Cancer Modeling Advances, Liquid Biopsy Technologies, Imaging Agents, Mass Spectrometry, Immunotherapy Tools, Mechanobiology, Clinical Diagnostics, and presentations from guests supported by the American Cancer Society*

Dinner (on your own)

# Agenda

## Day 3 - Friday Nov. 30



9:05 **Cancer Moonshot – Drug Sensitivity and Resistance Network (DSRN)**  
Michael Espey, *NCI*

9:15 **Clinical implementation of single cell tumor transcriptome analysis**  
Orit Rozenblatt-Rosen, *Broad Institute, Inc*

9:33 **Optical Demultiplexing for Large-Scale Integration of Imaging and Single Cell RNA-Seq**  
Peter Sims, *Columbia University Health Sciences*

9:55 **Single cell cytokine analysis of circulating malignant hematopoietic cells**  
Rong Fan, *Yale University*

10:15 **Multiplet analysis and lineage tracing for single cell cancer genomics**  
Allon Klein, *Harvard Medical School*

10:45 **Mass Spectrometry Detection of Drugs in Single Bladder Cancer Cells from Patients**  
Anthony Burgett, *University of Oklahoma*

11:05 **In-Depth Proteome Mapping of the Tumor Microenvironment with Single-Cell Resolution**  
Ryan Kelly, *Pacific Northwest National Laboratories*

11:25 **Online Raman Diagnostics of Oncometabolites**  
Zachary Schultz, *The Ohio State University*

11:45 **Measurement of Aberrant Protein Folds in Malignant Cells with Proteomics and Mass Spectrometry**  
Casimir Bamberger, *Scripps Research University*

*Meeting Adjourned at 12pm*



## Day 1 Posters (Wednesday Nov. 28<sup>th</sup>)

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<b>01</b>	<b>High-throughput ex vivo microscopy of cancer biospecimens using structured illumination microscopy</b> Quincy Brown, <i>Tulane University</i>	<b><u>71</u></b>
<b>02</b>	<b>MUSE: Greatest Innovation Since the Thermos</b> Richard Levenson, <i>University of California, Davis</i>	<b><u>73</u></b>
<b>03</b>	<b>High-throughput super-resolution imaging of chromatin structures at different epigenetic states</b> Yang Liu, <i>University of Pittsburgh</i>	<b><u>74</u></b>
<b>04</b>	<b>Stimulated Raman scattering spectroscopic optical coherence tomography (SRS-SOCT) for label-free molecular imaging of brain tumor pathology</b> Francisco Robles, <i>Georgia Institute of Technology</i>	<b><u>75</u></b>
<b>05</b>	<b>An integrated imaging tool for probing EGFR subcellular trafficking in real time</b> Hsin-Chih (Tim) Yeh and Andrew Dunn, <i>University of Wisconsin</i>	<b><u>76</u></b>
<b>06</b>	<b>Marking and capturing DNA double strand breaks to track repair and the role of chromatin dynamics during the DNA damage response</b> Stephen Kron, <i>University of Chicago</i>	<b><u>77</u></b>
<b>07</b>	<b>Advanced development and validation of targeted molecular counting methods for precise and ultrasensitive quantitation of low prevalence somatic mutations and microsatellite instability</b> Stephen Salipante, <i>University of Washington</i>	<b><u>78</u></b>
<b>08</b>	<b>Scalable Cancer Genomics via Nanocoding and Sequencing</b> David Schwartz and Jian Ma, <i>University of Wisconsin</i>	<b><u>79</u></b>
<b>09</b>	<b>Determining Measurable Residual Disease in Myeloid Malignancies Using Targeted Single Molecular Error Corrected Sequencing</b> Matthew Walter and Eric Duncavage, <i>Washington University</i>	<b><u>80</u></b>
<b>10</b>	<b>rePPI-i: A system for the rapid continuous evolution of protein-protein interaction inhibitors</b> Bryan Dickinson, <i>University of Chicago</i>	<b><u>82</u></b>
<b>11</b>	<b>Engineered regulation of tyrosine phosphatase activity in living cells</b> Andrei Karginov, <i>University of Illinois at Chicago</i>	<b><u>83</u></b>
<b>12</b>	<b>A Molecular Toolkit for the Production of the Tyrosine Phosphorylated Proteins</b> Kristen Naegle, <i>Washington University</i>	<b><u>84</u></b>
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15	<b>Profiling of Pol II transcriptomes using small capped RNA sequencing</b> Sergei Nechaev, <i>University of South Dakota</i>	<u>88</u>
16	<b>High-efficiency microfluidic-assisted single-cell DNA methylome sequencing</b> Hariharan Easwaran and Thomas Russell Pisanic II, <i>Johns Hopkins University</i>	<u>89</u>
17	<b>Determining and enhancing metabolite fitness for metabolomics measurements</b> Aalim Weijie, <i>University of Pennsylvania</i>	<u>90</u>
18	<b>Molecular Detection of DNA Hydroxymethylation for Cancer Screening</b> Adam Hall, <i>Wake Forest University Health Sciences</i>	<u>91</u>
19	<b>A Target-Directed Reagent Pipeline via Microfluidic mRNA Display</b> Noah Malmstadt and Richard Roberts, <i>University of Southern California</i>	<u>93</u>
20	<b>Microfluidic Western Blotting for Targeted Proteomic Analysis of Single Circulating Tumor Cells</b> Amy Herr, <i>University of California Berkeley</i>	<u>94</u>
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23	<b>Single-molecule mechanical detection of protein and microRNA cancer biomarkers</b> Wesley Wong, <i>Boston Children's Hospital</i>	<u>98</u>
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25	<b>High Content Screening of Multicellular Invasion with 3D Traction Force Microscopy</b> Ian Wong, <i>Brown University</i>	<u>100</u>
26	<b>Development of proteasome adaptors to catalytically deplete specific proteins from cells</b> Andreas Matouschek, <i>University of Texas, Austin</i>	<u>101</u>
27	<b>Novel Bi-functional Inhibitors Blocking OncomiR Biogenesis</b> Fu-Sen Liang, <i>Case Western Reserve University</i>	<u>102</u>



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30	<b>Next-generation MOWChIP-seq for high-throughput epigenomic profiling using clinically relevant samples</b> Chang Lu, <i>Virginia Tech</i>	<b><u>107</u></b>
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<b>03</b>	<b>Ex vivo culture platform validation for preservation of patient derived multiple myeloma cells</b> Jenny Zilberberg and Woo Young Lee, <i>Hackensack University Medical Center</i>	<b><u>117</u></b>
<b>04</b>	<b>Rapid unbiased isolation and in situ RNA analysis of circulating tumor cells using a magnetic micropore-based diagnostic chip</b> David Issadore, <i>University of Pennsylvania</i>	<b><u>119</u></b>
<b>05</b>	<b>Development and validation of nanoparticle-mediated microfluidic profiling approach for rare cell analysis</b> Shana Kelley, <i>University of Toronto</i>	<b><u>126</u></b>
<b>06</b>	<b>Detecing Living Cancer Cells with Gain-Of-Function (GOF) p53 Mutations and GOF p53 Activity Quantitation</b> Brad Windle and Sumitra Deb, <i>Virginia Commonwealth University</i>	<b><u>127</u></b>
<b>07</b>	<b>Fluorescence lifetime-based single fluorophore biosensors of post-translational modification enzyme activity</b> Laurie Parker, <i>University of Minnesota</i>	<b><u>128</u></b>
<b>08</b>	<b>Exquisitely selective turn-on probes of kinase activation and localization</b> Matthew Soellner, <i>University of Michigan</i>	<b><u>130</u></b>
<b>09</b>	<b>An integrated therapeutic T cell receptor screening platform for adoptive cell therapy in cancer</b> Ning Jenny Jiang, <i>University of Texas, Austin</i>	<b><u>131</u></b>
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<b>12</b>	<b>Integrated exosomes profiling for minimally invasive diagnosis and monitoring of cancer</b> Yong Zeng, Andrew Godwin and Glenson Samuel, <i>University of Kansas</i>	<b><u>136</u></b>
<b>13</b>	<b>High Resolution High Throughput Proteomics Platform for Cancer Research</b> Yehia Ibrahim, <i>Battelle Pacific Northwest Laboratories</i>	<b><u>138</u></b>
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17	<b>Advanced development and validation of microdevices for high-throughput in situ drug sensitivity testing in tumors</b> Michael Cima and Oliver Jones, <i>Massachusetts Institute of Technology</i>	<b><u>143</u></b>
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30	Development of a kynureninase clinical candidate to inhibit cancer immune suppression John Blazeck, <i>University of Texas, Austin</i>		<a href="#"><u>159</u></a>
31	Broad-spectrum receptor tyrosine kinase inhibitors overcome de novo and acquired modes of resistance to EGFR-targeted therapies in colorectal cancer Bhuminder Singh, <i>Vanderbilt University Medical Center</i>		<a href="#"><u>160</u></a>
32	Engineering <i>Caenorhabditis elegans</i> as a Transcription Biosensor to Identify Therapeutics Paul Goetsch, <i>Michigan Technological University</i>		<a href="#"><u>161</u></a>





## Resources and Funding Opportunities

### Resources

- The NCI Center for Strategic Scientific Initiatives (CSSI) [Data Coordinating Center \(DCC\) Portal](#) is a public repository of experiment-related information describing cancer research investigations. You can use the portal to browse, search, and access data generated through CSSI funded projects and other user uploaded data sets. This data is in ISA-Tab format.
- NCI's [Proteomics Data Portal](#) provides datasets of breast, ovarian, and tumor tissue that have been genomically characterized by TCGA datasets.
- The [Antibody Characterization Laboratory](#) provides access to a large number of reagents and accompanying characterization data. Antigens and antibodies are expressed, purified, and characterized using standard operating procedures, with all accompanying protocols and data.
- The Nanotechnology Characterization Laboratory (NCL) within Frederick National Laboratory for Cancer Research performs preclinical characterization of nanomaterials using a comprehensive battery of assays. The operation of NCL relies on collaboration with the Food and Drug Administration and the National Institute of Standards and Technology.
- The cancer Nanotechnology Laboratory ([caNanoLab](#)) data portal provides access to nanomaterial characterization data to expedite and validate the use of nanomaterials in biomedicine. Users can search and download cancer-relevant characterization data resulting from physico-chemical, *in vitro*, and *in vivo* assays, as well as associated protocols and publication information.
- The [Nanomaterial Registry](#) archives research data on nanomaterials and their biological and environmental implications from a broad collection of publicly available nanomaterial resources. All data housed is curated using a set of minimal information about nanomaterials (MIAN) to create criteria for curation and enable nanomaterial comparisons.
- NCI's Physical Sciences-Oncology Network and Cancer Systems Biology Consortium [Data Coordinating Center](#) on Synapse provides datasets of genomic characterization and physical characterization of numerous non-malignant and malignant cell lines (<https://www.synapse.org/#!/Synapse:syn7248578/wiki/405995>).
- The NCI Physical Sciences-Oncology Network Bioresource Core Facility (PBCF) at ATCC is a central resource that provides common stocks of authenticated non-malignant and cancerous cell lines, their derivatives, cell culture reagents, and related standard operating protocols (SOPs). The bioresources are available for the cost of shipping and handling only, not only for members of the Physical Sciences-Oncology Network and Cancer Systems Biology Consortium, but also all investigators who are willing to share data sets that are generated using the bioresources provided by the PBCF. Visit the website to view the list of available cell lines and derivatives, the SOPs, order form, and transfer agreements: <http://physics.cancer.gov/bioresources>.
- The Early Detection Research Network (EDRN) – A consortium that promotes discovery, development, and clinical validation of biomarkers for early detection of cancer. Investigators with promising biomarkers may request for core funds to validate their markers using reference sets and resources within the network.
- The NCI [SBIR Development Center](#) oversees all NCI Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) support programs, which includes all grant and contract funding opportunities, as well as a broad variety of additional resources aimed at supporting the innovations and commercial interests of small business entities against cancer.



## Resources and Funding Opportunities

- The [Cancer Genomics Cloud Pilots](#) are designed to explore innovative methods for accessing and computing on large genomic data. Three contracts were awarded to develop infrastructure and a set of tools to access, explore, and analyze molecular data, which are all being implemented through commercial cloud providers and adopting common standards. The three project teams have distinct system designs, data presentation, and analysis resources to serve the cancer research community, which will be made available to researchers in early 2016.
- The [Genomic Data Commons \(GDC\) Data Portal](#) is an interactive data system for researchers to search, download, upload, and analyze harmonized cancer genomic data sets, including The Cancer Genome Atlas (TCGA).
- The [Alliance of Glycobiologists for Detection of Cancer](#) – A consortium that investigates the molecular basis by which altered glycan expression leads to cancer progression and develop cancer biomarkers based on the aberrant expression of these glycans. Opportunities exist to collaborate in cancer relevant research with a number of experts in glycobiology.
- NCI [Best Practices for Biospecimen Resources](#) guiding principles that define state-of-the-science biospecimen resource practices, promote biospecimen and data quality, and support adherence to ethical and legal requirements. (<https://biospecimens.cancer.gov>)
- The Biospecimen Research Database ([BRD](#)) is a free and publicly accessible literature database that contains curated, peer-reviewed primary and review articles in the field of human biospecimen science. The database is searchable by various parameters including the biospecimen investigated (type and location, patient diagnosis), preservation method, analyte(s) of interest and technology platform(s) used for analysis. An original summary of relevant results is also provided for each article.
- The NCI offers the following two resources for research biospecimens:
  - [Specimen Resource Locator \(SRL\)](#) is a biospecimen resource database designed to help researchers locate resources that may have the samples needed for their investigational use. This publicly searchable database includes information about biospecimen banks and sample procurement services. The specimens and samples come from non-commercial, either NCI or non-NCI-funded resources. Investigators can search the database and gain access to thousands of specimens of various tumor, organ, and preservation methods.
  - [The Cooperative Human Tissue Network \(CHTN\)](#) is a resource developed and supported by the NCI that provides human tissues and fluids from routine procedures open to the scientific community to facilitate basic, early translation research, and assay/technology validation. Unlike tissue banks, the CHTN works prospectively with each investigator to tailor specimen acquisition and processing to meet their specific project requirements.
- The Genotype-Tissue Expression (GTEx) project is an ongoing effort to build a comprehensive public resource to study tissue-specific gene expression and regulation. Samples were collected from 53 non-diseased tissue sites across nearly 1000 individuals, primarily for molecular assays including WGS, WES, and RNA-Seq. Remaining samples are available from the GTEx Biobank. The [GTEx Portal](#) provides open access to data including gene expression, QTLs, and histology images. The current release is V7 including 11,688 samples, 53 tissues and 714 donors.
- NCI has developed the [Biobank Economic Modeling Tool \(BEMT\)](#), a publically available web-based financial planning tool for biobanks. BEMT is designed to enhance the understanding of the economic considerations involved in initiating, operating and maintaining a biobank to assist with long term financial planning and cost recovery.



## Resources and Funding Opportunities

- The NIH Library of Integrated Network-based Cellular Signatures ([LINCS](#)) Program aims to create a network-based understanding of biology using computational tools into a comprehensive view of normal and disease states that can be applied for the development of new biomarkers and therapeutics. By generating and making public data that indicates how cells respond to various genetic and environmental stressors, the [LINCS project](#) will help us gain a more detailed understanding of cell pathways and aid efforts to develop therapies that might restore perturbed pathways and networks to their normal states.

### Active Research Funding Opportunities

#### Innovative Molecular Analysis Technology (IMAT) Program

- [RFA-CA-19-019](#): Innovative Molecular and Cellular Analysis Technologies for Basic and Clinical Cancer Research (R21 Clinical Trial Not Allowed)
- [RFA-CA-19-020](#): Advanced Development and Validation of Emerging Molecular and Cellular Analysis Technologies for Basic and Clinical Cancer Research (R33 Clinical Trial Not Allowed)
- [RFA-CA-19-021](#): Innovative Technologies for Cancer-Relevant Biospecimen Science (R21 Clinical Trial Not Allowed)
- [RFA-CA-19-022](#): Advanced Development and Validation of Emerging Biospecimen Science Technologies for Basic and Clinical Cancer Research (R33 Clinical Trial Not Allowed)
- Revisions for Incorporation of Novel NCI-supported Technology to Accelerate Cancer Research
  - [RFA-CA-19-023](#) (R01 Clinical Trials Optional)
  - [RFA-CA-19-024](#) (U01 Clinical Trials Optional)
  - [RFA-CA-19-025](#) (U54 Clinical Trials Optional)
  - [RFA-CA-19-026](#) (P01 Clinical Trials Optional)
  - [RFA-CA-19-027](#) (P50 Clinical Trials Optional)
  - [RFA-CA-19-028](#) (U2C Clinical Trials Optional)

Applications for above RFAs due Feb 28, May 26 and Sept 26, 2019.

- [PAR-18-303](#): Innovative Molecular Analysis Technology Development for Cancer Research and Clinical Care (R43/R44 Clinical Trial Not Allowed). Expires Jan. 8, 2021.

#### Informatics Technologies for Cancer Research (ITCR) Program

- [PAR-15-334](#): (R21) Development of Innovative Informatics Methods and Algorithms for Cancer Research and Management
- [PAR-15-332](#): (U01) Early-Stage Development of Informatics Technologies for Cancer Research and Management



## Resources and Funding Opportunities

- [PAR-15-331](#): (U24) Advanced Development of Informatics Technologies for Cancer Research and Management
- [PAR-15-333](#): (U24) Sustained Support for Informatics Resources for Cancer Research and Management

*ITCR funding opportunities listed above have expired, but new FOAs are anticipated in 2019. Please visit <https://itcr.cancer.gov> for updates.*

### Alliance for Nanotechnology in Cancer

- [PAR-17-240](#): Innovative Research in Cancer Nanotechnology (IRCN) (R01).  
3 unique receipt dates per year. Expires May 22, 2020.

### Academic-Industrial Partnerships

- [PAR-18-530](#): Academic-Industrial Partnerships for Translation of Technologies for Cancer Diagnosis and Treatment (R01 Clinical Trial Optional).  
Expires January 8, 2021.
- [PAR-18-009](#): Academic-Industrial Partnerships to Translate and Validate *in vivo* Cancer Imaging Systems (R01 Clinical Trial Optional)  
Expires Nov. 6, 2019.

### Assay Validation for High Quality Markers for NCI-Supported Clinical Trials

- [PAR-18-317](#) (UH2/UH3 Clinical Trials Not Allowed)
- [PAR-18-310](#) (UH3 Clinical Trials Not Allowed)  
3 unique receipt dates per year. Expires Oct. 9, 2020.

### Physical Sciences-Oncology Network (PS-ON)

*NCI intends to issue a new P01 funding opportunity for Physical Sciences-Oncology Projects (PS-OP) by the end of 2018. Please see the following notice for more information: [NOT-CA-19-005](#).*

### Oncology Models

- [PAR-17-244](#): (Collaborative R01) Collaborative Research Projects to Enhance Applicability of Mouse Models for Translational Research
- [PAR-17-245](#): (R01) Research Projects to Enhance Applicability of Mouse Models for Translational Research.  
Standard due dates apply. Expires May 8, 2020.
- [PAR-17-171](#): (R01) Cancer Tissue Engineering Collaborative: Enabling Biomimetic Tissue-Engineered Technologies for Cancer Research  
Standard due dates apply. Expires Jan 8, 2019.

### Alliance of Glycobiologists for Cancer Research

- [PAR-17-206](#): (U01) Translational Tumor Glycomics Laboratories
- [PAR-17-207](#): (U01) Biological Tumor Glycomics Laboratories  
Last receipt date for applications is February 7, 2019.



## Resources and Funding Opportunities

### NCI Cancer Moonshot<sup>SM</sup> Initiative

#### *Fusion Oncoproteins in Childhood Cancer*

- [PA-16-251](#) (R01) & [PA-16-252](#) (R21): Gene Fusions in Pediatric Sarcomas  
Standard due dates apply. Expires May 8, 2019.

#### *Cancer Immunotherapy Translational Science Network*

- [RFA-CA-19-013](#): Immuno-Oncology Translation Network (IOTN); Immuno-engineering to Improve Immunotherapy (i3) Centers (U54 Clinical Trial Not Allowed)  
Applications due February 12, 2019
- [RFA-CA-19-015](#): Immuno-Oncology Translation Network (IOTN); Cancer Immunotherapy Research Projects (U01 Clinical Trial Not Allowed)  
Applications due January 9, 2019.
- [PAR-17-245](#): (R01) Research Projects to Enhance Applicability of Mammalian Models for Translational Research
- [PAR-17-244](#): (Collaborative R01) Collaborative Research Projects to Enhance Applicability of Mammalian Models for Translational Research  
Standard due dates apply. Expires May 8, 2020.
- [PAR-16-228](#) (R01) & [PAR-16-229](#) (R21): Metabolic Reprogramming to Improve Immunotherapy  
Standard due dates apply. Expires September 8, 2019.

#### *Prevention and Early Detection: Implementation Science*

- [RFA-CA-19-001](#): Communication and Decision Making for Individuals with Inherited Cancer Syndromes (U01 Clinical Trial Optional)
- [RFA-CA-19-017](#): Approaches to Identify and Care for Individuals with Inherited Cancer Syndromes (U01 Clinical Trial Required)  
Applications due January 9, 2019.
- [RFA-CA-19-018](#): Accelerating Colorectal Cancer Screening and follow-up through Implementation Science (ACCSIS, Second Wave) (UG3/UH3 Clinical Trial Required)  
Applications due February 12, 2019.

NOTE: For all funding opportunities associated with the NCI Cancer Moonshot Initiative, please visit <https://www.cancer.gov/brp>



## Resources and Funding Opportunities

### Other NCI Opportunities

- [PAR-18-951](#): Opportunities for Collaborative Research at the NIH Clinical Center (U01 Clinical Trial Optional) Applications due April 15 in 2019, 2020, and 2021.
- [PAR-18-947](#): Integrating Biospecimen Science Approaches into Clinical Assay Development (U01 Clinical Trial Not Allowed) Three unique receipt dates per year, expires July 12, 2021
- [PAR-18-913](#): Utilizing the PLCO Biospecimens Resource to Bridge Gaps in Cancer Etiology and Early Cancer Detection Research (U01 Clinical Trial Not Allowed) Two unique receipt dates per year, expires August 12, 2021
- [PAR-18-841](#): Oncology Co-Clinical Imaging Research Resources to Encourage Consensus on Quantitative Imaging Methods and Precision Medicine (U24 Clinical Trial Optional). Two unique receipt dates per year, expires Jun 15, 2021
- [PAR-18-290](#): National Cancer Institute Program Project Applications. (P01 Clinical Trial Optional) Applications due February 20, 2019.
- [PAR-18-020](#): NCI Clinical and Translational Exploratory/Developmental Studies. (R21 Clinical Trial Optional) Applications due February 20, 2019.
- [PAR-16-276](#) (R01) & [PAR-16-277](#) (R21): Program to Assess the Rigor and Reproducibility of Exosome-Derived Analytes for Cancer Detection. Applications due June 13, 2019.

### General NIH Bioengineering Research Opportunities

- [PAR-18-205](#): NIBIB Biomedical Technology Resource Center. (P41 Clinical Trials Optional) Standard due dates apply. Expires January 8, 2020.
- [PAR-17-046](#): (R21) Exploratory Research for Technology Development from the National Institute for General Medical Sciences.
- [PAR-17-045](#): (R01) Focused Technology Research and Development from the National Institute for General Medical Sciences. Standard due dates apply. Expires May 8, 2019
- [PAR-17-316](#): (P41) NIGMS Biomedical Technology Research Resource. Applications due: January 25, 2019; May 25, 2019; and January 25, 2020.
- [PAR-18-286](#): (R21) Exploratory/Developmental Bioengineering Research Grant (EBRG).
- [PAR-18-206](#): (R01) Bioengineering Research Grants (BRG).
- [PAR-18-208](#): (U01) Bioengineering Research Partnerships (BRP). Expires Jan 8, 2019.



## Resources and Funding Opportunities

### Diet and Physical Activity Assessment Methodology

- [PA-18-856](#) (R01)
- [AR-18-857](#) (R21)  
Standard receipt dates, expiring September 8, 2021

### Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative

Various funding opportunities can be found at <https://www.braininitiative.nih.gov>

## Training and Other Support

### Ruth L. Kirschstein National Research Service Award (NRSA)

- [PA-18-396](#): (K25) Mentored Quantitative Research Development Award
- [PA-18-403](#): (T32) Institutional Research Training Grant
- [PA-18-404](#): (T35) Short-Term Research Training Grant
- [PA-18-666](#): (F31) Predoctoral Fellowship to Promote Diversity in Health-Related Research
- [PA-18-668](#): (F30) Fellowship for Students at Institutions With NIH-Funded Institutional Predoctoral Dual-Doctoral Training Programs
- [PA-18-670](#): (F32) Individual Postdoctoral Fellowship
- [PA-18-671](#): (F31) Individual Predoctoral Fellowship
- [PA-18-672](#): (F33) Individual Senior Fellowship.
- [PA-18-673](#): (F30) Fellowship for Students at Institutions Without NIH-Funded Institutional Predoctoral Dual-Doctoral Training Programs
- [PAR-18-467](#): (K22) The NCI Transition Career Development Award.

More information on NIH-supported training initiatives [here](#).



## NCI IMAT Program Team

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