

KEYSTONE SYMPOSIA

on Molecular and Cellular Biology

Systems and Engineering Immunology: Advancing Immunological Insights in Health and Disease (Z2)

Scientific Organizers: John Tsang, Shannon J. Turley and Alex Marson

Supported by the Directors' Fund

Innate Immunity Across the Molecular, Cellular, Tissue and Therapeutic (Z1)

Scientific Organizers: Kate L. Jeffrey, Ramnik Xavier and Xu Zhou

April 9-12, 2024 • Fairmont Banff Springs • Banff, AB, Canada

Sponsored by Sensei Biotherapeutics

Scholarship Deadline: January 18, 2024 / Abstract Deadline: January 18, 2024 / Discounted Registration Deadline: February 8, 2024

TUESDAY, APRIL 9

Arrival and Registration

WEDNESDAY, APRIL 10

Welcome and Keynote Address (Start 8:00AM) (Z1)

***Kate L. Jeffrey**, Moderna and Harvard Medical School, USA

***Xu Zhou**, Boston Children's Hospital, USA

Ramnik Xavier, Massachusetts General Hospital, USA
Variants Linked to Functional Phenotypes and Causal Mechanisms in Relevant Cell Types

Systems Immunology: Signatures and Mechanisms (Start 8:00AM) (Z2)

Mark M. Davis, Stanford University School of Medicine, Howard Hughes, USA

Of Human, Mouse, and Organoid Immune Systems

***John Tsang**, Yale University School of Medicine, USA
The Systems Immunology of Immune Set Points

Aleksandra Walczak, École Normale Supérieure, France
Decoding Immune Repertoires

Rachelly Normand, MGH / Harvard Medical School / Broad Institute, USA

Short Talk: Modeling the Effect of Immune Cell Infiltration on Tissue Function Reveals Cellular Rewiring Driving Human Thyroid Autoimmunity

Guangbo Chen, Stanford University, USA
Short Talk: Pre-Vaccination Type I Interferon Abundance is Rate-Limiting for Post-Vaccination Influenza Antibody Response Among Human Populations

Sensing of Microbial Friends and Enemies (Start 9:00AM) (Z1)

***Marco Colonna**, Washington University School of Medicine, USA
Activating and Inhibitory Innate Immune Receptors in Neurodegeneration

Virginia Pascual, Cornell University, USA
Talk Title to be Announced

Nandan Satish Gokhale, University of Washington, USA
Short Talk: Cellular RNA Interacts with MAVS to Promote Antiviral Signaling

Diep H. Nguyen, MIT/Whitehead Institute, USA
Short Talk: Spatial Gradients of Pathogen-sensing Capability Confer a Tiered Tissue Self-Defense System

Workshop 1: Organoids and Model Systems for Systems and Engineering Immunology (Start 2:30PM) (Z2)

Yuri Pritykin, Princeton University, USA

Ultra-Long-Range and Interchromosomal Looping and Compartmentalization in Regulatory T Cell Genome

Stefan Schattgen, St Jude Children's Research Hospital, USA
MetaCoNGA: A Comprehensive Multi-Modal Index of Human T Cell Phenotype and Specificity

***Alma-Martina Cepika**, Stanford School of Medicine, USA
Integration of Systems Biology Analysis and CRISPR-based Functional Epigenomics Reveals the Key Transcriptional Regulators of Human Antigen-Inducible Tregs

***Ruby Lunde**, Bristol Myers Squibb, USA
Automated Analytical Pipeline for Cell Therapy Hypothesis Generation

Daniel P. Caron, Columbia University Medical Center, USA
Multimodal Hierarchical Classification of CITE-Seq Data Enables Delineation of Tissue-Specific Signatures Shared Across Human Immune Cell Subsets

Aditya Murthy, Gilead Sciences, USA
Decoding Regulators of Inflammatory Macrophage States Through Functional Genomics

Jishnu Das, University of Pittsburgh, USA
Sliding Window Interaction Grammar (SWING) - a Generalized Interaction Language Model for Decoding Biological Interactions

Workshop 1: Inflammasomes in Sickness and in Health (Start 2:30PM) (Z1)

Daniel A. Okin, Massachusetts General Hospital, USA
Tissue Stiffness is a Fundamental Regulator of NLRP3 Inflammasome Activities

Pritisha Rozario, Nanyang Technological University, Singapore
Mechanistic Basis for Potassium Efflux Driven Activation of the Human NLRP1 Inflammasome

***Ben A. Croker**, University of California San Diego, USA
GSDME Promotes PAD4 Activation and DNA Externalization from Apoptotic Neutrophils

Maria Luisa Gil Marques, Massachusetts General Hospital/Harvard Medical School, USA
Interaction Between NLRP11, CASP4, and LPS in the Context of the Innate Immune Response to Bacterial Pathogens

***Charles L. Evavold**, Massachusetts General Hospital, USA
Sterol-izing Immunity: Cholesterol Control of Mammalian Gasdermins
Simone Caielli, Weill Cornell Medical College - Drukier Institute For Children's Health, USA
An Unconventional Mechanism of IL-1 β Secretion that Requires Type I IFN in SLE Monocytes

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Tsan Sam Xiao, Case Western Reserve University, USA
S-palmitoylation of Gasdermins Regulate Their Function in Membrane Pore Formation and Pyroptotic Cell Death

Programming and Engineering Immune Cells: Understand to Build and Build to Understand (Start 5:00PM) (Z2)

***Alex Marson**, Gladstone Institutes, University of California, San Francisco, USA

Genomics Programming of Human T Cells

Jenny McGovern, Quell Therapeutics, USA
Regulatory T Cell Engineering

Mirco J. Friedrich, MIT, USA

Short Talk: Reprogramming T Cell Aging with a Transient mRNA Intervention

Yiming Yin, Boston Children's Hospital, USA

Short Talk: Affinity Maturation of CRISPR-Engineered B-Cell Receptors in vivo

Nicholas Kalogiropoulos, Stanford University, USA

Short Talk: Programmable Synthetic GPCRs for Customized Antigen-dependent Control of Cell Behaviors

Alissa Danford, UC Berkeley, USA

Short Talk: Depletion of Intratumoral Tregs Enhances Tumor Immunity Locally and Systemically Against Disseminated Metastatic Cancer

Innate Immunity 2.0: Epigenetics (Start 5:00PM) (Z1)

***Kate L. Jeffrey**, Moderna and Harvard Medical School, USA
Chromatin Readers and Inflammation

Steven Z. Josefowicz, Weill Cornell Medical College, USA
Signaling to Chromatin for Rapid Innate Immunity

Liraz Galia, UT Southwestern Medical Center, USA
Talk Title to be Announced

Theresa Alenghat, Cincinnati Children's Hospital, USA
Epigenetic Regulation of the Host-microbiota Relationship

Poster Session 1

THURSDAY, APRIL 11

Immunoreceptors: Specificities, Interactions, and Engineering (Start 8:00AM) (Z2)

Frederick A. Matsen IV, Fred Hutchinson Cancer Research Center, USA

Deconvolving Mutation and Selection in Antibody Evolution using Neural Networks Trained on Large-Scale Repertoire Data

***Armita Nourmohammad**, University of Washington, USA
Leaning the Shape of the Immune and Protein Universe

Stephanie A. Gaglione, Massachusetts Institute of Technology, USA
Viruses for High-throughput Antigen Discovery

Mark C. Coles, Kennedy Institute University of Oxford, UK

Short Talk: Combining Mechanistic Modelling with Machine Learning to Predict Human T Cell Epitopes and Vaccine Immune Responses in Ancestrally Diverse Populations

Innate Immunity in 3D (Start 8:00AM) (Z1)

***Xu Zhou**, Boston Children's Hospital, USA

Environmental Control of Inflammatory Response

Miguel Soares, Instituto Gulbenkian de Ciência, Portugal
Tissue Tolerance to Infection

Andrés Hidalgo, Yale School of Medicine, USA
Neutrophil dynamics: vessels, skin and beyond

Sacha Lebon, Weizmann Institute of Science, Israel

Short Talk: Dissecting a Novel Stem-Cell Defense Mechanism in Early Epithelial-Specific Responses to an Enteric Bacterial Pathogen

Alexandra Wells, University of Texas Southwestern Medical Center, USA

Short Talk: Characterization of Interferon-Induced Gene Expression in the Mouse Lung and Liver

Elizabeth Fay Rowland, University of Illinois Urbana-Champaign, USA

Short Talk: High Resolution 3D Spatial-Temporal Mapping of Influenza A Virus Infection and Innate Immune Signaling in Whole Lung Organs Reveals the Early Spatial Interplay of Viral Spread and Host Response

Julia Bayer, University of Bern, Switzerland

Short Talk: Spatial Transcriptomics Reveals Interaction of Mesothelial Cells with Injury-Derived Osteopontin in Serosal Scarring

Career Roundtable (Joint) (Start 3:00PM)

Sarah Teichmann, Wellcome Sanger Institute, UK

Kara Lassen, Roche, Switzerland

Bryan D. Bryson, Massachusetts Institute of Technology, USA

Jonathan Sockolosky, Curie.Bio, USA

Immunoengineering and Drug Development (Start 5:00PM) (Z2)

***Christoph Bock**, CeMM and Medical University of Vienna, Austria
Immune Cell Engineering and "Structural Immunity"

Caleb R. Perez, MIT, USA

Mapping Diverse CAR Signaling Inputs to Transcriptional and Functional Outcomes via Library-Based Single-Cell Omics Assays

Kate Griffin, University of Michigan, USA

Short Talk: Nanoparticles Reprogram Circulating Immune Cells to Alter the Metastatic Niche and Reduce Metastatic Burden in Murine Triple Negative Breast Cancer

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Nathaniel Robichaud, Nomic Bio, Canada

Short Talk: High-Throughput Protein Profiling Captures Variability Across Donors, Cellular Environments, and Perturbations - Implications for Systems and Engineering Immunology

Innate Immune Protectors and Drivers of Disease (Start 5:00PM) (Z1)

Yasmine Belkaid, Pasteur Institut, France

Remote Presentation: Microbial Control of Tissue Threshold of Activation

Bryan D. Bryson, Massachusetts Institute of Technology, USA

Unraveling TB Granuloma Phagocyte Heterogeneity

Kara Lassen, Roche, Switzerland

Fibroblasts in Chronic Inflammatory Diseases

***Hernandez Moura Moura Silva**, Massachusetts Institute of Technology, USA

Short Talk: Decoding Immune Mediated Circuits Supporting Tissue Physiology

Disha Sood, Sanofi, USA

Short Talk: Astrocyte Sensitivity to Nucleic Acid Agonism Contributes to Neurodegeneration in iPSC-Derived Tri-Culture Models of Amyotrophic Lateral Sclerosis

Poster Session 2

FRIDAY, APRIL 12

The Emerging, Unexpected and New Frontiers (Joint) (Start 8:00AM)

Sarah Teichmann, Wellcome Sanger Institute, UK

What's Next in Human Cell Atlasing?

Graham Heimberg, Genentech, USA

SCimilarity Queries Reveal Connections across Macrophage Populations

***Nicolas Chevrier**, University of Chicago, USA

Decoding the Body Language of Immunity

Subhajt Poddar, University of Pennsylvania, USA

Short Talk: STING Modulates Golgi pH, Cargo Sorting, and Secretion Through ArfGAP2

Toufic Mayassi, Broad Institute, USA

Short Talk: Molecular Cartography Reveals Robust, Adaptable, and Resilient Intestinal Networks

Shubham Tripathi, Yale School of Medicine, USA

Short Talk: Role of a Cellular Circuit Involving IFN- γ / IL-15 Positive Feedback in Establishing Antigen-Non-Specific Immune Memory

Tomer Milo, Weizmann Institute, Israel

Short Talk: A Paradox of Foreign-Specific Regulatory T Cells and a Proposed Resolution by a Lymph Node Microdomain Theory

Workshop 2: In vivo Systems Immunology and Engineering: Emerging Areas and Challenges (Start 2:30PM) (Z2)

Antonella Prisco, IGB CNR, Italy

Modeling Variations in Antibody Response Longevity Among Individuals

***David R. Glass**, Fred Hutchinson Cancer Center, USA

Bridging the Identity and Function of Human Plasma Cell Subsets

Neil Q. Tay, University of California, San Francisco, USA

Tracking Cell-Cell Interactions Using Intercellular Barcode Transfer

Nicole Rosin, University of Calgary, Canada

A Systems Biology Approach to Understanding Wound Healing

Katherine Susa, UCSF, USA

A Spatiotemporal Map of Co-Receptor Signaling Networks Underlying B Cell Activation

***Catera Wilder**, University of California, San Francisco, USA

Dynamic Control of Signaling Networks: Uncovering Specificity in Interferon-Mediated Cellular Responses Through Coordinated Positive Feedback Loops

Workshop 2: Single Cell to Tissue-Level Immunity (Start 2:30PM) (Z1)

Ayshwarya Subramanian, Cornell University, USA

Immune Checkpoint Molecule Tim-3 Regulates Microglial Function and the Development of Alzheimer's Disease Pathology

***Tasuku Nishimura**, Kumamoto, Japan

Non-Canonical Type I Interferons are Induced by Cholesterol Restriction and Prime RIG-I-Mediated Antiviral Innate Immune Responses

Rio Sugimura, HKU, Hong Kong

Cancer and Vascular Immune Assembloids Model the Oncofoetal Niche in the Solid Tumor Microenvironment

Stephanie Hajjar, Boston Children's Hospital, USA

Exploring the Role of GPR65-Mediated pH Sensing in Tuning Systemic and Local Immune Responses

Kiara Wiggins, University of California, Irvine, USA

TLR4'S Impact on Pcos Outcomes in Letrozole-induced Mouse Model

Siyao Cao, Washington University in St. Louis, USA

Mucosal Single-Cell Profiling of Crohn's-Like Disease of the Pouch Reveals Unique Pathogenesis and Therapeutic Targets

Victoria Schuster, Oregon Health and Science University, USA

Multi-Antigen Management by Dendritic Cells Within the Melanoma Microenvironment

Tissue Systems Immunology and Dynamics (Start 5:00PM) (Z2)

***Shannon J. Turley**, Genentech, Inc., USA

Evolution of Stromal Niches in Inflammation, Cancer and Immunotherapy

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Karin Pelka, Gladstone Institutes and University of California, San Francisco, USA

Spatially Organized Immune Hubs in Human Tumors

Gabriel D. Victora, Rockefeller University, USA

Multicellular Dynamics in Germinal Center Responses

Samuel W. Kazer, Boston Children's Hospital, USA

Short Talk: Primary Nasal Viral Infection Rewires the Tissue-Scale Memory Response

Therapeutics - Leveraging and Avoiding Innate Immunity (Start 5:00PM) (Z1)

Joseph R. Arron, Sonoma Biotherapeutics, USA

Engineered Treg Therapies for Inflammatory Disorders

Paul-Joseph P. Aspuria, Synthekine, USA

Engineering Cytokines and Cells to Treat Disease: A Tale of Two Cytokines

***Eicke Latz**, University of Bonn, Germany

Drugging Innate Immunity

Lingyin Li, Stanford University, USA

Short Talk: Chemical Biology of Extracellular cGAMP Signaling in Health and Disease

Meeting Wrap-Up: Outcomes and Future Directions (Organizers) (Z2)

Meeting Wrap-Up: Outcomes and Future Directions (Organizers) (Z1)

SATURDAY, APRIL 13

Departure