

An AACR Special Conference in Cancer Research  
**Translating Cancer Evolution and Data Science: The Next Frontier**

*in association with the AACR Cancer Evolution Working Group (CEWG)*

December 3-6, 2023 | Westin Copley Place | Boston, MA

**STAFF AND AV VERSION**

**Updated 12/6/23**

**Conference Cochairs:**

Anna D. Barker, Ellison Institute for Transformative Medicine of USC, Los Angeles, California

Franziska Michor, Dana-Farber Cancer Institute, Boston, Massachusetts

Jeffrey P. Townsend, Yale University, New Haven, Connecticut

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**Sunday, December 3, 2023**

**Opening Plenary Session**

5:30-7:00 p.m. | Essex Ballroom

**40 min presentation + 5 min Q&A**

**Molecular archeology of cancer**

Peter Van Loo, The University of Texas MD Anderson Cancer Center, Houston, Texas

**40 min presentation + 5 min Q&A**

**Evolutionary dynamics of whole genome doubling in ovarian cancer**

Sohrab Shah, Memorial Sloan Kettering Cancer Center, New York, New York

**Opening Reception**

7:00-8:30 p.m. | Staffordshire

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**Monday, December 4, 2023**

**Continental Breakfast**

7:00-8:00 a.m. | St. George B, C, D

**Plenary Session 1: How Cancer Evolution Impacts Clinical Research**

8:00-10:00 a.m. | Essex Ballroom

*Session Chair: Christine A. Iacobuzio-Donahue, Memorial Sloan Kettering Cancer Center, New York, New York*

**20 min presentation + 10 min Q&A**

**Composing each patient's equation: Deciphering brain tumor dynamics and evolution by integrating multi-regional image-localized biopsies**

Kristin R. Swanson, Mayo Clinic, Phoenix, Arizona

**20 min presentation + 10 min Q&A**

**Insights into lung cancer evolution and metastasis in TRACERx and PEACE**

Mariam Jamal-Hanjani, University College London Cancer Institute, London, United Kingdom

**20 min presentation + 10 min Q&A**

**Novel insights into pancreatic cancer evolution from carcinogenesis to metastasis**

Christine A. Iacobuzio-Donahue, Memorial Sloan Kettering Cancer Center, New York, New York

**10 min presentation + 5 min Q&A**

**Somatic mutation rates and strength of selection on driver genes change by age in melanoma\***

Yihan Liu, Yale School of Public Health, New Haven, Connecticut

**10 min presentation + 5 min Q&A**

**Learning to adapt: Rational personalization of adaptive therapy using deep reinforcement learning\***

Kit Gallagher, Moffitt Cancer Center, Tampa, Florida

**Break**

10:00-10:30 a.m. | Essex Ballroom Foyer

**Plenary Session 2: Panel Discussion on Cancer Evolution and Therapeutic Resistance**

10:30 a.m.-12:00 p.m. | Essex Ballroom

*Session Chair: Anna D. Barker, Ellison Institute for Transformative Medicine of USC, Los Angeles, California*

**10 min presentation; no Q&A**

**Leveraging the extreme selection induced by therapeutic bottlenecks to subvert resistance via identifying evolutionarily-informed targets for orthogonal immunotherapy**

J. Nic Fisk, University of Rhode Island, Kingston, Rhode Island

**10 min presentation; no Q&A**

**Improving cancer treatment through data-driven game theory**

Katrina Stankova, Delft University of Technology, Delft, The Netherlands

**10 min presentation; no Q&A**

**Data science meets the clinic: Novel clinical trial design to prevent the emergence of resistance**

Franziska Michor, Dana-Farber Cancer Institute, Boston, Massachusetts

**10 min presentation; no Q&A**

**Stem cells, clonal evolution and therapeutic resistance**

Lucie Laplane, CNRS, University Paris & Gustave Roussy Cancer Center, Paris, France

**Panel Discussion until the end of the session**

**Lunch Break (lunch on your own)**

12:00-2:00 p.m.

**Plenary Session 3: Exploring the Role of Biomarkers in Cancer Evolution**

*Organized by the AACR Cancer Evolution Working Group (CEWG)*

2:00-4:00 p.m. | Essex Ballroom

*Session Chair: Jeffrey P. Townsend, Yale University, New Haven, Connecticut*

**20 min presentation + 10 min Q&A**

**Drugging evolution, the DNA damageome, and cancer**

Susan M. Rosenberg, Baylor College of Medicine, Houston, Texas

**20 min presentation + 10 min Q&A**

**Mutants, loners and bad influences**

Edward C. Stites, Yale University, New Haven, Connecticut

**20 min presentation + 10 min Q&A**

**Niche-mediated interaction between sensitive and resistant subpopulations shapes the evolutionary dynamics of acquired resistance**

Andriy Marusyk, Moffitt Cancer Center, Tampa, Florida

**20 min presentation + 10 min Q&A**

**A quantitative look at selection in somatic evolution and the role of the tumor microenvironment during treatment**

David Basanta Gutierrez, Moffitt Cancer Center, Tampa, Florida

**Proffered Talks and Lightning Lectures 1**

4:15-5:30 p.m. | Essex Ballroom

*Session Chair: J. Nic Fisk, University of Rhode Island, Kingston, Rhode Island*

**Proffered Talks**

**10 min presentation + 5 min Q&A**

**Multi-drug adaptive therapy protocol in vitro: An exercise in optimization for neuroblastoma\***

Subhayan Chattopadhyay, Lund University, Lund, Sweden

**10 min presentation + 5 min Q&A**

**Tracing the clonal dynamic of metastatic castration-resistant prostate cancer over immunotherapy using circulating tumor DNA\***

Chennan Li, National Cancer Institute, Bethesda, Maryland

**10 min presentation + 5 min Q&A**

**Evolution of evolvability\***

Jill A. Gallaher, Moffitt Cancer Center, Tampa, Florida

**Lightning Lectures**

**2 min presentation; no Q&A**

**Cancer origin tracing and timing in two high risk prostate cancers using multisample whole genome analysis: potential clinical value\*\***

Serafiina Jaatinen, Tampere University, Tampere, Finland

**2 min presentation; no Q&A**

**Dissecting patterns of small cell lung cancer evolution using deep whole genome sequencing of circulating tumor DNA\*\***

Benjamin B. Morris, University of Texas MD Anderson Cancer Center, Houston, Texas

**2 min presentation; no Q&A**

**Emergence of MEK1 mutations in RAF or RAS-mutant solid tumors following treatment with a combination of selective type II RAF inhibitor belvarafenib and MEK inhibitor cobimetinib\*\***

Stephanie Hilz, Genentech, Inc., South San Francisco, California

**2 min presentation; no Q&A**

**Longitudinal histology and spatial transcriptomics profiling in targeted treatment of melanoma patient-derived models interrogates persister and resistant cell populations\*\***

Sergii Domanskyi, The Jackson Laboratory for Genomic Medicine, Farmington, Connecticut

**2 min presentation; no Q&A**

**Computational and mouse models of adaptive therapy with multiple drugs in breast cancer\*\***

Carlo C. Maley, Arizona State University, Tempe, Arizona

**Poster Session A (with light refreshments)**

5:30-7:00 p.m. | Staffordshire

## **Tuesday, December 5, 2023**

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**Continental Breakfast**

7:00-8:00 a.m. | St. George B, C, D

**Plenary Session 4: Cancer Evolution, Early Detection, and Diagnosis**

8:00-10:00 a.m. | Essex Ballroom

*Session Chair: Jimmy Lin, Freenome, Inc., San Mateo, California*

**20 min presentation + 10 min Q&A**

**Unraveling mutation and selection to better understand early cancer evolution**

Vincent Cannataro, Emmanuel College, Boston, Massachusetts

**10 min presentation + 5 min Q&A**

**Molecular subtyping of lung adenocarcinoma premalignant lesions identifies features associated with aggressive disease\***

Kelley Anderson, Boston University, Boston, Massachusetts

**20 min presentation + 10 min Q&A**

**The epigenetic-based liquid biopsy odyssey of bedside pancreatic cancer diagnostics**

Nita Ahuja, Yale University School of Medicine, New Haven, Connecticut

**20 min presentation + 10 min Q&A**

**Leveraging multiomics and machine learning towards a stepwise approach to multi-cancer screening**

Jimmy Lin, Freenome, Inc., San Mateo, California

**10 min presentation + 5 min Q&A**

**Cell state transitions drive the evolution of disease progression in B-cell acute lymphoblastic leukemia\***

Jeffrey West, Moffitt Cancer Center, Tampa, Florida

**Break**

10:00-10:30 a.m. | Essex Ballroom Foyer

**Plenary Session 5: Decoding the Evolutionary History of Human Tumors**

10:30 a.m.-12:30 p.m. | Essex Ballroom

*Session Chair: Melissa B. Davis, Morehouse School of Medicine, Atlanta, Georgia*

**20 min presentation + 10 min Q&A**

**Using genetic ancestry in genomics of tumor evolution**

Melissa B. Davis, Morehouse School of Medicine, Atlanta, Georgia

**10 min presentation + 5 min Q&A**

**Tick tock trees: Reconstructing the evolutionary dynamics of human tissues using fluctuating methylation clocks\***

Heather Grant, Centre for Evolution and Cancer, The Institute of Cancer Research, London, United Kingdom

**20 min presentation + 10 min Q&A**

**Detecting epistatic effects among somatic cancer mutations across oncogenesis**

Jorge Alfaro-Murillo, Yale University, New Haven, Connecticut

**20 min presentation + 10 min Q&A**

**Phylomedicine of cancers and tumors: A molecular phylogenetic approach to oncology**

Sudhir Kumar, Temple University, Philadelphia, Pennsylvania

**10 min presentation + 5 min Q&A**

**Linking proliferation rate to the evolution of single-cell primary and metastatic tumor clones\***

Olivia Lucas, University College London, London, United Kingdom

**Lunch Break (lunch on your own)**

12:30-2:30 p.m.

**Plenary Session 6: Cancer Evolution: A New Frontier in Drug Discovery**

2:30-4:00 p.m. | Essex Ballroom

*Session Chair: Olivia W. Rossanese, The Institute of Cancer Research, Sutton, United Kingdom*

**20 min presentation + 10 min Q&A**

**Extrachromosomal DNA (ecDNA): Cancer's dynamic circular genome**

Paul S. Mischel, Stanford University School of Medicine, Stanford, California

**20 min presentation + 10 min Q&A**

**Bayesian phylodynamics to quantify cancer growth across space and time**

Alison Feder, University of Washington, Seattle, Washington

**20 min presentation + 10 min Q&A**

**Evolutionary thinking in drug discovery: Challenges and opportunities**

Olivia W. Rossanese, The Institute of Cancer Research, Sutton, United Kingdom

**Proffered Talks and Lightning Lectures 2**

4:15-5:30 p.m. | Essex Ballroom

*Session Chair: Vincent Cannataro, Emmanuel College, Boston, Massachusetts*

**Proffered Talks**

**10 min presentation + 5 min Q&A**

**Evolutionary dynamics of whole-genome doubling in ovarian cancer\***

Ignacio Vázquez-García, Memorial Sloan Kettering Cancer Center, New York, New York

**10 min presentation + 5 min Q&A**

**Multiregion biopsies and corresponding neurosphere cultures reveal spatial divergence in glioblastoma evolution\***

Michalina Janiszewska, The Wertheim UF Scripps Institute, Jupiter, Florida

**10 min presentation + 5 min Q&A**

**Comprehensive longitudinal tracking of lung cancer evolutionary clonal dynamics during therapy using circulating tumour DNA\***

Alexander M. Frankell, Early Cancer institute, University of Cambridge, Cambridge, United Kingdom

**10 min presentation + 5 min Q&A**

**An agent-based modelling framework to study cell plasticity in non-small cell lung cancer\***

Helena M. K. Coggan, University College London, London, United Kingdom

**Lightning Lectures**

**2 min presentation; no Q&A**

**Genomic signatures of past and present chromosomal instability in Barrett's esophagus and early esophageal adenocarcinoma\*\***

Chunyang Bao, Dana-Farber Cancer Institute, Boston, Massachusetts

**2 min presentation; no Q&A**

**The polyclonal path towards malignant transformation in familial adenomatous polyposis\*\***

Ryan O. Schenck, Stanford University, Palo Alto, California

**2 min presentation; no Q&A**

**A histological data-driven analysis of the hypoxic microenvironment of preclinical murine bladder tumors\*\***

Awino Maureiq E. Ojwang<sup>1</sup>, H. Lee Moffitt Cancer Center & Research Institute, Tampa, Florida

**2 min presentation; no Q&A**

**Elucidating metastatic pathways in pediatric cancers\*\***

Natalie Andersson, Lund University Sweden

**2 min presentation; no Q&A**

**PISCA-box: A user-friendly interface for Phylogenetic Inference using Somatic Chromosomal Alterations (PISCA)\*\***

Heather Grant, Institute of Cancer Research, London, United Kingdom

**Poster Session B (with light refreshments)**

5:30-7:00 p.m. | Staffordshire

## **Wednesday, December 6, 2023**

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**Continental Breakfast**

7:00-8:00 a.m. | St. George B, C, D

**Plenary Session 7: Cancer Microenvironment**

8:00-10:00 a.m. | Essex Ballroom

*Session Chair: Jasmin Fisher, UCL London Cancer Institute, London, England*

**20 min presentation + 10 min Q&A**

**Multiscale systems approach to target tumor ecosystem responses for therapeutic benefit**

Laura M. Heiser, Oregon Health and Science University, Portland, Oregon

**20 min presentation + 10 min Q&A**

**Microphysiological systems to decipher tumor-stromal interactions in colorectal cancer**

Shannon M. Mumenthaler, USC - University of Southern California, Los Angeles, California

**10 min presentation + 5 min Q&A**

**Topology of the tumor microenvironment; integrating imaging, modeling, and topological data analysis\***

Rowan Barker-Clarke, Cleveland Clinic, Cleveland, Ohio

**10 min presentation + 5 min Q&A**

**Interpretable computational pathology reveals that vascular networks reflect evolutionary dynamics in kidney cancer\***

Charlotte E. Spencer, The Francis Crick Institute, London, United Kingdom

**20 min presentation + 10 min Q&A**

**Digital patient avatars predict cancer evolution and personalised therapeutic strategies**

Jasmin Fisher, UCL London Cancer Institute, London, England

*\*Recording not available at speaker's request*

**Break**

10:00-10:30 a.m. | Essex Ballroom Foyer

**Plenary Session 8: Cancer Genome and Epigenome Evolution**

10:30 a.m.-12:30 p.m. | Essex Ballroom

*Session Chair: Peter W. Laird, Van Andel Institute, Grand Rapids, Michigan*

**10 min presentation + 5 min Q&A**

**Properties of somatic methylation changes in human hematopoietic stem cells in health and disease\***

Lori D. Kregar, Wellcome Sanger Institute, University of Cambridge, Cambridge, United Kingdom

**20 min presentation + 10 min Q&A**

**Epigenetic stochasticity in cancer evolution**

Andrew P. Feinberg, Johns Hopkins University School of Medicine, Baltimore, Maryland [R]

**20 min presentation + 10 min Q&A**

**Spatial reconstruction and temporal inference of DNA methylation alterations in primary human colorectal cancer**

Peter W. Laird, Van Andel Institute, Grand Rapids, Michigan

**20 min presentation + 10 min Q&A**

**Unraveling potential genetic drivers of intratumor transcriptional heterogeneity and phenotypic plasticity in malignant cells**

Valentina Boeva, ETH Zurich, Zurich, Switzerland

**10 min presentation + 5 min Q&A**

**Adaptive local fitness landscapes for aneuploid karyotypes\***

Noemi Andor, Moffitt Cancer Center, Tampa, Florida

**Closing Remarks**

12:30-12:45 p.m. | Essex Ballroom

Anna D. Barker, Ellison Institute for Transformative Medicine of USC, Los Angeles, California

Franziska Michor, Dana-Farber Cancer Institute, Boston, Massachusetts

Jeffrey P. Townsend, Yale University, New Haven, Connecticut