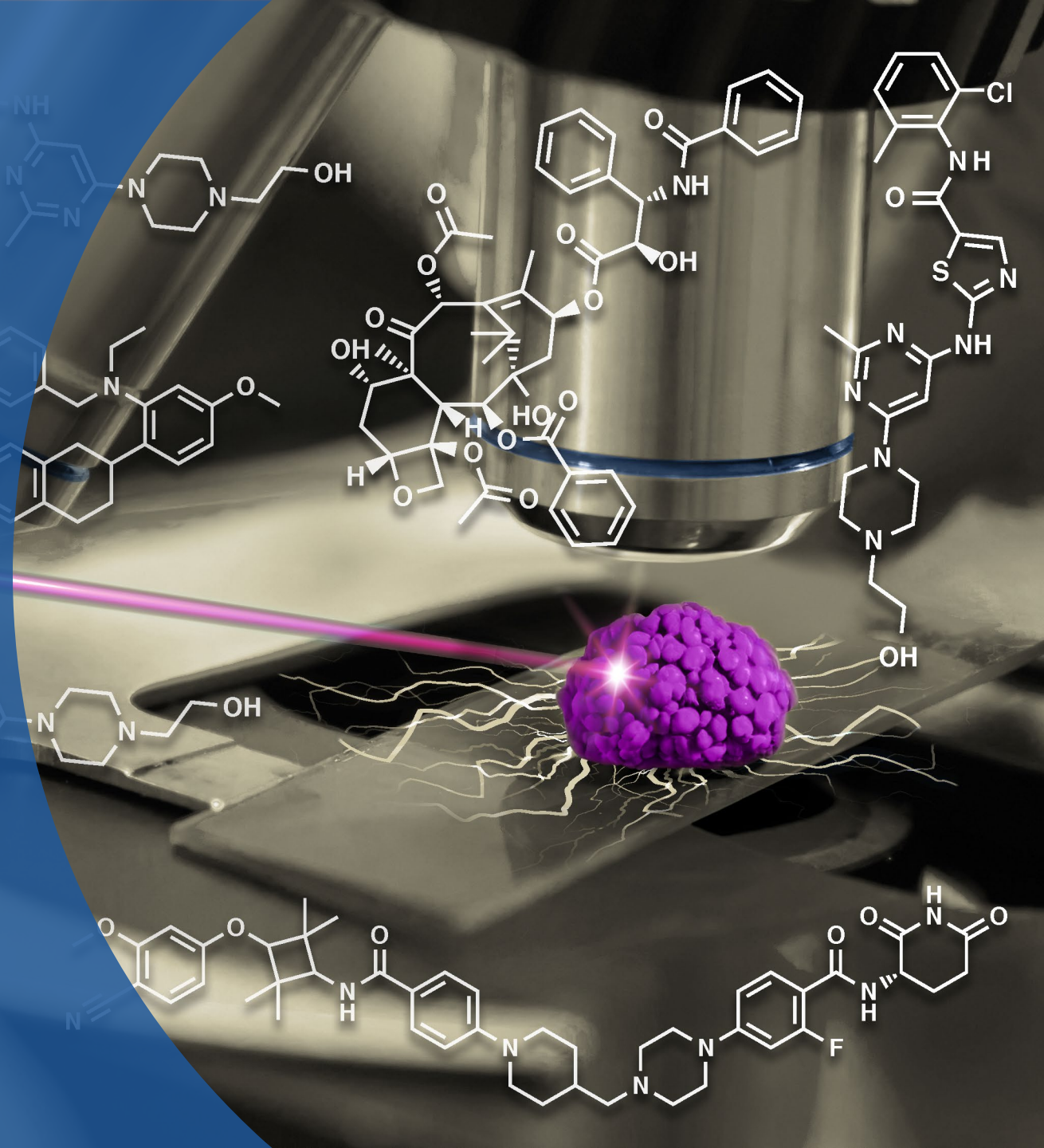


Biotechnology, Imaging & Drug Development (BIDD)

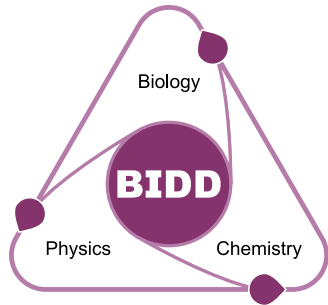
ANAND GANESAN, MD, PHD
BRIAN PAEGEL, PHD
XIAOYU SHI, PHD

EAB 2025

MARCH 14, 2025



Objective & Specific Aims (Proposed for Renewal 2026)



OBJECTIVE

Assemble multidisciplinary scientific teams that utilize novel computational, chemical and engineering-based approaches to detect, diagnose, and treat cancer

AIMS

1

Advancing Cancer Diagnostics

Engineer bioanalytical and biotechnology devices that use chemical probes, nanoparticles or engineered cells to improve early detection, detect early recurrence, or develop better treatments for cancer

2

Innovative Cancer Imaging

Develop biophotonic and multi-modality imaging technologies that facilitate the early detection of cancer and aid in its treatment through iterative, machine learning-based approaches

3

Targeted Cancer Therapies

Synthesize small molecules, antibodies, and immunotherapeutics for the treatment of cancer through world-class expertise in chemistry and protein engineering

4

Concept to Trials

Translate CFCCC developed drugs and devices from concept to IND-enabling studies to clinical trials

Program Leadership



Anand Ganesan, MD, PhD
Co-Leader

EXPERTISE

- Professor of Dermatology, Biological Chemistry, and Surgery
- Physician-scientist
- Research Interests: melanocyte biology, melanoma, systems biology, signal transduction, drug development

ROLES

- Provide translational expertise to interdisciplinary teams focused on device development
- Expertise in imaging, single-cell sequencing, and cell biology
- CRTEC Liaison



Brian Paegel, PhD
Co-Leader

EXPERTISE

- Professor of Pharmaceutical Sciences, Chemistry, and BME
- Research Interests: drug discovery, miniaturization, microfluidics, combinatorial chemistry, DNA-encoded libraries

ROLES

- Provide chemistry/structural biology expertise to interdisciplinary teams
- Expertise in drug screening and IND-enabling studies
- Provide extensive experience starting spinout companies



Xiaoyu Shi, PhD
Assistant Program Leader

EXPERTISE

- Assistant Professor of Developmental & Cell Biology, Chemistry, and BME
- Research Interests: super-resolution microscopy, structural biology, single-cell spatial omics, cancer cell biology, neurodegeneration

ROLES

- Provide bioimaging and single-cell proteomics expertise
- PED Liaison

SHARED RESPONSIBILITY

- Guide interdisciplinary team assembly and identify pilot award and other funding opportunities
- Provide technology expertise and identify core resources to accelerate discovery
- Position technologies, identify unmet needs, and align projects to catchment area priorities with COE
- Advise on startup creation and fundraising, coach new founders
- Provide mentorship to junior investigators and identify career development opportunities

Response to EAB Review



STRENGTHS (2021 NIH Summary Statement)

“ The strengths...are the impactful work in basic science focused on drug discovery, imaging and bioengineering. Some of the accomplishments are highly impactful and very novel”

CRITIQUE

RESPONSE

Strategic Recruitment: in immunomodulation

- New members: cell-based immunotherapy; NK and T cell immunotherapy

Program Integration: Connect technology-driven Aims 1 and 2 with chemistry-driven Aim 3. Show how the systems/methods developed in Aims 1 and 2 facilitated drug discovery

- New tumor angiogenesis inhibitors, UCI IP: Vascularized microtumors (VMTS) and vascular imaging with NLOM lab expertise (Aims 1 and 2)
- DOD Team Science Award: MPM and AI based cell segmentation methods to measure immunotherapy response (Aims 2 and 3)

Community Engagement: Align program activities with COE to support cancer screening

- With community input, Phage Tech, clinically tested bladder cancer screening tool, secured funding
- Conducted community engagement studios to align GlyTR technologies to community needs
- CFCCC Cancer Health Disparities Award examining melanoma disparities in Hispanic/Latino populations with input from COE. Two grants submitted in 2024

Emphasize Intra-Programmatic Collaboration: to increase joint publications, which are very low (8%)

- Fostering partnerships between immunology–imaging (DOD team science, STING agonist project) and drug development–biotech (manuscript in revision preprint)

Impact on Training: Pursue a T32 grant

- MPI K12 grant for translational science, supporting career development for imaging
- IPERT offers training in advanced imaging methods (R25 funded short course)
- T32 NIGMS Pharmacological Sciences submission

Translational Pipeline: Engage investigators early, develop robust processes for monitoring progress, facilitate IND approval (at least 2), leverage UCI Chem

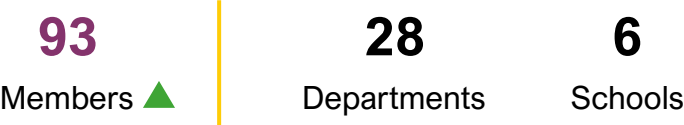
- R01 using VMT devices for therapeutic response prediction
- DOD Team Science involves direct patient imaging
- GlyTR trial design involves direct input from AD for Translational Science Dayyani and the Stern Center Early CFCCC funding from first Anti-Cancer Challenge (2017) to recent \$4.6M CIRM (2025)

Startup Showcase: Capture launch of start-up (Aim 4), highlight impact, and CFCCC role in creation


- Startup dashboard highlighting technology development efforts

Program Metrics CY2024


MEMBERSHIP




Member Highlight




Eng, MD
Nature Comm (PMC11283463), in catchment area priority population



Lee, PhD
Imaging of live suspension cells PNAS (PMC11536124)

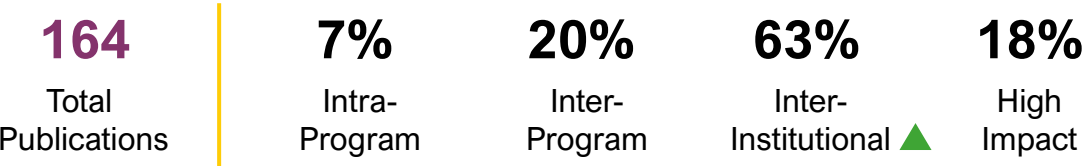


Shah, PhD
Awarded NCI R21 for digital histopathology with deep learning for cancer diagnosis



Xiang, PhD
Multi-PI award NCI U01 for 3D In vivo dosimetry for FLASH proton therapy

PUBLICATIONS



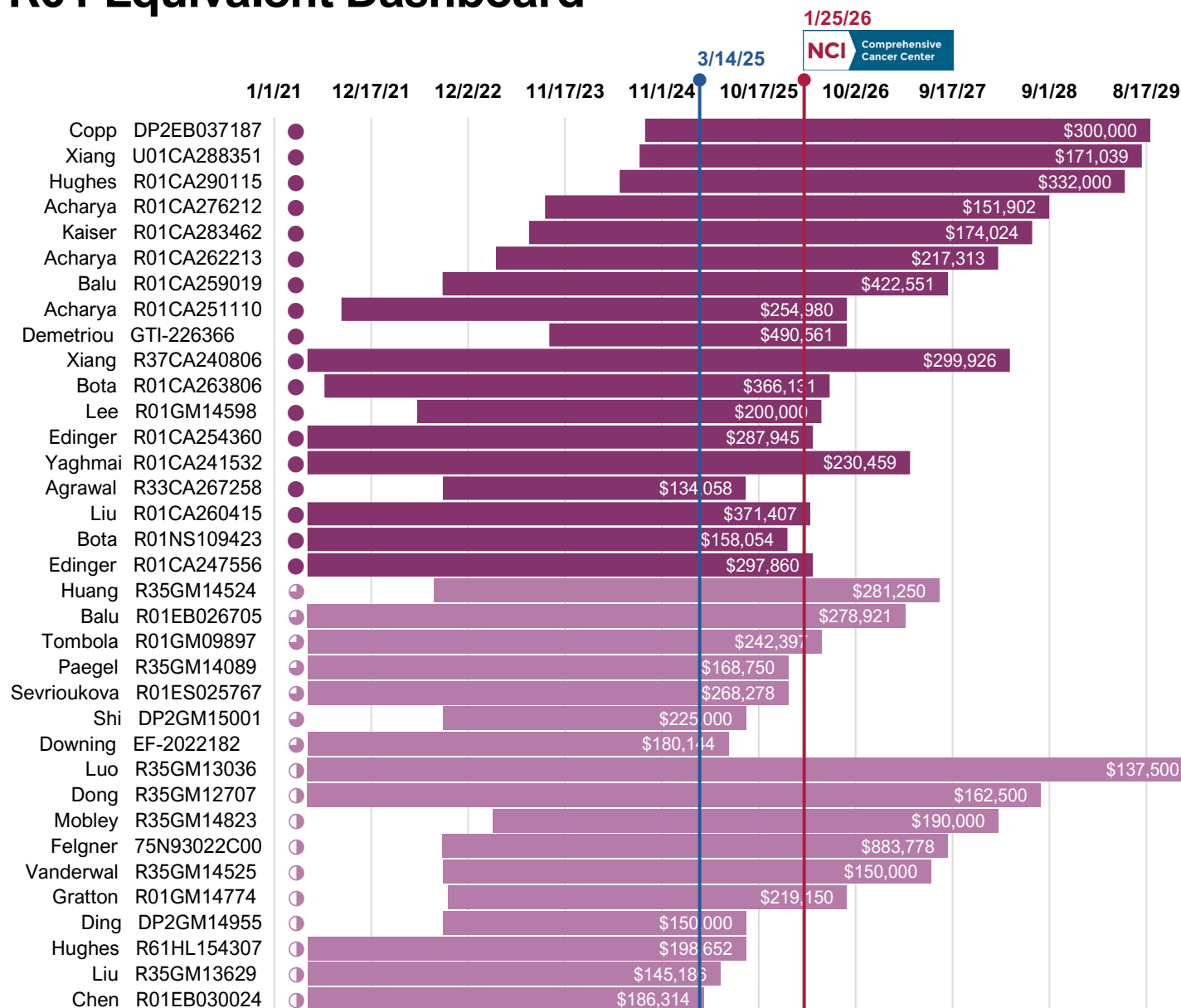
FUNDING 2/28/2025

69 Funded Projects	DIRECT COSTS	
	NCI ▲	\$5,257,858
	Other NIH	\$5,898,965
	Other Peer-Reviewed	\$851,955
	Total Peer-Reviewed	\$12,008,778

CLINICAL TRIALS

	OPEN TO ACCRUAL	ACCRUAL
Treatment Trials	220 ▲	292 ▲
Interventional Trials (including treatment)	228 ▲	465
Non-Interventional Clinical Studies	6	18

R01 Equivalent Dashboard



Cancer Relevance

Full	Projects	18	PIs	13
100%	<ul style="list-style-type: none"> Funded by NIH-recognized peer-reviewed funding agencies that exclusively fund cancer research DoD grants directed at specific cancers "Cancer" in RCDC Cancer terms in title, abstract, etc Applicability to cancer is clearly described in the abstract and public health statement All the grant is cancer related 			
Partial	Projects	17	PIs	17
75%	<ul style="list-style-type: none"> Cancer terms in title, abstract, etc. Cancer terms are not in title, abstract, etc. but the grant has significant cancer-related components Only minor components of the grant are not directly linked to cancer 			
50%	<ul style="list-style-type: none"> Cancer terms are not in title, abstract, etc. but the subject on which grant focuses is used for cancer research, diagnosis or treatment Grant funds study of disease or risk factors that can lead to cancer 			

Inter-Programmatic Activity & Collaboration



Award on **melanoma disparities** to collaboration with Shiu (**SPT**), a K awardee physician-scientist, Edwards (**CC**) and Ganesan (**BIDD**)

Identified melanoma in Hispanic/Latino population as a disparity in catchment area and established a collaboration with Loma Linda to expand number of cases

Resulted in **two grant applications** submitted (Shiu: Damon Runyon; Ganesan: R01). **Developing new methods to decipher tumor-TME signaling**



DoD Team Science Award to Marangoni (**SPT**), Tinoco (**BIDD**), and Ganesan (**BIDD**) to develop a bedside imaging device to measure ITX response

Cancer Cell publication describing initial findings which identifies signaling pathways that drive ITX resistance (Nie (**SPT**), Marangoni (**BIDD**) (PMC11285091)

Collaborative research with Chang (**BIDD**) and Marangoni (**SPT**) toward machine learning-based immune cell profiling at the bedside



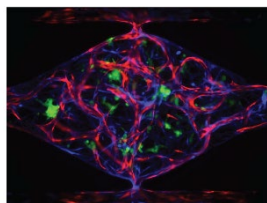
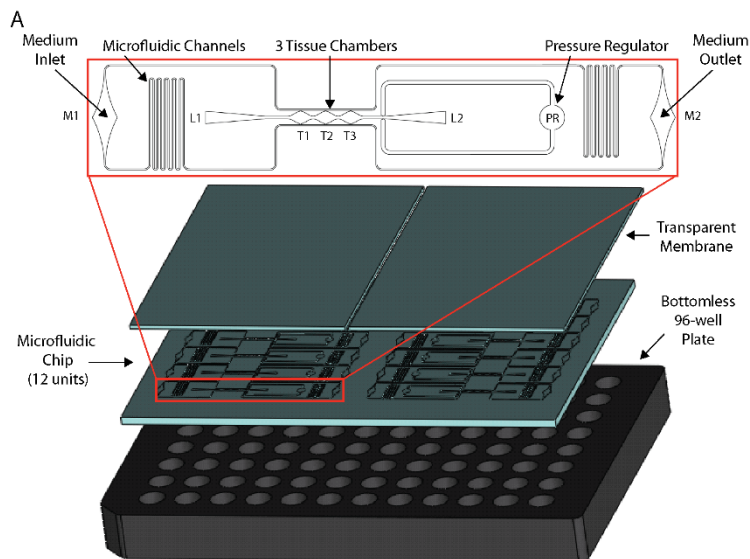
NCI R01 and IIT for vascularized microtumor (VMT) device to examine role of exosomes in peritoneal cancer metastasis with Senthil (**BIDD**), Hughes (**BIDD**)

Therapeutic response to treatment IIT from Zell (**CC**) and Hughes (**BIDD**) seeks to examine if patient tumor tissue can be grown on the VMT (UCI 15-20)

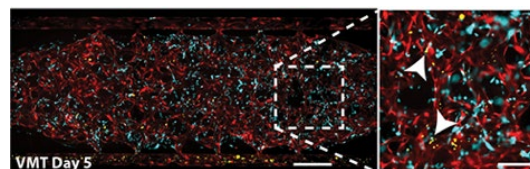
Predicting immunotherapy response IIT from Keshava (**CC**) and Hughes (**BIDD**) seeks to predict immunotherapy response in lung CA (UCI 20-118)

Using VMTs to Study Rare Cancer & Identify Cancer Treatments

BIDD Bioanalytics Help Identify Better Cancer Therapies

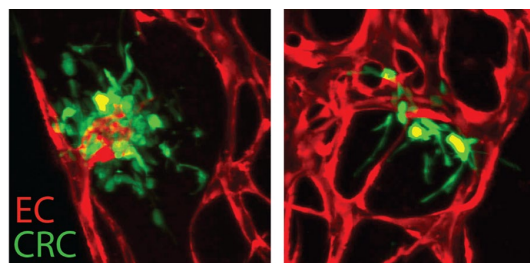


VMT device, developed by Lee and Hughes, measures tumor microenvironmental Interactions (vasculature, immune cells)



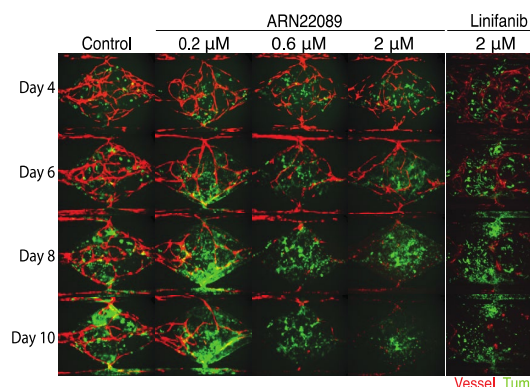
T cell perfusion

Vessels, Tumor, 70 kD dextran, T cells



Hughes and Senthil
Peritoneal Carcinomatosis
Metastasis NCI R01, IIT
PMC11050739

Hughes and Zell
Colon Cancer
IIT
PMC10593408



Hughes and Ganesan
Melanoma
NCI R01
PMC9127750



CATCHMENT AREA RELEVANCE



Investigators



Ganesan, MD, PhD



Hughes, PhD



Senthil, MD



Zell, PhD

CFCCC Investments

SHARED RESOURCE



DOT



FUNDING

2021



PROGRAMS



Outcomes

PUBLICATION

Jahid, Cell Rep, 2022, PMC9127750

Hachey, J Vis Exp, 2023, PMC11050739

Hachey, Transl Res, 2023, PMC10593408

GRANTS R01CA244571 | R01CA290115

UCI-15-20: Tumor in Chip Model

UCI-23-184: Peritoneal Carcinomatosis

IMPACT

Match cancer therapies to patients who will benefit most and improve treatment outcomes

Flash Radiotherapy New Devices for Delivery & Dose Detection

Creating Tools for Safe, Targeted Delivery of Radiotherapy



CATCHMENT AREA RELEVANCE



Investigators



Barty, PhD



Xiang, PhD



Limoli, PhD

CFCCC Investments

SHARED RESOURCE



DOT



FUNDING

2020
2022
2024 A1

PROGRAMS



Outcomes

PUBLICATION

Xiang, Med Phys, 2024, PMC11530303

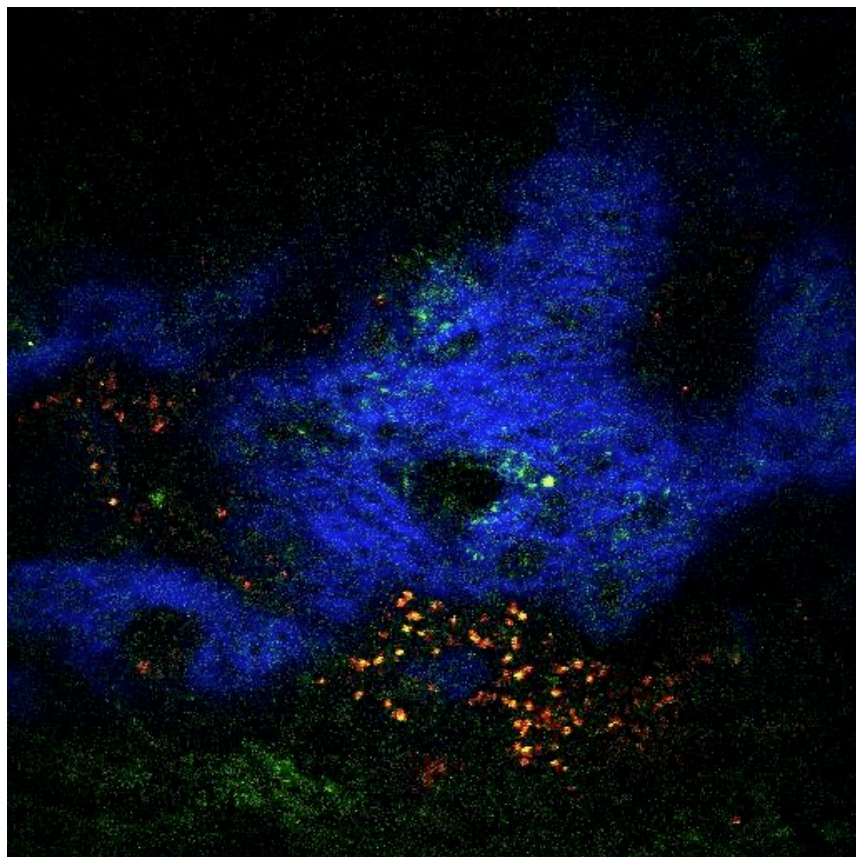
GRANTS U01CA288351
P01CA244091*

*Supported research

Using Advanced Imaging & AI to Measure Immunotherapy Efficacy

A Team Science Approach to Addressing a Catchment Area Problem

Immune cell movement in Human Skin



Immune Cell Movement in Mouse Skin



Atlas of immune cell behaviors before/after
checkpoint blockade



AI to infer the identity of
human cells from shape,
position and motility
behavior

Use human dynamic intravital microscopy to monitor
response to checkpoint immunotherapy
noninvasively



CATCHMENT AREA RELEVANCE



Investigators



Marangoni, PhD



Tinoco, PhD



Ganesan, MD, PhD



Balu, PhD

CFCCC Investments

SHARED RESOURCE



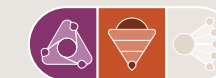
DOT



FUNDING

2017 ACS
2019
2020, COE

PROGRAMS



Outcomes

PUBLICATION

Viramontes, Front Immunol, 2022, PMC9237324
Geels, Cancer Cell, 2024, PMC11285091

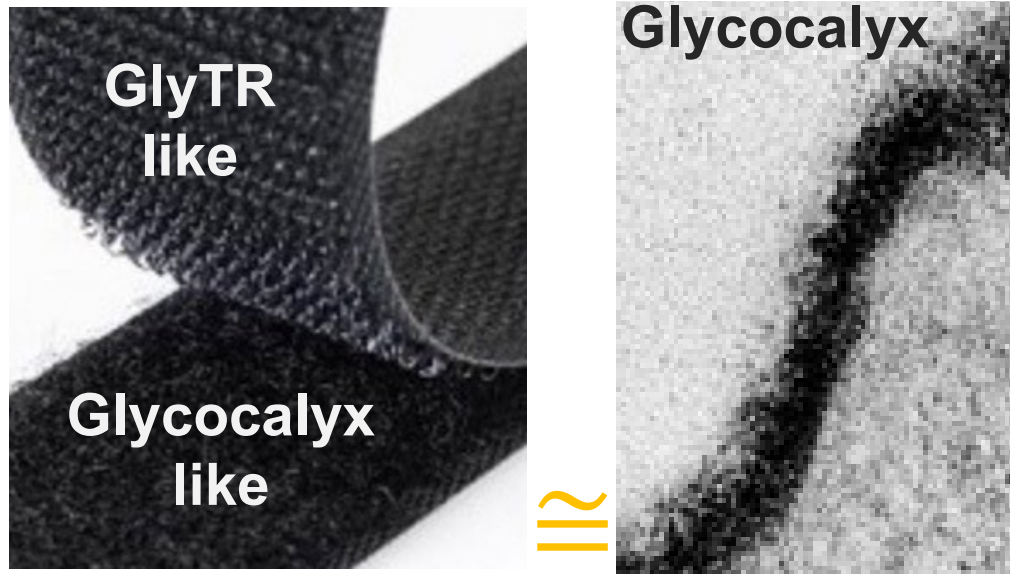
GRANTS DoD Team Science Award
HT94252311024

IMPACT

Identify patients who are not responding to immunotherapy to provide optimally efficacious treatment

Developing More Selective Immunotherapies for Cancer

GlyTR Develops the Next Generation of Immunotherapies

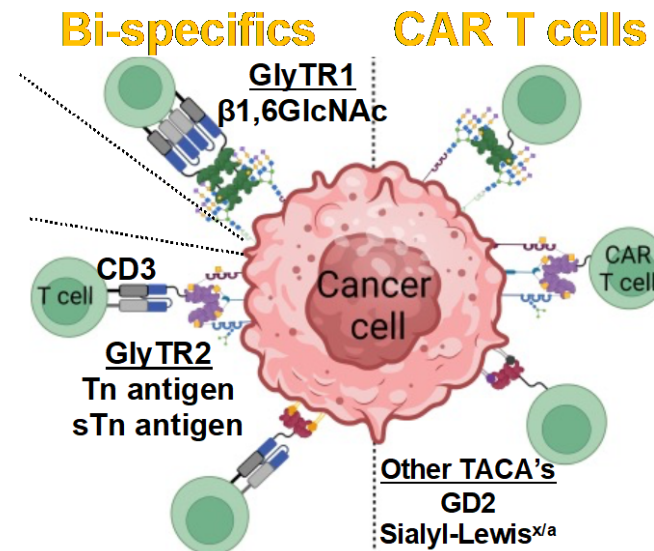


High avidity Velcro-like binding

GlyTR1-Bi-specific is in late-stage pre-clinical development:

- NCI (NExT) performing IND enabling studies
- UC Irvine: Phase 1 basket trial in refractory solid cancer

GlyTR2 CAR T cells: clinical candidate finalized → IND → basket trial



CATCHMENT AREA RELEVANCE



Investigators



Demetriou, MD, PhD

CFCCC Investments

SHARED RESOURCE



DOT



FUNDING

2017
2023

PROGRAMS



Outcomes

PUBLICATION

Cell, 2025, under review

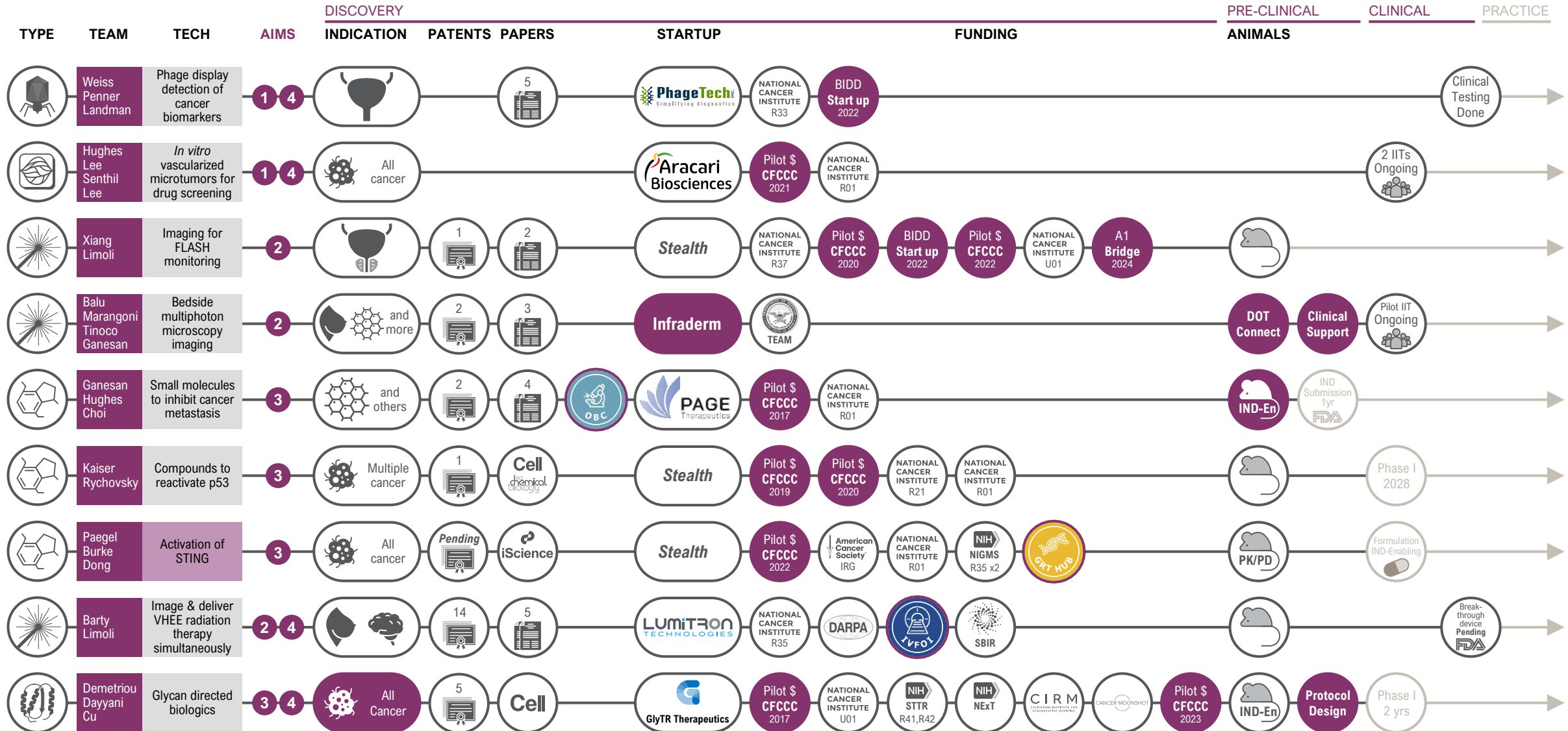
GRANTS

2025 CIRM
R42CA285234

IMPACT

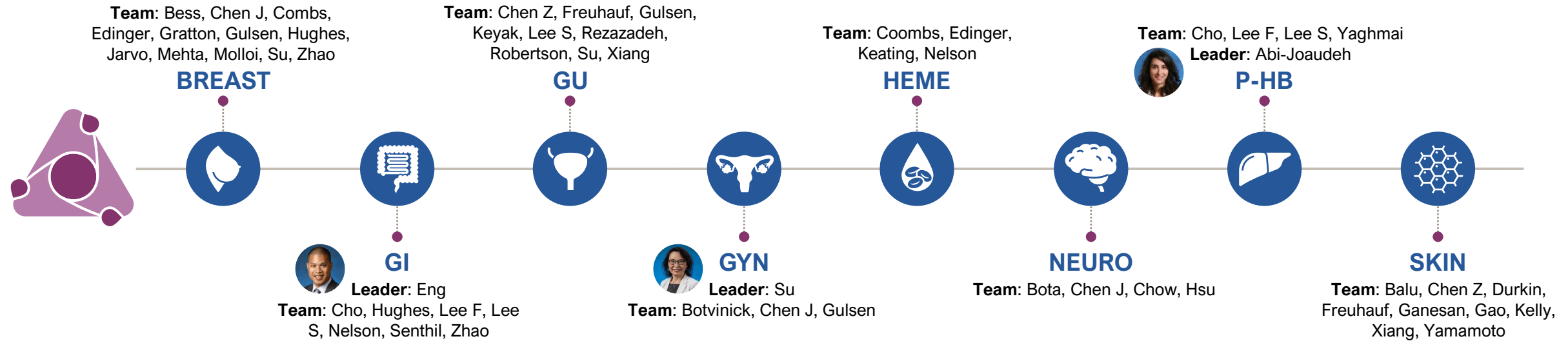
Identify a more selective cancer immunotherapy that is broadly applicable to many cancers

Translational Pipeline Dashboard



BIDD-supported step

Disease-Oriented Team Interactions



NEW EXTRAMURAL FUNDING

- Xiang (U01CA288351) 3D in vivo dosimetry for FLASH radiotherapy
- Senthil (R01CA290115) A vascularized microphysiological system (MPS) platform for modeling peritoneal carcinomatosis.
- Huang (R01CA290875) Structural surfaceomics to probe conformation-selective immunotherapy targets

SHARED RESOURCES USED



CLINICAL TRIALS OPENED

- 20 trials opened in 2024, 72 patients accrued
- Phase II cholangiocarcinoma (NCT06050252), catchment area concern
- Phase II CAR-T cell therapy in multiple myeloma (NCT06179888)
- UCI IIT- intraoperative ICG use in prostate cancer (NCT06446648)

Impact of Research on the Catchment Area

PRIORITY CANCER

GRANT/PUBLICATION

PRIORITY POPULATION



Stomach

STOPGAP Trial (Dayyani, Senthil). Stomach cancer has high incidence of peritoneal metastasis (R01CA290115 Hughes, Senthil)



Asian

Stomach cancer is of high incidence particularly in Asian population in OC. Seek to develop new treatments for it and its peritoneal metastasis



Lung

Lung Cancer Screening (Keshava). Screen non-smoker or light smoker family members of lung cancer patients (CT scanning and cfDNA)



Asian

Lung cancer has increasing incidence and mortality in Asian and Hispanic/Latino males



H/Lat



Melanoma

Ganesan, Marangoni, Balu, Tinoco: Cancer Cell, 2024 (PMC11285091) identifies signaling pathways that drive ITX resistance



Melanoma is a high incidence cancer in our area, and only 50% of patients respond to immunotherapy



Melanoma

Understand why melanoma presents at a later stage in Hispanic patients. Shiu (CFCCC Cancer Health Disparities Pilot Award; Damon Runyon Clinical Investigator Award; R01 submitted; CDA submitted)



H/Lat

California has a large Hispanic/Latino population and the tumors in these individuals have a worse prognosis

Bidirectional Value Added: CFCCC to BIDD

INVESTMENTS

\$779,420 Annual Investment (CY024)

Investment (2021-Present)

Recruitment/Retention	\$1,194,073
Pilot Funding	\$941,967
Salary support	\$668,332
IIT support (Stern)	\$493,835
SR subsidy and rebates	\$15,233
Other	\$1,952
Total	\$3,315,391

Selected New Faculty (2021-Present)



Eng, MD



Trader, PhD



Zhang, MD, PhD

SHARED RESOURCES

Use by BIDD Members



3%



26%



16%



N/A



22% ▲



4%



8%



1% ▲

Resulting Publications (CY2024)

31

Total Publications
with SRs

7

High
Impact

HIGHLIGHTS

- Funded BIDD startup creator event that helped initiate the F2F forum for startup founders
- Mass Spectrometry Shared Resource (*developing*) investment will help with drug development
- Recruited two new faculty members to enhance immunotherapy expertise in 2024
- A majority of the technology in BIDD startups was initially funded by CFCCC pilot awards
- Assistance with clinical needs assessment and protocol design for clinical trials with the Stern Center

Bidirectional Value Added: BIDD to CFCCC (CY2024)

BY LEADERSHIP



GANESAN

- Established Physician Scientist Training Program
- PI of ICTS K12
- MPI of Skin P30 and Skin T32



PAEGEL

- Director, Center for Neurotherapeutics
- Co-Founder, Initial Therapeutics & Plexium
- UC DCC Consortium



SHI

- Co-Chair, Communication Committee, ACS
- International bioimaging workshops (Uruguay, Italy)
- Short courses (e.g., LFD)

TO ACTIVITY

Membership

38%

93 of 248

CFCCC members are members of **BIDD**

Publications

33%

164 of 500

CFCCC publications include a **BIDD** author

Funding

31%

70 of 228

CFCCC peer-reviewed grants include **BIDD** PI

\$11.9M

of \$37.97M

CFCCC peer-reviewed grants annual direct costs include **BIDD** PI

HIGHLIGHTS

- Established a training pipeline for skin cancer research and translational science research
- Drug screening and pre-IND expertise to facilitate all phases of drug development
- Expertise in bioimaging and spatial proteomics to help with diagnostics and biomarker identification
- Startup experience of two project leaders to help with startup development
- Broad technology expertise of leaders to lend a level of technical expertise

Future Plans (Proposed for Renewal 2026)

AIMS

1

Advancing Diagnostics

- Leverage IITs to transition technologies into clinical trials for diagnostic approval
- Enhance the activities in nanotherapeutic development, through the expertise of our new program leader (Shi)

2

Innovative Imaging

- Catalog immune cell behaviors in mice and human skin to predict immunotherapy response
- Develop and test Lumitron in animal models
- Advance photoacoustic detection to measure flash radiotherapy dosing
- Leverage iPERT R25 and K12 training in device development and translation to develop more clinician-scientists

3

Targeted Therapies

- Leverage the Center for Neurotherapeutics to develop new drug screening approaches and expand oncology portfolio
- Grow new biological mass spectrometry shared resource for drug development
- Leverage the new GMP facility for cell and gene therapy development
- Use the new Falling Leaves Foundation building to recruit immunotherapy experts

4

Concept to Trials

- Build drug metabolism and pharmacokinetics (DMPK) capabilities through School of Pharmacy and Pharmaceutical Sciences
- Establish a clinical trial advisory panel to help startups accelerate clinical discovery
- Move technologies from Page TX and *Stealth* through the IND to trial stage
- Collaborate with UCI Beall Applied Innovation to enhance training for startup founders

Questions?
