

# The NCI's Human Tumor Atlas Network

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NCI Bioinformatics Training & Education Program (BTEP) Seminar

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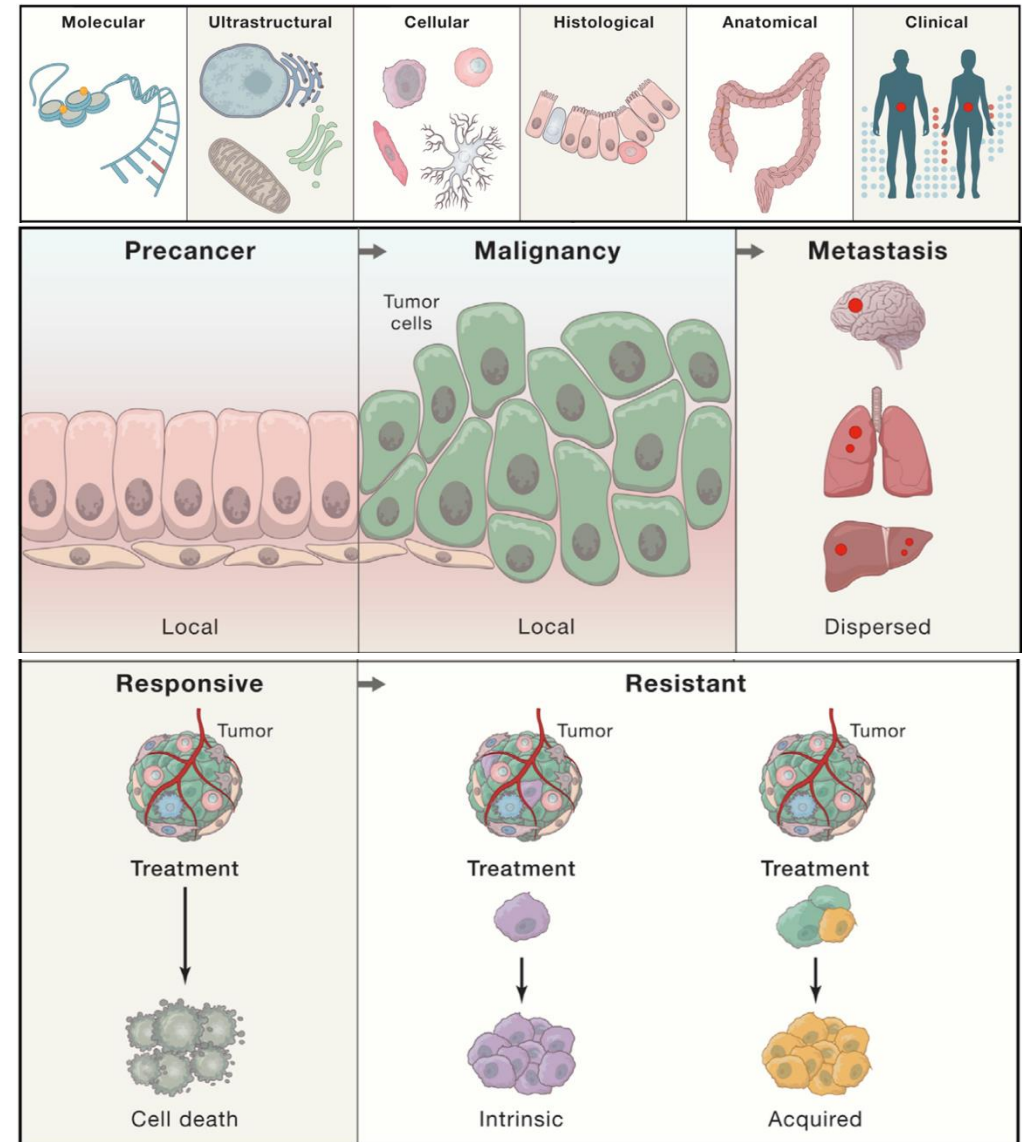
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# The NCI Human Tumor Atlas Network

**Overarching program goal:** Construct dynamic 3D atlases of human cancers

- **Integrate** molecular, cellular, and tumor tissue composition and architecture, including the microenvironment and immune milieu
- Describe **transitions during cancer:** pre-malignant lesions to malignancy, locally invasive to metastatic cancer
- Enable **predictive modeling** to refine detection and therapeutic choices



# HTAN Phase 2: building on the goals of HTAN Phase 1

A publicly available set of spatially-resolved tumor maps describing transitions in cancer for use by the cancer research community



# Highlights from the HTAN *Nature* Collection

- One study examined the **interactions among cancer and non-cancer cells** in **breast, colon, pancreas, kidney, uterus, and bile duct cancers**. The study identified distinct substructures, which they called microregions, within many tumors. They found that cells in **different microregions within the tumors often have different activities and interactions**.
- Several studies focused on **colorectal cancer**, including two that defined early molecular-level events that drive the **transformation of precancerous lesions in the colon into cancer**.
- Two studies focuses on **breast cancer**. One used single-cell RNA sequencing to **profile metastatic cancer** from 60 individuals with this disease, and another described the **underlying genetic networks that define breast cancer subtypes** based on profiles of thousands of cells from each of 37 tumors.

# Common Themes Across Tumor Types and Analyses

- Recurring cellular spatial patterns that typify **co-evolution of tumor and stroma** emerging as drivers for progression and resistance
- **Discovery of rare, transitional, dedifferentiated and/or plastic tumor cell types** - often conserved across tumor subtypes and correlated with poor outcome
- Deep **exploration of stroma, immune and tumor cell interactions**
  - Regulation of tumor growth via **immune-suppressive signaling circuits** and cancer subtype-specific **spatially organized immune-malignant cell networks**
  - Cancer-associated fibroblasts (CAFs) act as **CAF-subtype-specific TME remodelers** that impact immune responses

~200  
Total HTAN  
publications & preprints

20+  
Primary Atlases  
Publications

50+  
New analytical or  
experimental tools

# Diverse HTAN Tumor Types: Phase 1

## LUNG

Avrum Spira and Steven Dubinett

Boston University and University of California Los Angeles

Dana Pe'er and Christine Icabuzio-Donahue

Memorial Sloan Kettering Cancer Center

## PANCREAS

Dana Pe'er and Christine Icabuzio-Donahue

Memorial Sloan Kettering Cancer Center

Li Ding, Ryan Fields, William Gillanders  
and Samuel Achilefu

Washington University in St. Louis

## COLON

Michael Snyder and James Ford

Stanford University

Robert Coffey, Ken Lau and Martha Shrubsole

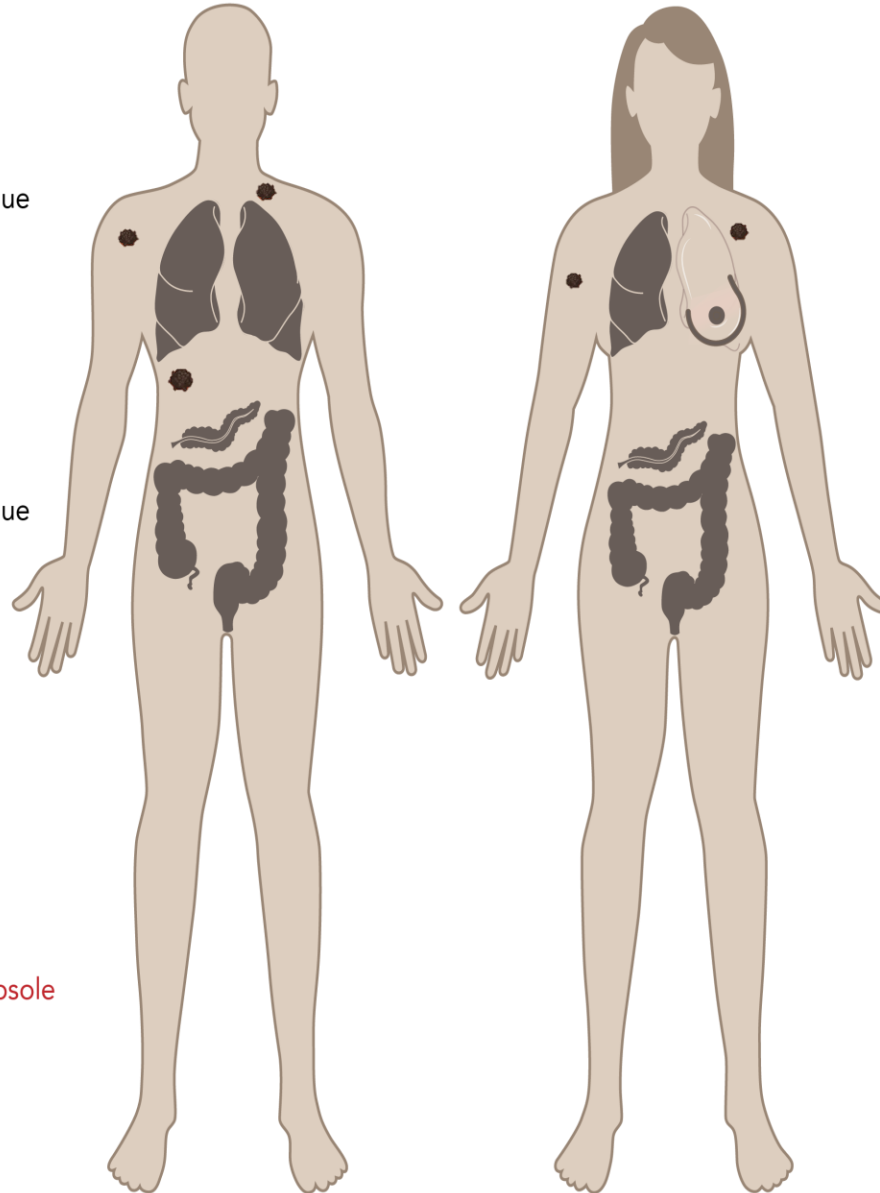
Vanderbilt University

Bruce Johnson

Dana-Farber Cancer Institute and Broad Institute

FNLCR and Broad Institute

Tumor Atlas Pilot



## BREAST

Shelley Hwang, Carlo Maley and Robert West

Duke University, Arizona State University and Stanford University

Joe Gray, Gordon Mills, Jeremy Goecks

Oregon Health and Science University

Bruce Johnson

Dana-Farber Cancer Institute and Broad Institute

Li Ding, Ryan Fields, William Gillanders and Samuel Achilefu

Washington University in St. Louis

Frederick National Laboratory for Cancer Research (FNLCR)  
and Broad Institute Tumor Atlas Pilot

## SKIN

Peter Sorger, Sandro Santagata and Jon Aster

Harvard University and Brigham and Women's Hospital

Bruce Johnson and Aviv Regev

Dana-Farber Cancer Institute and Broad Institute

## PEDIATRIC

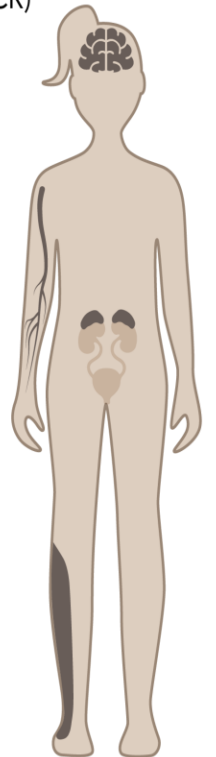
FNLCR and Broad Institute  
Tumor Atlas Pilot

glioma / neuroblastoma / sarcoma

Kai Tan and Stephen Hunger

Children's Hospital of Philadelphia

glioma / neuroblastoma /  
very high risk acute lymphoblastic leukemia





# Diverse HTAN Tumor Types: Phase 1 and Phase 2

## SKIN

**Melanoma and Cutaneous Squamous Cell Carcinoma**

Alan Shain, Boris Bastian and Iwei Yeh  
University of California, San Francisco

## PANCREAS

Rosalie Sears, Elana Fertig, Jonathan Brody and Laura Wood  
Oregon Health & Science University

## BRAIN

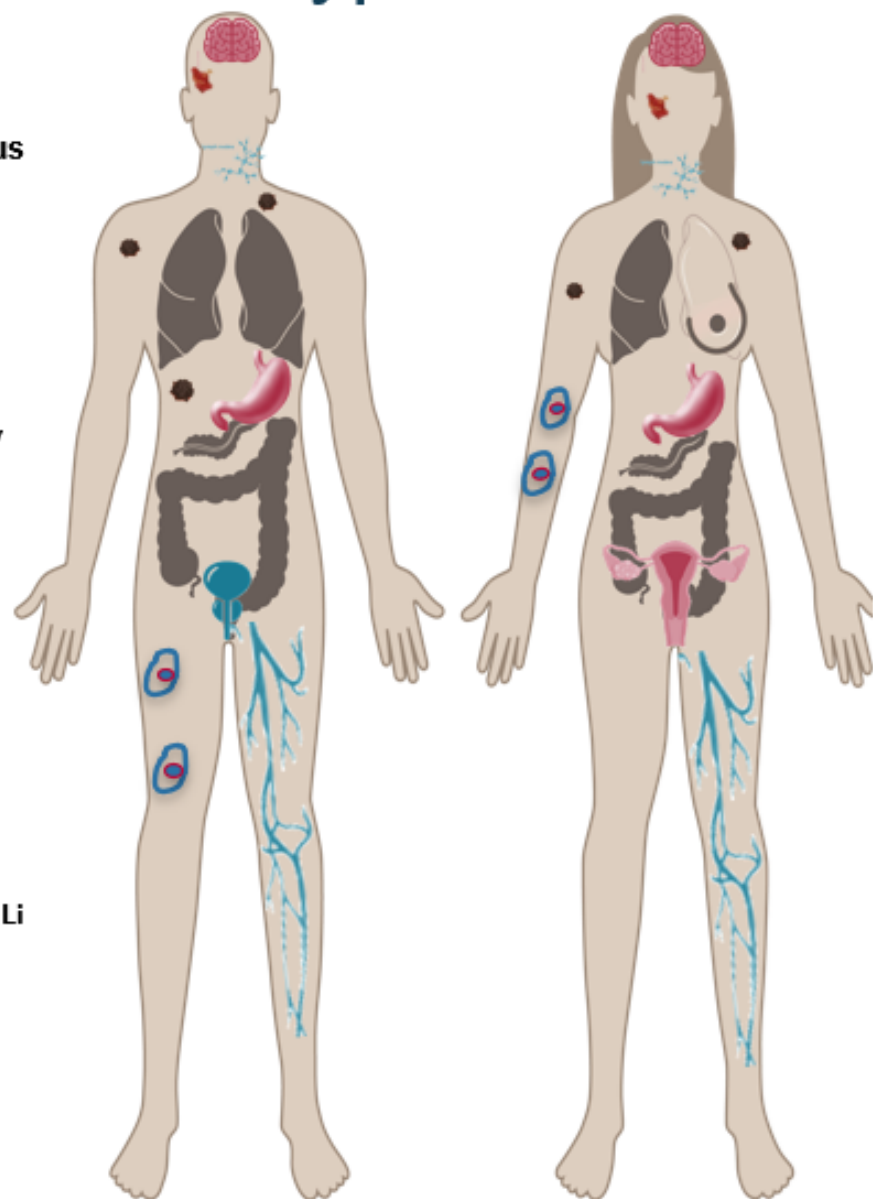
Long Cai, Richard Everson, Matthew Thomson and Barbara Wold  
California Institute of Technology

## GASTRIC

Linghua Wang, Tae Hyun Hwang, Mingyao Li and Paul Mansfield  
MD Anderson

## MULTIPLE MYELOMA

Irene Ghobrial  
Dana Farber Cancer Institute



## PROSTATE

Li Ding, Feng Chen, Eric Kim and Russell Pachynski  
Washington University in St. Louis

## COLON

Ken Lau and Jeffery Spraggins  
Vanderbilt University

## OVARY

Samuel Mok, Michael Birrer and Sammy Ferri-Borgogno  
MD Anderson

## LYMPHOMA

Rong Fan, Stephanie Halene, Zongming Ma and Mina Xu  
Yale University

## PEDIATRIC SOLID TUMORS

**Rhabdomyosarcoma, Neuroblastoma and Wilms Tumor**

Shahab Asgharzadeh, James Amatruda and Long Cai  
University of California, Los Angeles





# The NCI Human Tumor Atlas Network

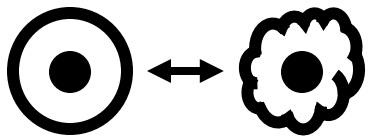
Normal → Pre-malignant → Malignant → Metastatic → Responsive → Resistant

5 Pre-Cancer Atlas Centers

5 Tumor Atlas Centers

HTAN-Data Coordinating Center

HTAN Steering Committee



Precancer Atlas Subcommittee



Advisory Committee for Data Coordination (ACDC)



Computational Alignment WG



Methods WG



Visualization WG



Translational WG



Outreach WG

Visit the HTAN Data Portal:

<https://data.humantumoratlas.org/>

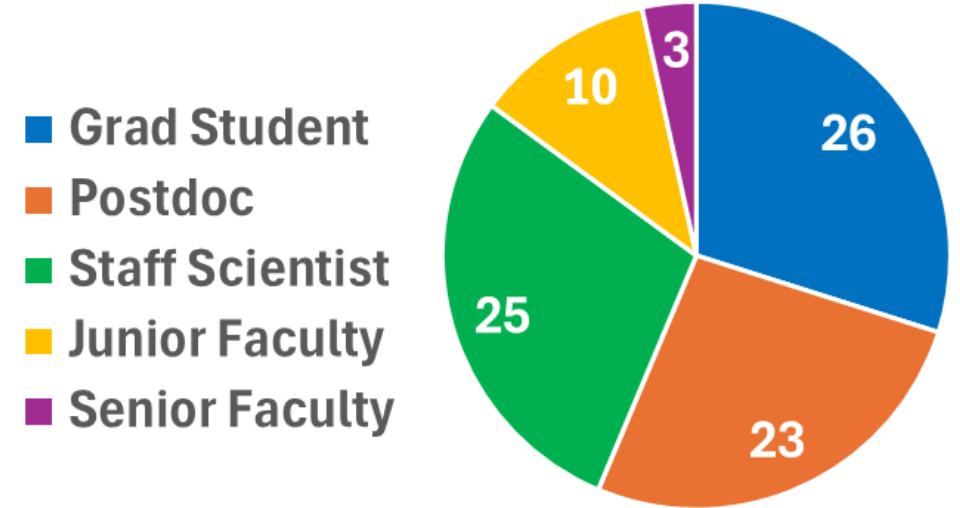
# HTAN Principles

- **Community Resource** – create a community resource that catalyzes cancer research across disciplines
- **Complementary approaches** – strengths and weaknesses will be discovered as a Network; expect to work together
- **Open communication** – accelerate science by breaking down walls; strive towards inter-operability
- **Data & Resource sharing** – requirement for success; expect aggressive public data/resource release timelines

# HTAN Data Jamborees

- Virtual HTAN Jamboree, Dec 2023 & In-Person HTAN Jamboree, Nov 2024
  - ~200 total participant applications
  - ~30 total project pitch submissions
- ~90 participants selected to work on **12 projects**, each addressing a specific scientific question or technical challenge using available HTAN data
  - ✓ Promote the **access and reuse** of HTAN data
  - ✓ Promote **collaborations** to expand the HTAN community
  - ✓ Promote development of **new methods and tools** for HTAN data analysis
  - ✓ Identify **gaps and limitations** of existing HTAN data and resources

## HTAN Jamboree Participants



# HTAN Associate Membership



- Associate Members are expected to contribute to HTAN by:
  - generating, sharing or analyzing data;
  - jointly developing software or algorithms;
  - developing mutually beneficial resources, protocols or reagents;
  - and/or coordinating development of standards, formats or metadata
- Associate Members are encouraged to actively engage in HTAN activities
- Associate Member must abide by all HTAN policies
- Applications for Associate Membership require:
  - A letter of support from a current HTAN member
  - A recent biosketch
  - A letter of intent from the applicant describing their planned contributions to HTAN

# Upcoming HTAN-BTEP Presentations



- ❑ **April 2, 2025:** Fabian Seidl, General Dynamics Information Technology
  - **Title:** *Analyzing HTAN scRNASeq data accessible in BigQuery with CellTypist*
  - **Description:** This tutorial will demonstrate how to access HTAN single cell expression data directly from ISB-CGC BigQuery tables. It will then show how to perform a CellTypist analysis in Python.
  
- ❑ **April 9, 2025:** Rowan Beck, Velsera
  - **Title:** *Accessing and Analyzing HTAN Data using the Cancer Genomics Cloud*
  - **Description:** This session will provide an overview of accessing HTAN data on the Cancer Genomics Cloud (CGC) and demonstrate how to process and analyze these datasets using scalable pipelines and interactive apps.
  
- ❑ **May 7, 2025:** Fabian Seidl, General Dynamics Information Technology
  - **Title:** *Analyzing HTAN spatial data with BigQuery spatial analytics*
  - **Description:** This tutorial will demonstrate how to perform spatial analysis on HTAN single cell data identifying local cell neighborhoods directly with built in BigQuery functionality.