

# Division of Cancer Biology: Program Priorities

*Anu Sharman , Ph.D.*

1. *Role of DCB?*
2. *Cancer research supported by DCB*
3. *Emerging topics in cancer biology*

# Divisions within NCI

DCCPS: Division of Cancer Control and Population Sciences

DCP: Division of Cancer Prevention

DCTD: Division of Cancer Treatment and Diagnosis

DCB: Division of Cancer Treatment and Diagnosis

DEA: Division of Extramural Activities

# Division of Cancer Biology

- Provides funds for research that investigates basic cancer biology
- Basic cancer biology research focuses on:
  - Mechanisms of cell growth
  - Transformation of normal cells to cancer cells
  - Metastasis of cancer cells
- The research provides:
  - Building blocks to new treatments
  - Clinical trials
  - Improved understanding of cancer

# Division of Cancer Biology

- Scientific management of ~2000 grants/year
- Facilitates investigator-initiated research
- Conducts workshops and symposiums
- Establishes program priorities
- Communicates with scientists
- Reports on scientific progress

# Division of Cancer Biology

Director: Dan Gallahan

Office of the Director

*Deputy: Shannon Hughes*

Cancer Immunology, Hematology, and Etiology

*Chief: Kevin Howcroft*

Structural Biology & Molecular Applications

*Chief: Jennifer Couch*

DNA & Chromosomal Aberrations

*Chief: Judy Mietz*

Cancer Cell Biology

*Chief: Rihab Yassin*

Tumor Biology & Microenvironment

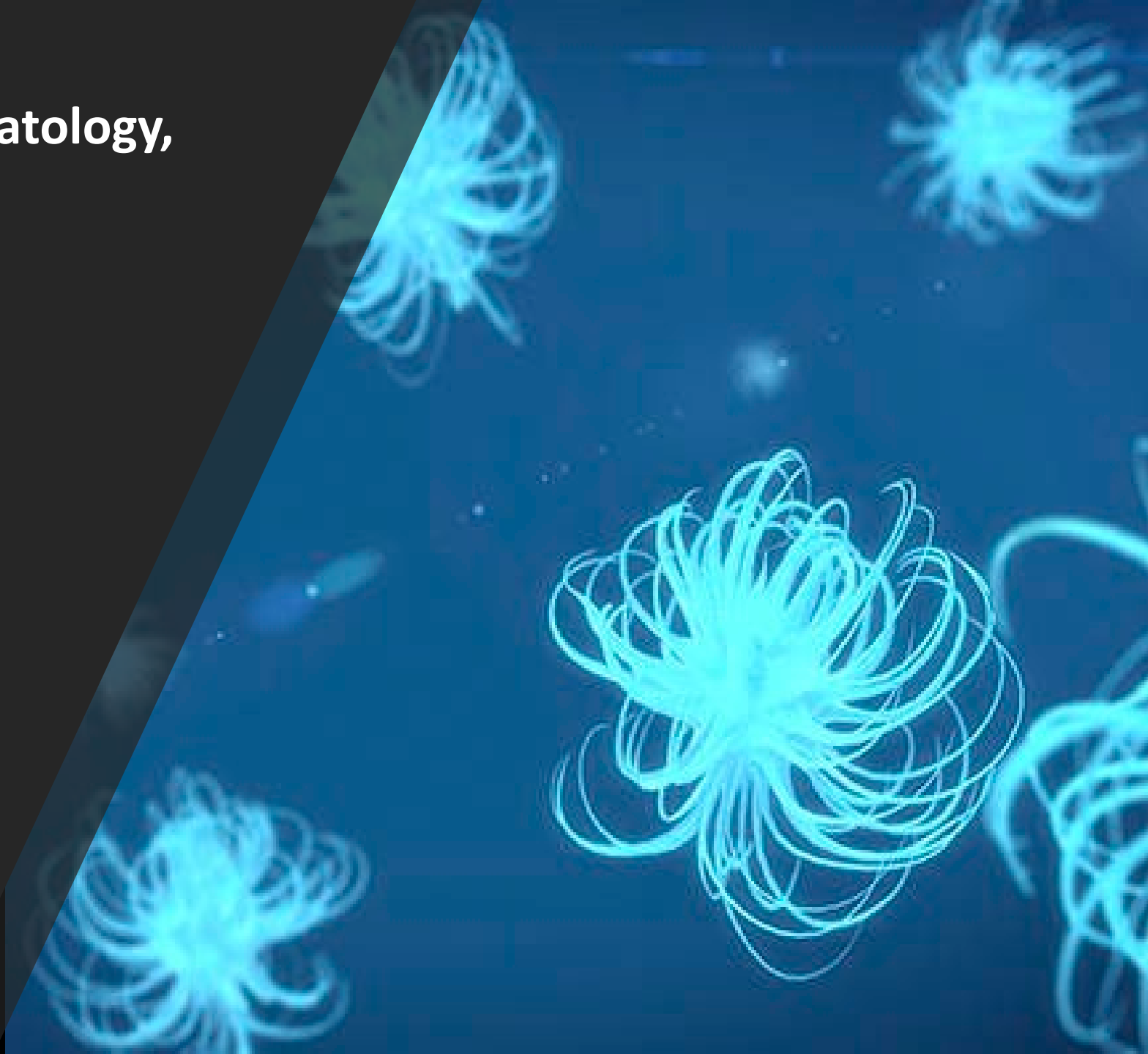
*Chief: Jeff Hildesheim*

Tumor Metastasis

*Chief: Joanna Watson*

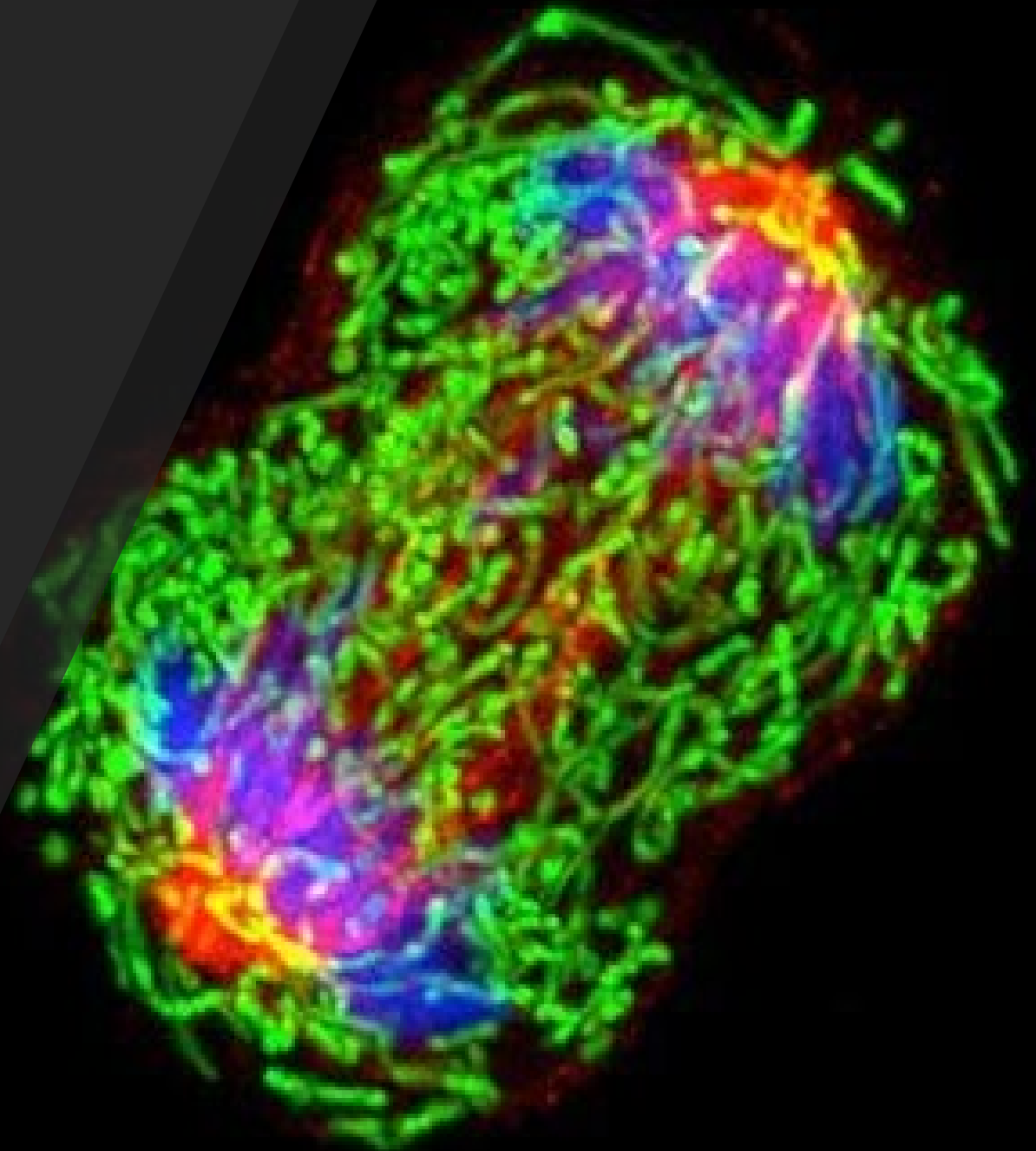
# Cancer Immunology, Hematology, and Etiology Research

- Anti-tumor Immunity
- B and T Lymphoid Malignancies
- Hematopoiesis and Myeloid Malignancies
- Viral Carcinogenesis
- Bacterial Carcinogenesis and the Role of the Microbiome
- Host Predisposing States



# Cancer Cell Biology Research

- Cancer Cell Metabolism
- Cancer Cell Stress Responses
- Organelle Biology
- Cancer Cell Cycle Control
- Post-transcriptional Regulations Influencing Cancer
- Basic Mechanisms of Cell Transformation
- Biospecimen Resources to Support Cancer Biology Research





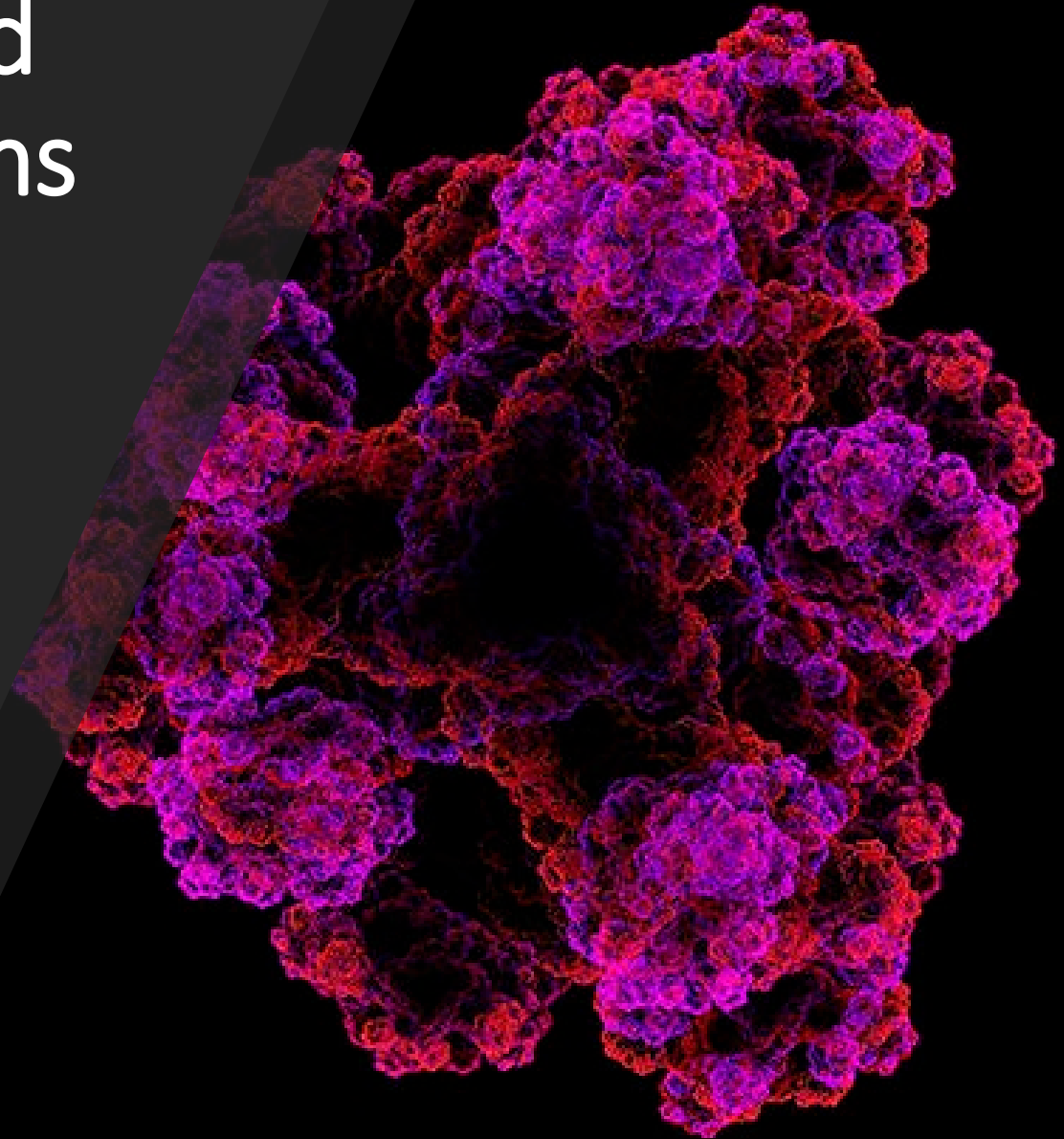
# DNA and Chromosome Aberrations Research

- Gene Regulation and Epigenetics
- Mechanisms of Genomic Instability
- Cancer Genetics
- Mechanisms of DNA Damage and Repair
- Mechanisms of DNA Damage Signaling
- Chemical and Physical Carcinogenesis



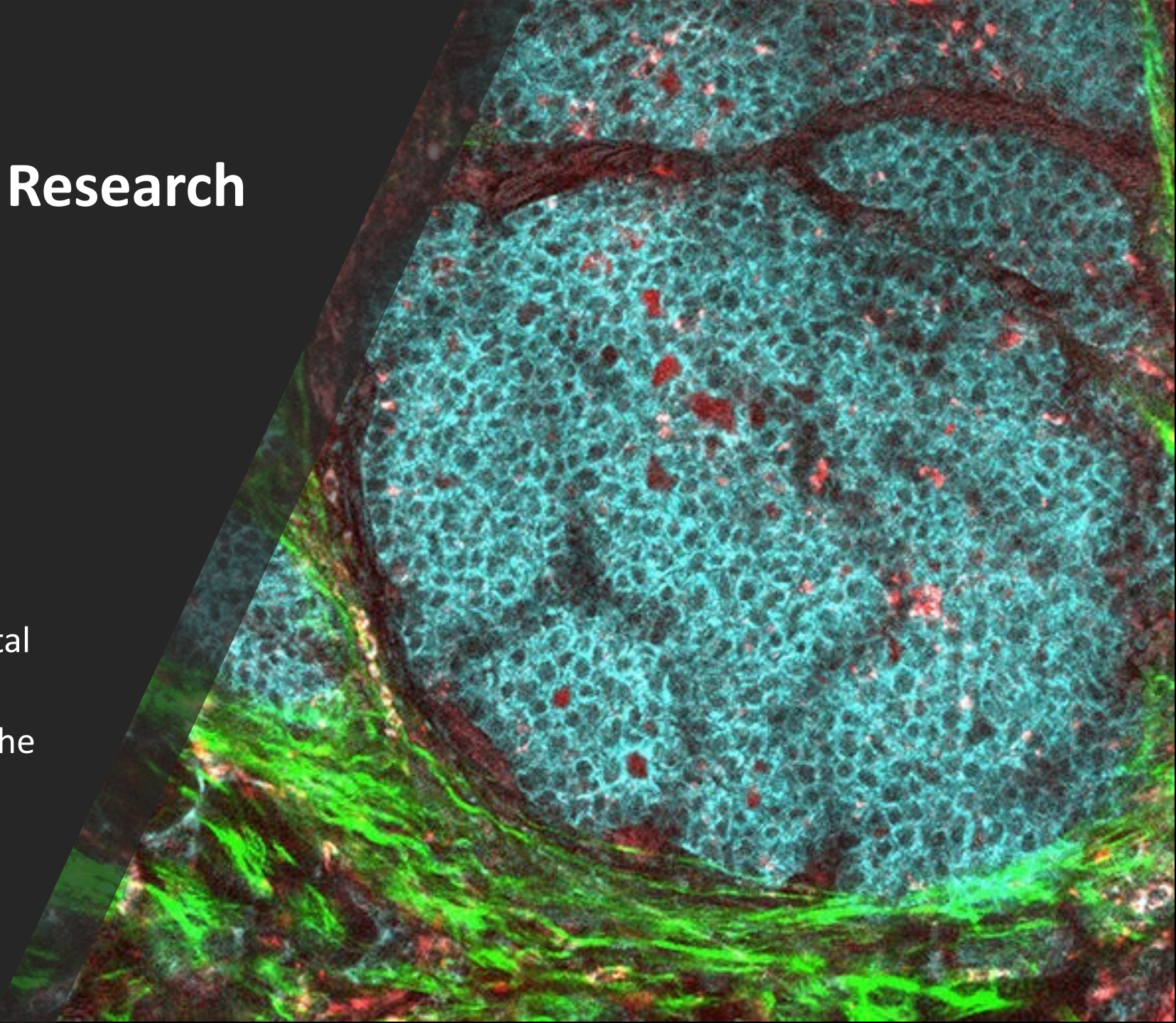
# Structural Biology and Molecular Applications

- Structural and Biophysical Biology
- Molecular and Cellular Applications
- Bioinformatics and Data Science
- Computational Biology, Mathematical Modeling, and Systems Biology
- Bioengineering and Biotechnology



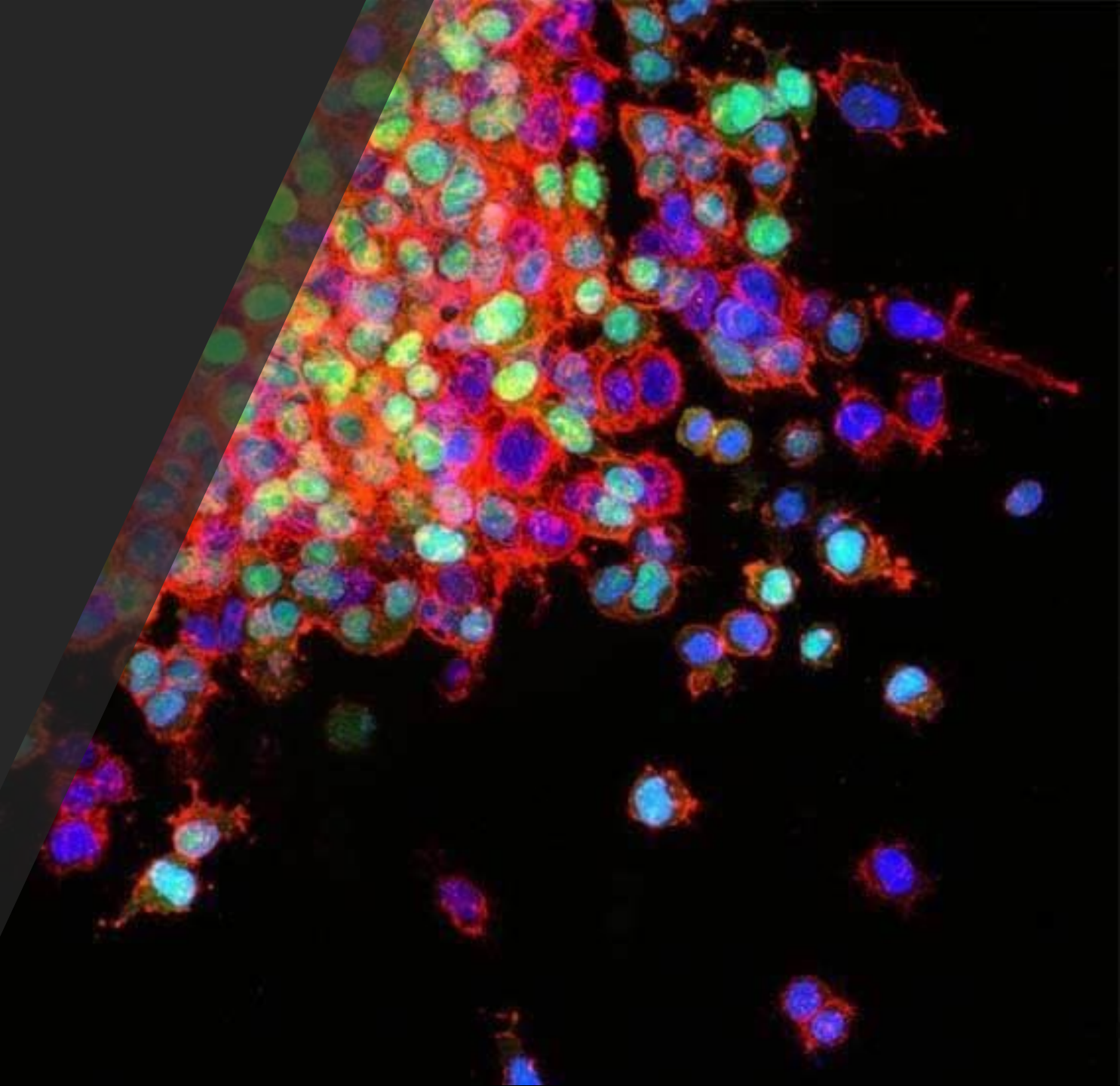
# Tumor Biology and Microenvironment Research

- Tumor and Stromal Cellular Interactions
- Extracellular Matrix and Tumor Dynamics
- Angiogenesis and Lymphangiogenesis
- Tumor Cell Plasticity
- Cellular and Microenvironmental Aging in Tumors
- Metabolic Reprogramming of the Tumor Microenvironment
- Hormonal Signaling and Tumor Progression
- Glycobiology



# Tumor Metastasis Research

- Cellular Invasion and Migration
- Intravasation and Extravasation
- Early Metastatic Dissemination
- The Metastatic Niche and Colonization
- Metastatic Dormancy



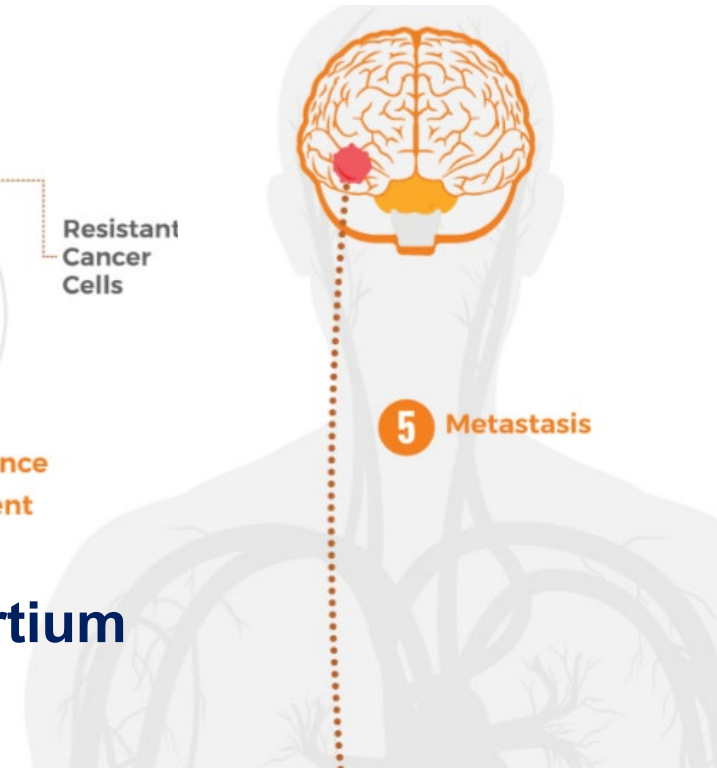
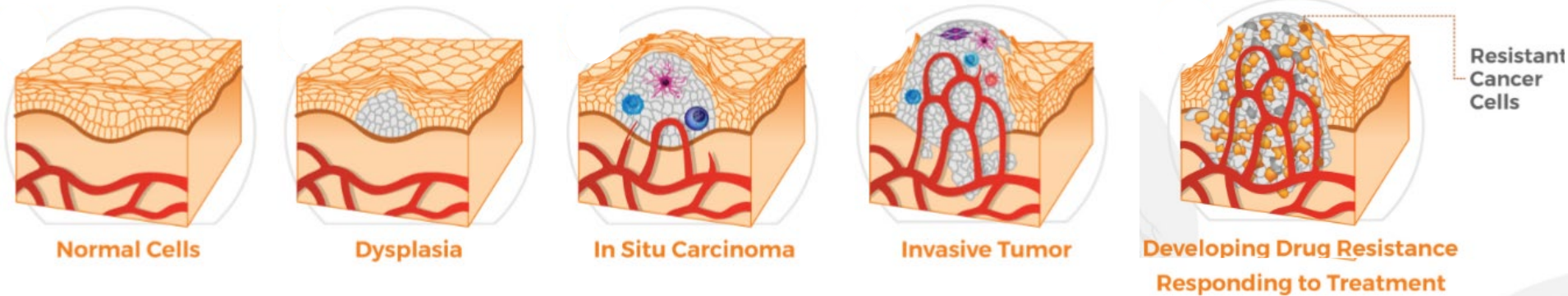
# DCB Supported Research Programs

- Acquired Resistance to Therapy Network (ARTNet)
- Alliance of Glycobiologists for Cancer Research
- Barrett's Esophagus Translational Research Network (BETRNet)
- Cancer Systems Biology Consortium (CSBC)
- Cancer Tissue Engineering Collaborative (TEC)
- Cellular Cancer Biology Imaging Research (CCBIR)
- Metastasis Research Network (MetNet)
- Onco-Aging Consortium (OAC)
- Oncology Models Forum
- Pancreatic Ductal Adenocarcinoma (PDAC) Stromal Reprogramming Consortium
- Patient-Derived Models of Cancer (PDMC)
- Physical Sciences - Oncology Network (PS-ON)
- Program on the Origins of Gastroesophageal Cancers
- Translational and Basic Science Research in Early Lesions (TBEL)

# DCB Programs: Interdisciplinary team science driving discovery

Cancer Systems Biology Consortium (CSBC) & Physical Sciences – Oncology Network (PSO)

## Acquired Resistance to Therapy Network (ARTNet)



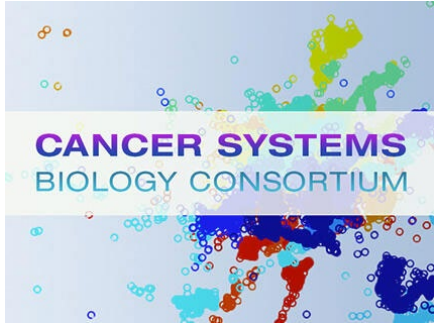
Origins of Gastroesophageal Cancers

PDAC Stromal Reprogramming Consortium (PRSC)  
OncoAging Consortium

Translational and Basic Science Research in Early Lesions (TBEL)

Metastasis Research Network (MetNet)

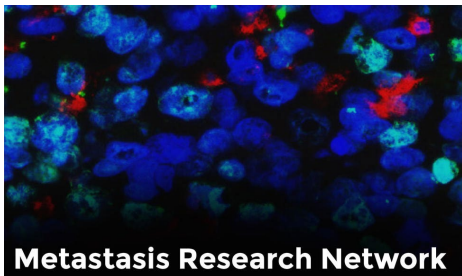
# Examples of ongoing DCB Programs that support collaborative, multidisciplinary research



**Cancer Systems Biology Consortium (CSBC):** Using systems biology approaches to advance the understanding of mechanisms that underlie fundamental processes in cancer



**Cancer Cell Biology Imaging Research (CCBIR) Program:** Bringing together technology developers and cancer biologists for designing and testing imaging technologies at the cellular and organ scales driven by questions in cancer biology



**Metastasis Research Network (MetNet):** Using systems level approaches to understand the spectrum of complex metastatic processes

# DCB Research Resources

The NCI Resources for Researchers is a directory of NCI-supported tools and services for cancer researchers. Most resources are free of cost and available to anyone.

- The NCI Mouse Repository
- GM/CA X-ray Beamline
- The International Registry of Werner Syndrome
- NIH MHC Tetramer Program
- Reagents Available to NCI-funded Researchers
- Biomedical Citizen Science and Crowdsourcing: The NIH Citizen Science Working Group

<https://www.cancer.gov/about-nci/organization/dcb/researcher-resources>



# New Grantee Workshop to Foster Careers of New Investigators

- Understand NIH/NCI organization and processes;
- Understand responsibilities as recipients of federal funding;
- Optimize interactions with extramural staff;
- Learn of available resources and opportunities to expand the investigator scientific enterprise.
- Active program since 2001
- Served over 1500 NI



# **Basic Cancer Health Disparities Research Grants (R03/R21/R01)**

Important collaboration between DCB, DCP, and CRCHD

Science: Mechanistic studies that investigate biological/genetic basis of Cancer health disparities

Eligibility: Open to any qualified researcher

Research Project: Basic cancer disparities research, focus on racial/ethnic disparities

# Emerging topics in cancer biology

# Supporting emerging areas of cancer biology research

DCB plays an important role in:

- Recognizing underdeveloped, underfunded, or emerging areas of science. Mainly through staff experience, portfolio analysis, and informal discussion with extramural and intramural scientists.
- Convening public scientific workshops, think tanks, and symposia. These events aim to engage a diversity of perspectives and career stages.
- Building relationships across NCI, NIH, and with other funding agencies and foundations.

*Extensive internal discussions and vetting are paramount to moving forward initiatives with the potential for high impact.*

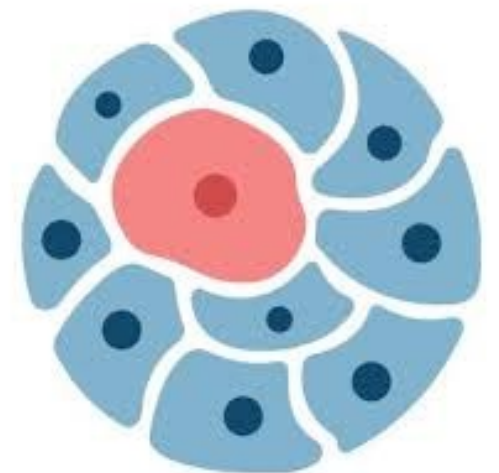
# Early events in tumorigenesis

Cancer develops in unique niches throughout the body over varying time scales. This evolution is driven by intrinsic and extrinsic factors. It is critical to understand the biology underlying the earliest events to prevent, detect, diagnosis and treat early cancers.

- When is a cell transformed and not responsive to normal controls?
- What are the earliest changes? What role does the stroma or macroenvironment play? What is the reciprocal relationship between tumor initiating cells and the immune system?
- How universal are these early (non-genetic) events?

Keys to understanding:

Defining the pre-cancer niche, principles of cell competition, new experimental and computational models of early disease



# Cancer Dynamics

Cancers adapt, evade, grow, and metastasize by employing dynamic multi-scale molecular mechanisms. Cumulatively, these mechanisms manifest in cell states that exhibit significant plasticity. Understanding cell states changes over time and how to manipulate state dynamics can lead to better treatment strategies.

- How do genetics impact cell state dynamics, cell fate decisions, and cellular plasticity? Epigenetics?
- How do combinatorial post-translational modifications contribute to cell state dynamics?
- What is the contribution of host physiology and vice versa?

Keys to understanding:

New methods for lineage tracing, dynamic cellular imaging, and data integration.

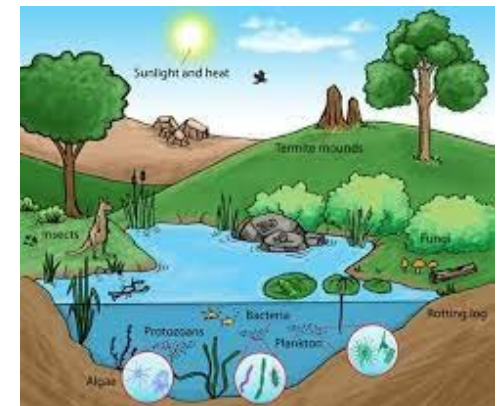
Systematic study of cell processes (ex. cell death, organelle communication and dynamics)

# Interactions within the tumor ecosystem

Single cell biology is providing a cellular parts list for the development, metastasis, and treatment of cancer. Understanding how the different cells within the tumor ecosystem cooperate to drive tumor phenotypes can pave the way to better cancer interception, detection, and therapy.

- How do emergent behaviors or structures driven by cell-cell interaction promote tumorigenesis?
- How do rare cell types, such as tumor-immune hybrid cells or giant polyploid cells, contribute to tumor progression?
- What interactions are common across tumor types?

Keys to understanding:  
Engineered tumor mimetics to test specific hypotheses  
Data integration and visualization methods  
New label-free technologies



# Disparate outcomes in cancer

Differences in cancer mortality are driven by many factors, including tumor biology. Epidemiological studies have demonstrated that co-morbidities, such as obesity, liver disease, and chronic inflammation, can contribute to disparate outcomes in cancer. Cancer outcomes also vary according to ancestry, ethnicity, and sex.

- To what extent does the intersectional biology of co-morbidities account for disparate outcomes in cancer?
- What is the role of sexual dimorphism in cancer biology?
- Can differences in tumor biology and the microenvironment across ancestral groups drive development of better therapies?

Keys to understanding:

Experimental model systems representative of the patient population

Collaborations across disciplines and disease states



# Useful Links!

Funding Opportunities for Research – Basic Cancer Biology

<https://www.cancer.gov/about-nci/organization/dcb/funding/opportunities>

Application Process (Overview) Insider's Guide to Peer Review for Applicants:

<http://www.csr.nih.gov/applicantresources/insider>

Help Your Application Get to the Right Study Section:

<http://www.csr.nih.gov>

NIH's Resubmission Policy:

[http://grants.nih.gov/grants/policy/resubmission\\_q&a.htm](http://grants.nih.gov/grants/policy/resubmission_q&a.htm)

What is the NIH Guide Notice? (Communicates changes in policy)

<https://grants.nih.gov/policy/notices.htm>

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Thank you!



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