National Cancer Institute

INNOVATIVE MOLECULAR ANALYSIS TECHNOLOGIES

Transformative Technology Support from the NCI: the Innovative Molecular Analysis Technologies (IMAT) Program

American Association for Cancer Research
2013 Annual Meeting, Washington DC

Tony Dickherber, Ph.D.
Center for Strategic Scientific Initiatives
National Cancer Institute

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
National Institutes of Health

NIH...Turning Discovery into Health

National Cancer Institute: Organization

Director
Harold Varmus, MD

National Cancer Institute

$5.07B
(FY12)

Deputy Director
Douglas Lowy, MD

Office of the Director

CSSI **CCG**

~$190 M (~4%)

Center for Cancer Research
Division of Cancer Epidemiology and Genetics
Division of Cancer Treatment and Diagnosis
Division of Cancer Biology
Division of Cancer Control and Population Sciences
Division of Cancer Prevention
Division of Extramural Activities

Conducting – Intramural

Funding – Extramural

NCI Center for Strategic Scientific Initiatives (CSSI): Concept Shop

INNOVATIVE MOLECULAR ANALYSIS TECHNOLOGIES

Director
Douglas Lowy, MD

CENTER *for* STRATEGIC SCIENTIFIC INITIATIVES

~$190M (FY12)

Deputy Director
Jerry S.H. Lee, PhD

Mission

"…to create and uniquely implement exploratory programs focused on the development and integration of advanced technologies, **trans-disciplinary approaches, infrastructures, and standards**, to accelerate the **creation and broad deployment** of **data, knowledge, and tools** to empower the **entire cancer research continuum** in better understanding and leveraging knowledge of the cancer biology space **for patient benefit**…"

INNOVATIVE MOLECULAR ANALYSIS TECHNOLOGIES — **2003, 2007, 2011**

CLINICAL PROTEOMIC TECHNOLOGIES FOR CANCER — **2005, 2010**

PHYSICAL SCIENCES in ONCOLOGY — **2008**

Provocative Questions Project — **2011, 2012**

NCI Alliance for Nanotechnology in Cancer — **2004, 2008**

THE CANCER GENOME ATLAS — **2005, 2008**

Cancer Target Discovery & Development (CTD²) — **2010**

Innovative Molecular Analysis Technologies (IMAT) Program

INNOVATIVE MOLECULAR ANALYSIS TECHNOLOGIES

Program Mission:

To support the development, maturation, and dissemination of novel and potentially transformative next-generation technologies through an approach of balanced but targeted innovation in support of clinical, laboratory, or epidemiological research on cancer.

R21

Exploratory/Pilot phase
Innovative technology/approach
No preliminary data required

R33

Validation/Development phase
Demonstration of transformative utility
Requires proof of feasibility

A selection of IMAT credits thus far…

INNOVATIVE MOLECULAR ANALYSIS TECHNOLOGIES

Older

- **ICAT** by Applied Biosystems [2001]
- **Mudpit**, licensed by the Scripps Research Institute [2001]
- **Rolling Circle Amplification**, available from Amersham Biosciences (now GE Healthcare), [2002]
- **Affymetrix GeneChip® CustomSeq®** arrays [2002]
- **Illumina Bead** technology (**BeadChip**, **Beadstation**, and **Sentrix BeadArray**) [2004]
- **Quantum Dots**, purchased by Invitrogen [2005]
- **MELT®** & **RNALater®** by Ambion [2005 and 2008, respectively]

Newer

- **Microfluidic Genetic Analysis** platform, licensed by both Lockheed Martin and MicroLab Diagnostics [2008]
- Raindance® **RDT-1000** (oil nanodroplet technology) [2009]
- **COLD-PCR**, licensed by TransGenomic [2010]
- **TrIP-Chip** Technology, licensed by OceanRidge Biosciences [2010]
- **NanoTrap** Biomarker Discovery Platform, licensed by Shimadzu Scientific [2010]
- **IUVO™** cell isolation platform from Bellbrook Labs, exclusively licensed by ThermoFisher [2012]
- CellASIC **ONIX** microfluidic perfusion system, acquired by EMD-Millipore [2012]

Diversity of IMAT-supported technologies

INNOVATIVE MOLECULAR ANALYSIS TECHNOLOGIES

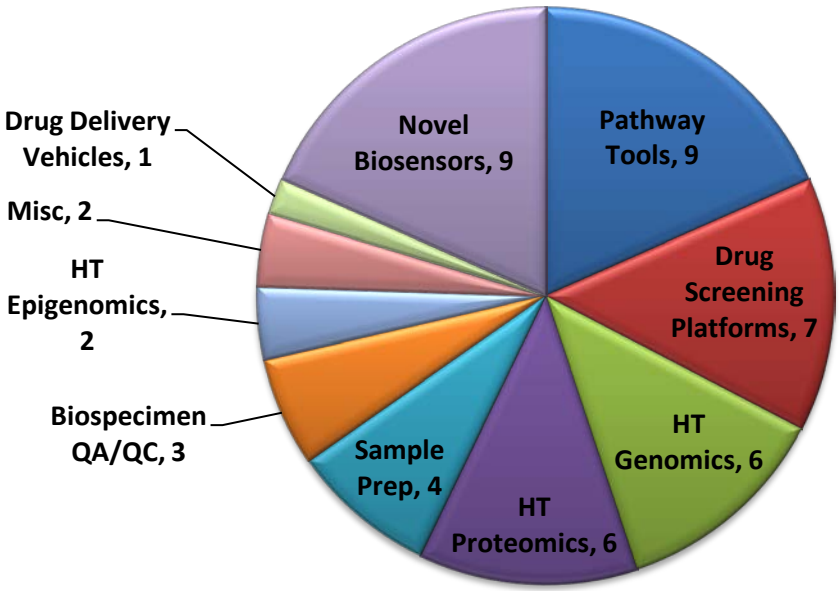
Innovative Technologies for Molecular Analysis of Cancer (R21)

- Proof-of-concept
- Milestone driven (no biology)

Application of Emerging Technologies for Cancer Research (R33)

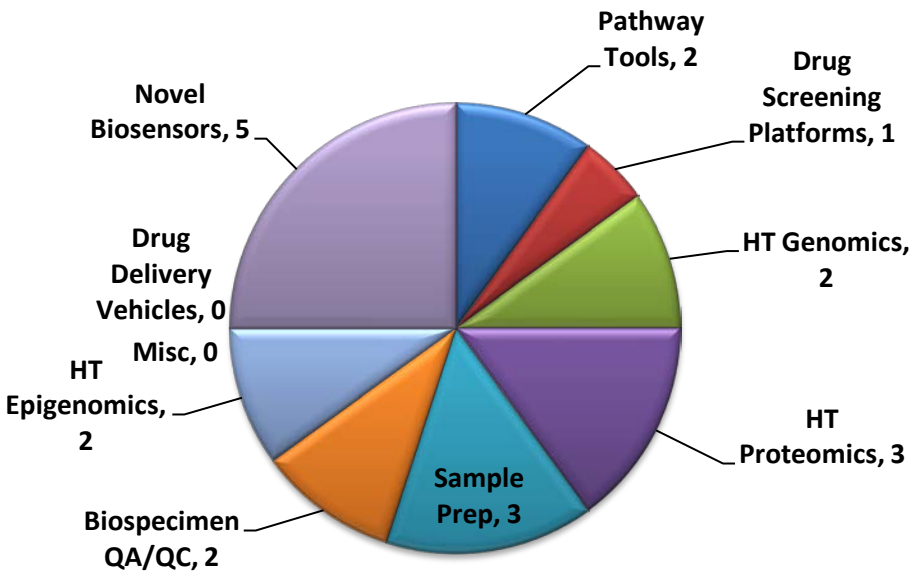
- Validation
- Demonstration of impact on basic and/or clinical research

Current IMAT R21 Portfolio (49 Active Projects)



HT = High throughput

Current IMAT R33 Portfolio (20 Active Projects)



TrIP-Chip Technology

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- Affinity capture beads that bind translationally-active mRNA only for high-throughput expression profiling
  - Enables investigation of translational control with limited sample quantities
- Licensed by OceanRidge Biosciences [2010]

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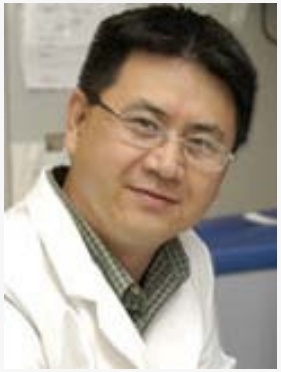
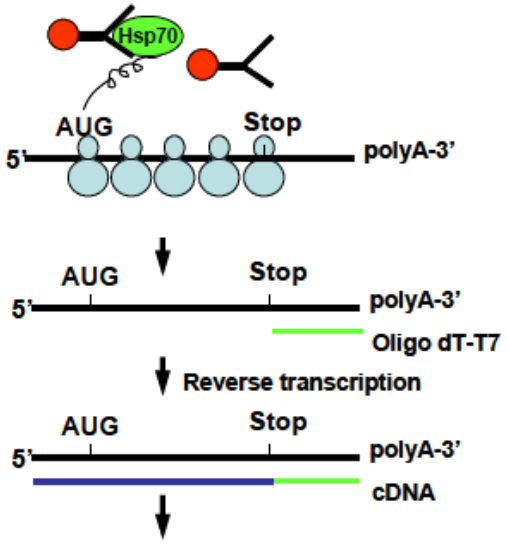
Ocean Ridge Biosciences



PI: Jingfang Ju, PhD
Associate Professor of Pathology
Stony Brook Universtiy Medical Cente



Gene Expression analysis (Microarray, qPCR and Sequencing)

CellASIC

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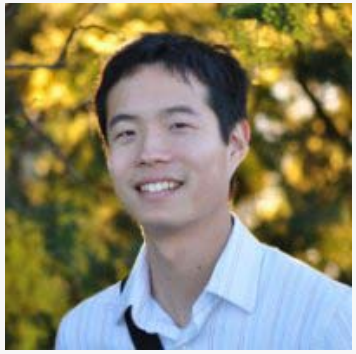
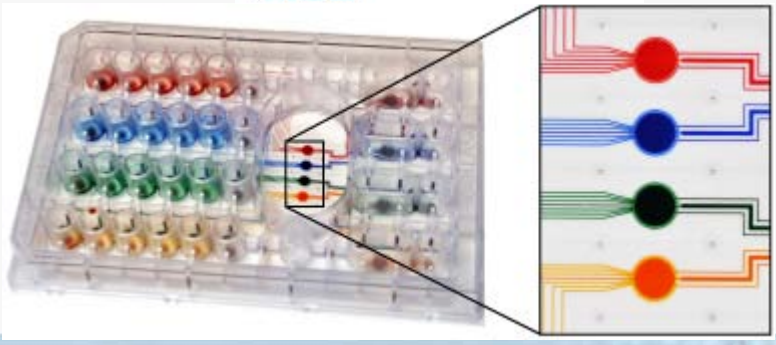
- Microfluidic cell culture instrumentation with various customizable plates for advanced cell biology studies.
  - Performs long-term tracking (days to weeks) of live cells with precise microenvironment control
- Finalist for ALA Innovation of the Year [2005] and was one of R&D100 innovations of the year [2010]
- Acquired by EMD-Millipore [2012]

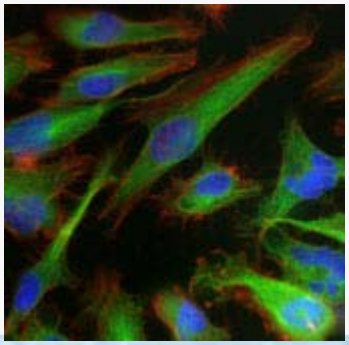
CELLASIC

EMD MILLIPORE



PI: Philip Lee, PhD
Co-founder/Director of R&D
CellASIC Corp





DNA-Catalyzed Molecular Biomarker Imaging Amplification (DC-MBIA)

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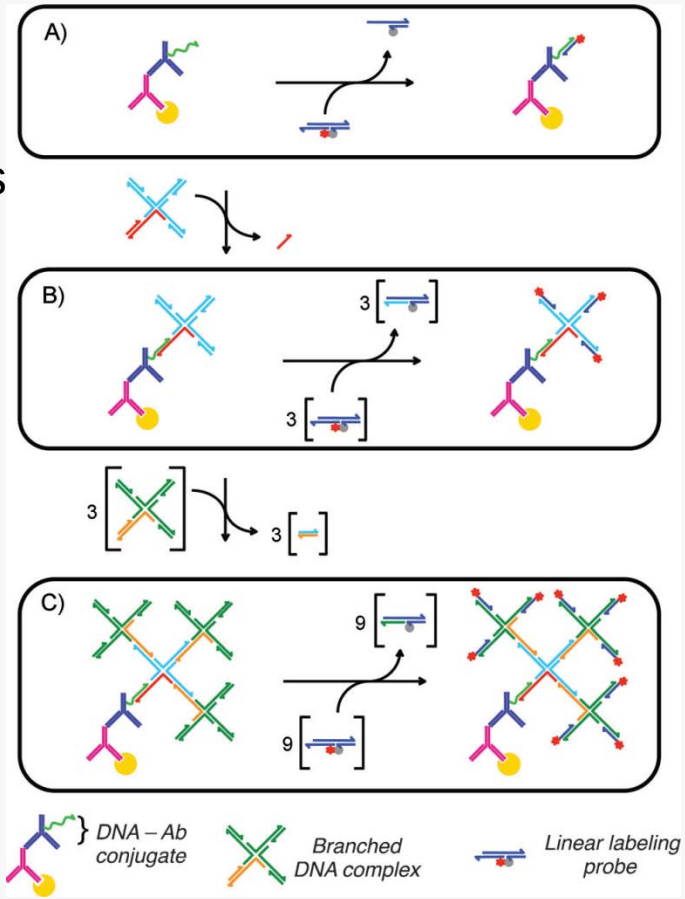
- Dynamic DNA based programmable imaging probes based on strand-displacement chemistry
- Highly multiplexed and reiterative immuno-fluorescence imaging capability for *in situ* studies
- Enzyme-free, isothermal, programmable, and regenerative system uses no harsh chemicals
- Multiplex imaging with 10-min to label and 10-min to erase



Diehl *et al*, ChemBioChem 2012, 13, 2722-8

PI: Michael Diehl, PhD
Asst. Professor of Bioeng/Chemistry
Rice University

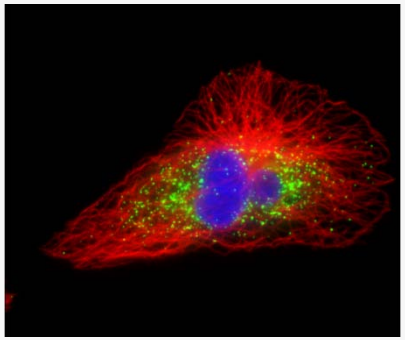


Image from http://diehllab.rice.edu

NanoTrap® Biomarker Discovery Platform

INNOVATIVE MOLECULAR ANALYSIS TECHNOLOGIES

- Porous core shell hydrogel nanoparticles with affinity via “bait chemistry” and size exclusion for selection of biomolecular target
- Allows for immediate preservation and conservation of low-abundance target biomarkers in complex solutions, including whole blood
- Licensed by Shimadzu Scientific [2010] and made available in partnership with Ceres Nanosciences and Nonlinear Dynamics

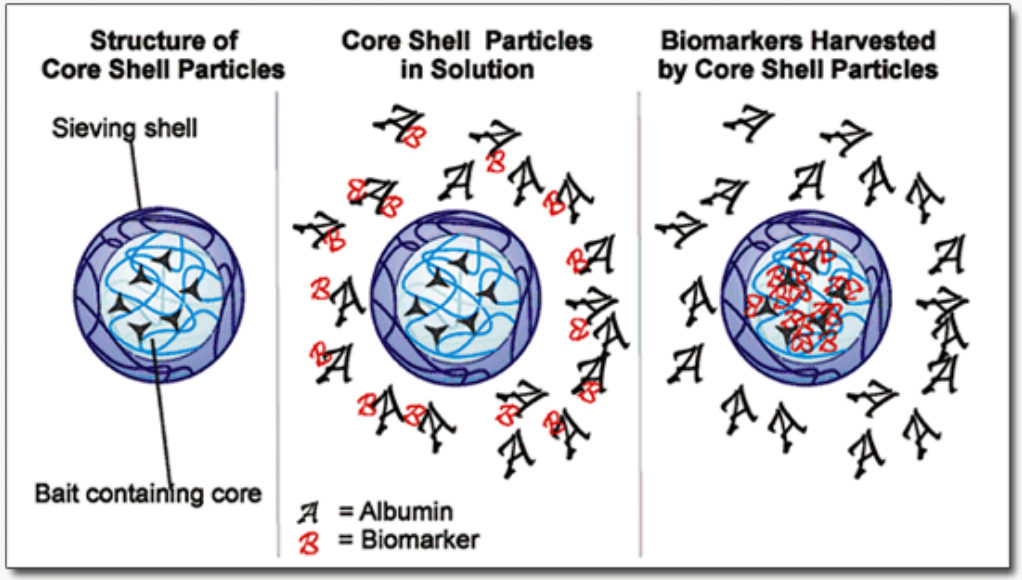
GEORGE MASON UNIVERSITY

SHIMADZU

nonlinear DYNAMICS

CERES NANO

PI: Lance Liotta, MD, PhD
Co-Director, Center for Applied Proteomics and Molecular Medicine
George Mason University



Active IMAT Funding Opportunities

INNOVATIVE MOLECULAR ANALYSIS TECHNOLOGIES

Early-Stage Innovative Molecular Analysis Technology Development for Cancer Research [R21] **RFA-CA13-001**
Advanced Development and Validation of Emerging Molecular Analysis Technologies for Cancer Research [R33] **RFA-CA13-002**
Innovative Technologies for Cancer-Relevant Biospecimen Sciences [R21] **RFA-CA13-003**
Advanced Development and Validation of Emerging Technologies for Cancer-Relevant Biospecimen Sciences [R33] **RFA-CA13-004**

Unique Attributes of IMAT Program

INNOVATIVE MOLECULAR ANALYSIS TECHNOLOGIES

- Emphasis on ***innovative technology with transformative potential*** (*i.e.* high-risk, high-impact)
  - Focus on technology development (*NOT hypothesis-driven research*)
- ***Milestone-based*** R21 applications that *quantitatively* assess the performance capacities of the technology (such as specificity, sensitivity, and speed) and characterize the improvement over state-of-the-art
- 100% ***investigator-initiated*** research grants

Non-responsive applications

INNOVATIVE MOLECULAR ANALYSIS TECHNOLOGIES

- Projects focused on a biological or clinical hypothesis for which the novelty resides in the biological or clinical question being pursued (i.e. traditional biological-hypothesis driven research);
- Projects that propose to use existing technologies (for which proof of concept has already been obtained) that may be ready for the targeted applications without substantial further developmental efforts;
- Projects that propose to develop only incremental technical advances to existing technologies projects that will have low potential for transforming cancer research;
- Technologies for whole-body or *in vivo* imaging methods;
- Projects involving clinical trials or toxicology studies;
- Projects focused on biomarker discovery or biomarker validation;
- Projects focused on development of specific contrast agents;
- Projects focused on development of specific drugs or therapies;
- Projects focused primarily on software/informatics solutions, database development, data mining, statistical tools, and computational/mathematical modeling (including those applicable to drug and/or patient responses) with the exception of projects which include software development for embedding in new devices or limited amounts of computational efforts as might be needed to develop new devices or methods;
- Applications that may have appropriate scientific scope but do not include the required specific components (Statement of Impact and Quantitative Milestones) will also be considered non-responsive to this FOA and will not be reviewed.

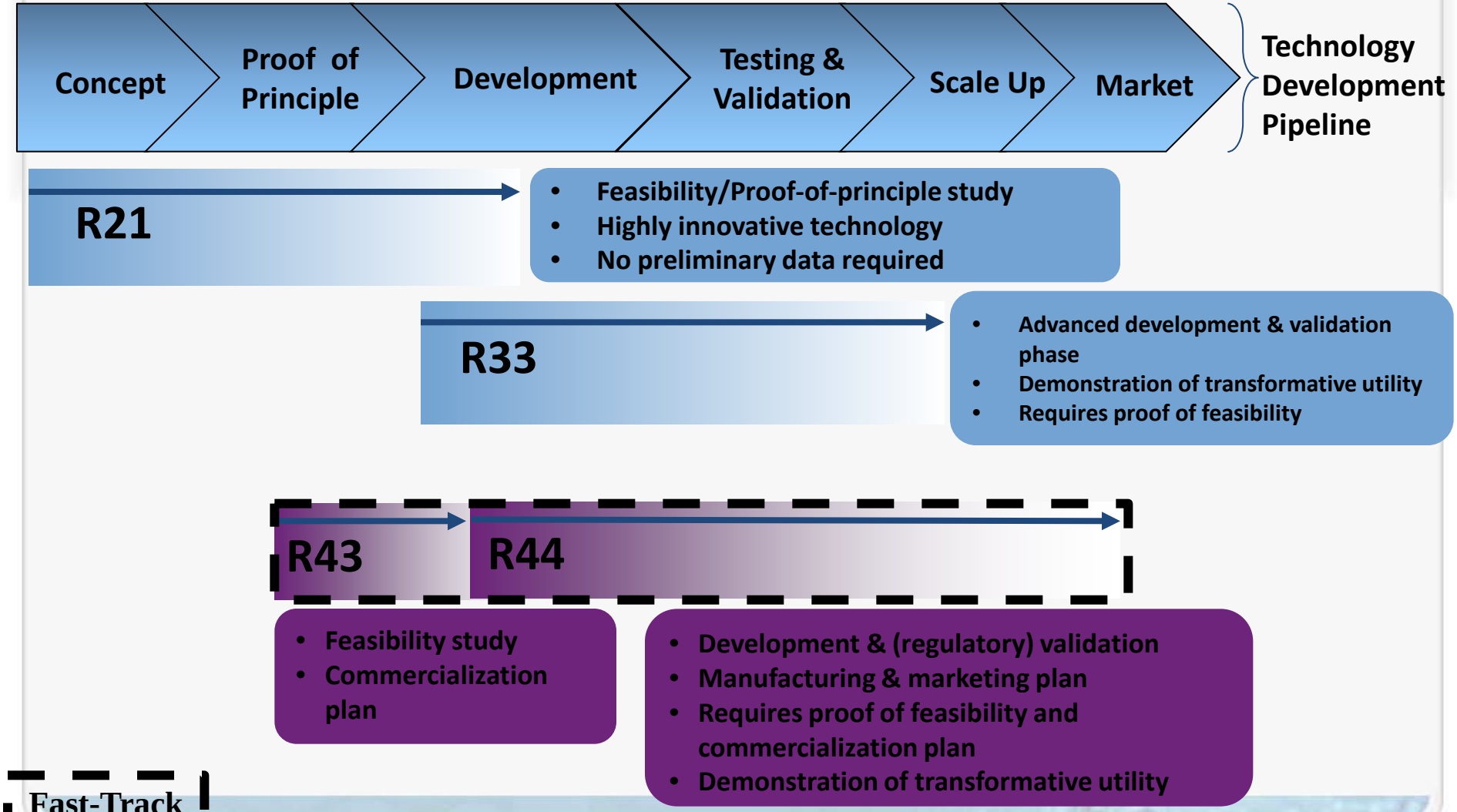
Application Information

INNOVATIVE MOLECULAR ANALYSIS TECHNOLOGIES

Funding Instrument	R21 & R33 Grants
Application Types Allowed	New Resubmission
Award Budget	R21: Direct costs are limited to $200,000 in any single year, with no more than $500,000 in all direct costs over a 3-year period R33: Direct costs are limited to $300,000 per year, and $900,000 in all direct costs over a 3-year period. Application budgets must reflect actual needs of the proposed project
Award Project Period	The total project period is allowed for up to, but may not exceed, 3 years for all awards
Letter of Intent Due Date	April 20, 2013; August 20, 2013
Application Due Date(s)	May 20, 2013; September 20, 2013, by 5:00 PM local time of applicant organization.
Earliest Start Date(s)	April 2014; July 2014

Coming soon?
IMAT-SBIR Awards

INNOVATIVE MOLECULAR ANALYSIS TECHNOLOGIES



Opportunities

INNOVATIVE MOLECULAR ANALYSIS TECHNOLOGIES

- CSSI:http://cssi.cancer.gov/resources-current_funding.asp
- Informatics Technologies for Cancer Research: http://itcr.cancer.gov
- Small-businesses: http://sbir.cancer.gov/funding/
- NCI:http://www.cancer.gov/researchandfunding/funding/announcements

National Cancer Institute

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Thank You!

Questions?

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