Welcome to the

Yale Idea Exchange

Faculty Collaboration Series

March 27, 2025

Yale *Office of Research Development*

2 Whitney Avenue
203-432-9147
researchdev@yale.edu
researchdev.yale.edu

AGENDA

10:00 a.m. — **Event Welcome**
-Michael Crair, VPR

10:05 a.m. — **YRD Introduction**
-Christina McDonald, Director

10:10 a.m. — **Research Presentations**

10:40 a.m. — **Networking**

Please hold all questions until the end of the presentations.

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Yale *Office of Research Development*

Misson: Enhance Yale's Research enterprise by supporting collaborative research across disciplines, schools, and institutions

Vision: To be a nationally recognized exemplary research development office and a sought-after resource for researchers at Yale

MEET THE TEAM

Christina McDonald
Director
christina.mcdonald@yale.edu

Trisha Bailey, Ph.D.
Research Development Specialist

Karen Francis, Ph.D.
Program Manager, Funding Opportunities

Kirsten Hewitt, Ph.D.
Research Development Coordinator

CONTACT US

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Yale *Office of Research Development*

Research Strategy, Communication, & Funding Intelligence

Limited Submissions & Internal Competitions
We support Yale's strongest candidates for competitive, limited-opportunity grants.

Strategic Research Positioning
Get guidance on aligning your research with funder priorities and long-term trends.

Funder Engagement Support
Learn how to connect with program officers and navigate the funding landscape.

Funding Opportunity Briefs & Newsletter
Receive curated funding intel directly to your inbox.

Funding Webinars & Reverse Site Visits
Engage directly with funders through tailored events and workshops.

Large-Scale Proposal Development & Facilitation

Pre-Proposal Planning
Clarify your scope, team roles, and strategy before you start writing.

Structuring & Narrative Development
We help strengthen clarity, cohesion, and alignment with funder goals.

Graphics Support
Get visual support to make your proposal easier to understand and more compelling.

Red Team Reviews & Feedback
Receive structured feedback to improve competitiveness before submission.

Proposal & Deliverable Roadmaps
We manage timelines and deliverables so your team stays on track.

Team Facilitation & Oversight
We can help your team stay aligned from concept to submission.

Research Team Development & Strategic Collaborations

Strategic Team Formation
We help you build competitive, cross-disciplinary teams for large grant opportunities.

Interdisciplinary Research Networks
Connect across departments and schools to spark new collaborations.

Collaboration and Networking Events
Discover partners and opportunities through facilitated research events.

Research Partner Engagement
Bring funders, national labs, and institutions into conversations with Yale researchers.

Yale Idea Exchange

Research Presentations

Using Stem Cells to Explore the Genetics of Brain Disease

Kristen Brennand

Departments of Psychiatry and Genetics

kristen.brennand@yale.edu

Using Stem Cells to Explore the Genetics of Brain Disease

Kristen Brennand, PhD

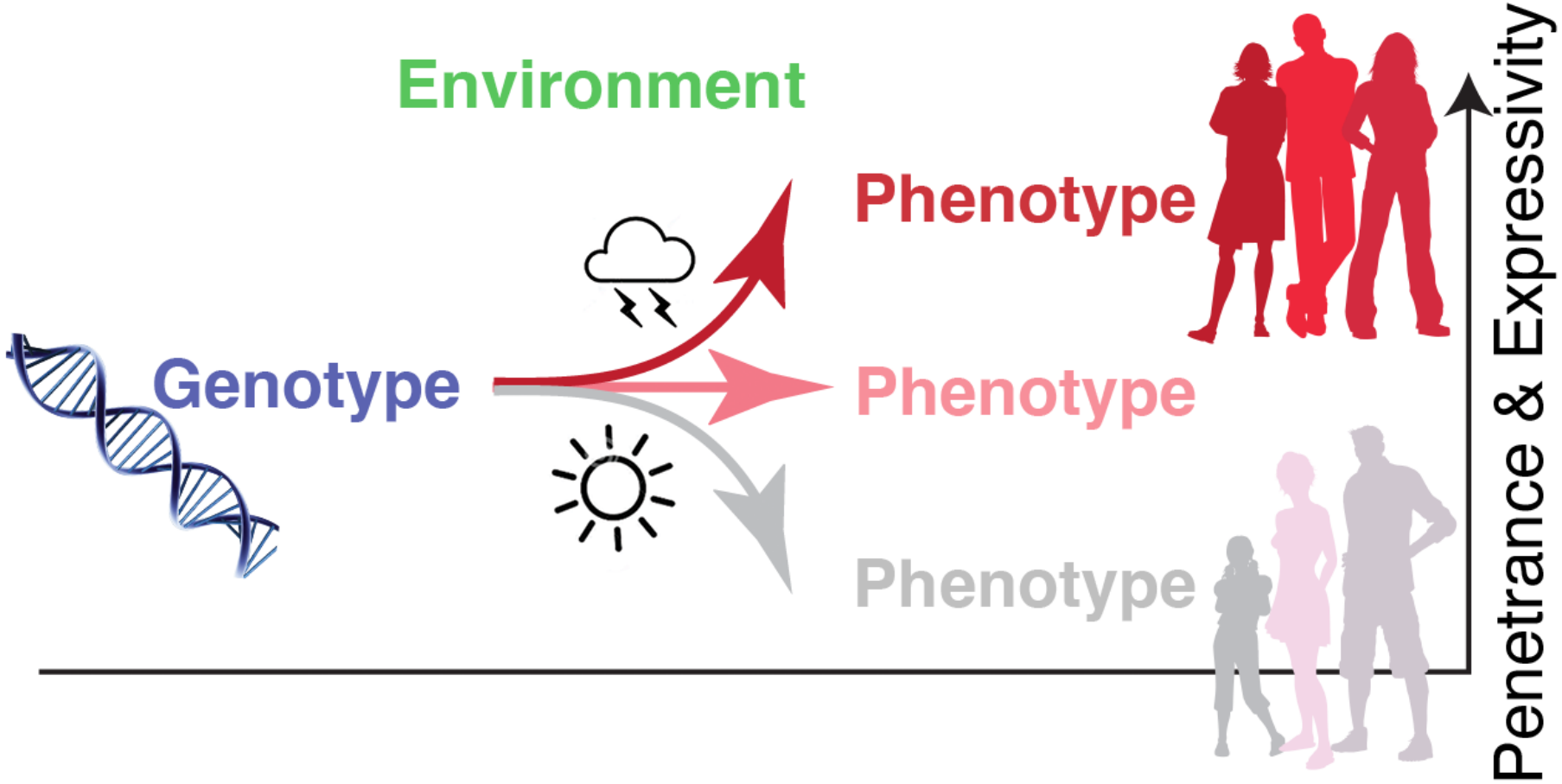
My Research

- combines expertise in human stem cell models, genomic engineering, and neuroscience to identify the mechanisms that underlie brain development, traits, and disease
- dissects the complex interplay between genetic variants and the environment to springboard personalized approaches to improve health

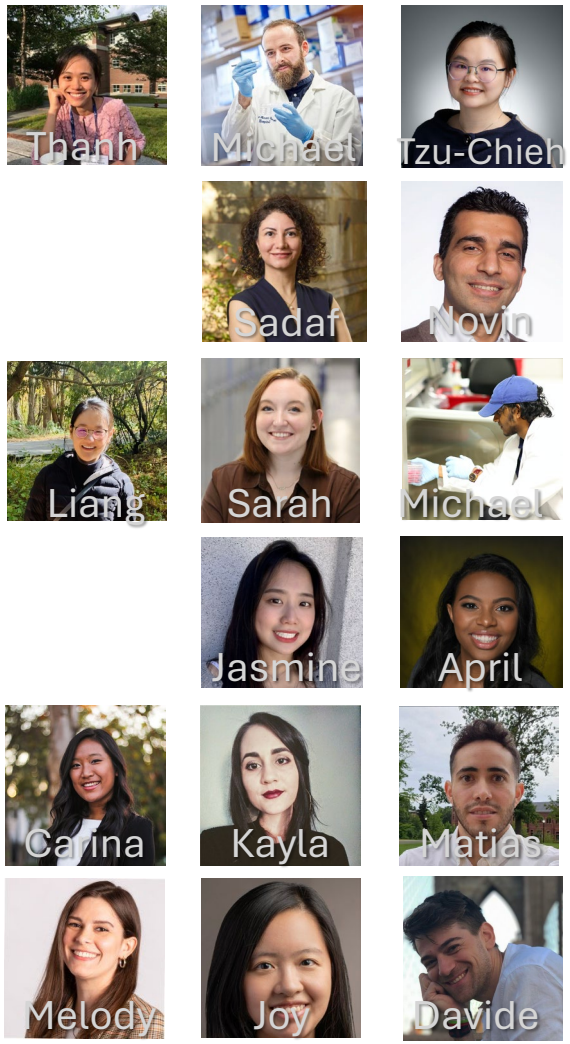
I am seeking …

- To expand our current research beyond brain cells
- Looking to explore interactions between:
  - metabolism and the brain
  - inflammation and the brain
  - mind-body connections

Can we modify the impact of genetic risk?



How does context modify genetic risk?

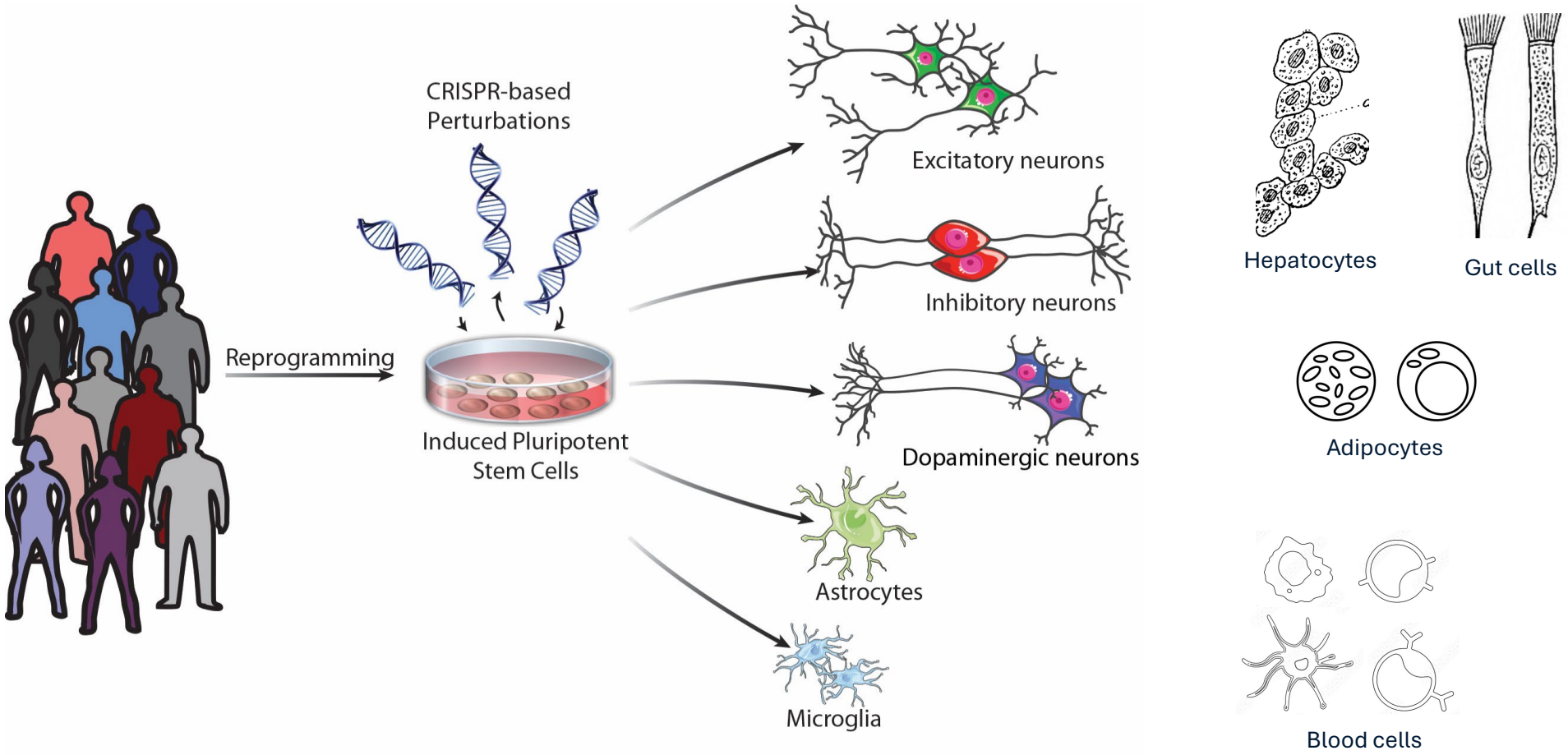


- Donor genetics
- Development
- Cell type
- Sex
- Environment

(e.g. stress, inflammation, injury, metabolism, drugs, toxins)

predisposition to

Modeling brain disease with stem cells



Kristen Brennand, PhD

Departments of Psychiatry and Genetics

kristen.brennand@yale.edu

brennandlab.org

neurogenomics

metabolism and immunology

Bakshi Lab

Submitted grants- areas of study

-Yoga for chronic sickle cell pain
-Longitudinal outcomes and risk classification of chronic SCD pain

Our current collaborations

Sickle Cell Treatment with Arginine (STaRT)
I-STRONG for SCD
STELLAR-Long term pain after HCT
Pain after HCT in BMT CTN Studies

Areas of study

- **Acute and chronic pain in sickle cell disease**
- **Risk-classification of chronic SCD pain**
- **Decision making in SCD and SCD pain**
- **Biomarkers of SCD pain**

Methods

- **Prospective longitudinal studies**
- **Intensive longitudinal data**
- **Retrospective EHR data for studying pain**
- **Qualitative methods**

Ongoing work

Sickle Pain-Related Impact (SPiRIt)

This study aims to describe risk factors associated high-impact chronic pain in SCD.

A study of transition to chronic pain in SCD

This study aims to describe risk factors associated with transition from acute to chronic pain in SCD.

Upcoming Study

Enhancing care for Hemoglobinopathy trAits identified on Newborn screening through Counseling and Education (ENHANCE)

Seeking collaborations

Sickle cell disease
Qualitative research
Chronic pain
Pediatric pain
Integrative approaches to chronic pain

CONTACT Information

Nitya Bakshi, MBBS, MS

Associate Professor of Pediatrics

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CAR-mast cells for solid tumors

Xiaolei Su

Cell Biology

Xiaolei.su@yale.edu

Develop a novel cell therapy for solid tumors

Xiaolei Su
Associate Professor
of Cell Biology

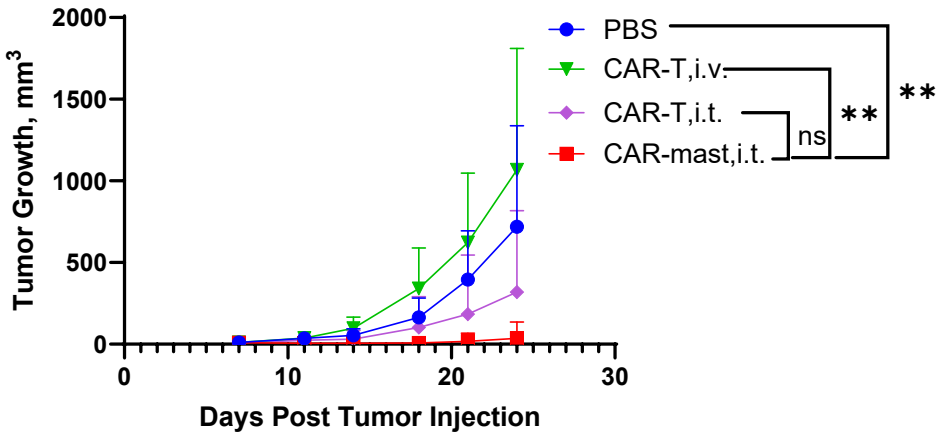
My Research

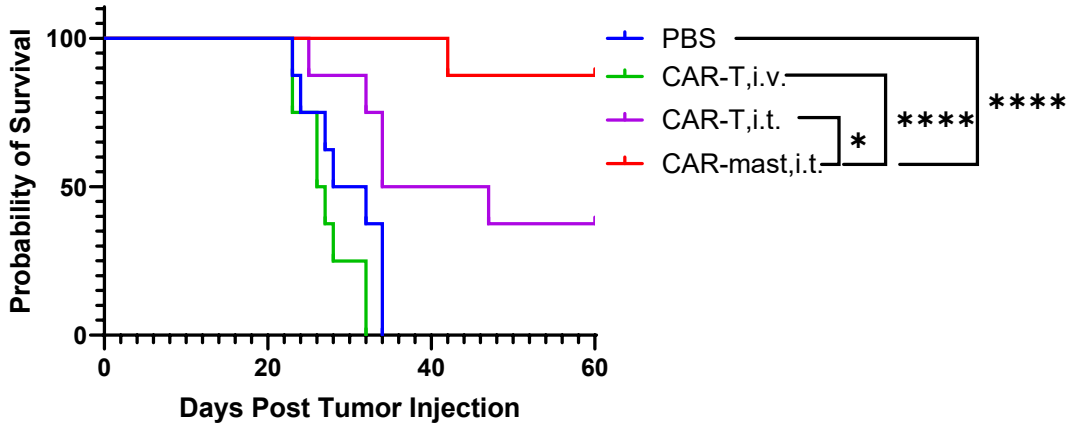
- Engineered mast cells targeting solid tumors.
  - Long-lived in tissue
  - Rechargeable
  - Duel killing mechanism: directly killing and remodeling of tumor microenvironment

I am seeking …

- Mouse models in solid tumors including brain, liver, breast, renal, prostate, and pancreatic cancers.
- Patient samples to test the efficacies of CAR-mast cells.

Superior anti-tumor effects by CAR-mast cells





Xiaolei Su, Associate Professor

Cell Biology

Xiaolei.su@yale.edu

Sulab.net

Immune Signaling; Cancer Immunotherapy

Mouse tumor models; Cancer patient samples

Electronic control of biosystems via bacterial protein nanowires to mitigate pollution & diseases

Nikhil S. Malvankar, Ph.D.

Molecular Biophysics and Biochemistry, Microbial Sciences Institute

Nikhil.Malvankar@yale.edu *MalvankarLab.yale.edu*

How to use electron-transporting cells & proteins?

My Research

- *Diverse environmentally & clinically important bacteria use hair-like protein "nanowires" to transfer metabolic electrons to extracellular molecules to respire w/o O_2*
- *Efficiently connect bacterial and biomolecular systems electronically using metal & metal-free nanowires for high-throuput environmental & health monitoring*

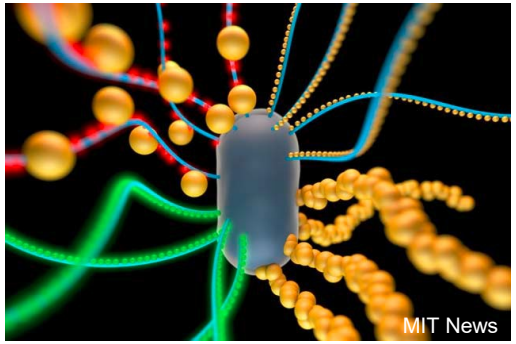
1. ***Removal*** *of pollutants (U, Oil) & gases (CH_4, CO)*
2. ***Synthesis*** *of Ultrafast & living electronic materials*
3. ***Production*** *of energy and fuels from organic waste*
4. ***Control*** *microbial growth to prevent & cure infections*
5. ***Sensing/manipulating*** *enzyme activity for catalysis*

I am seeking …

- *Help with developing use of conductive bacteria & nanowires*
- *Understanding the transport of electrons, spins, ions, and excitons at unprecedented ultrafast (<100 fs) rates & over distances 10,000 times the size of an individual cell*
- *Leveraging charge transfer from microbe-to-microbe/plants/hosts in diverse species & environments*

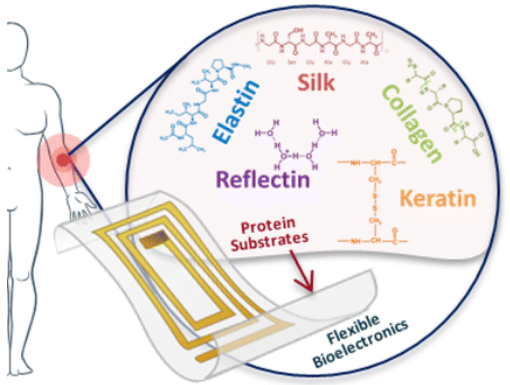
Imagine a world of low-cost, biodegradable nanomaterials w/o toxicity

Bacterial Factory
Electronics & Photonics



Fast & Scalable Synthesis
5 seconds for 1GB Chip

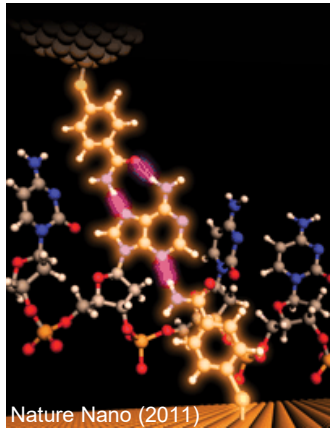
Flexible



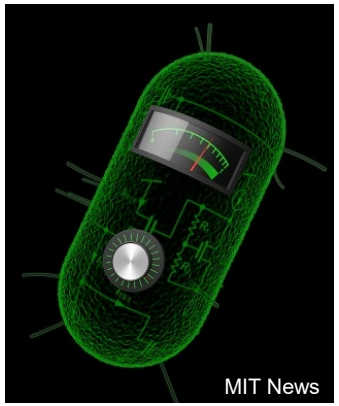
ACS Biomat. (2016)

Regenerative Electronics

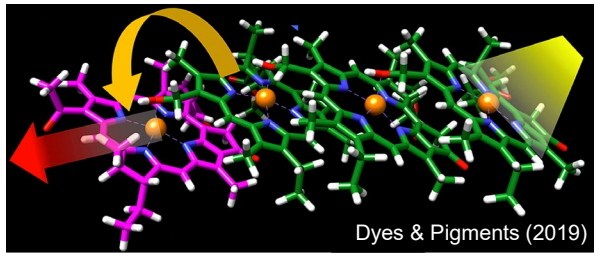
DNA Sequencing



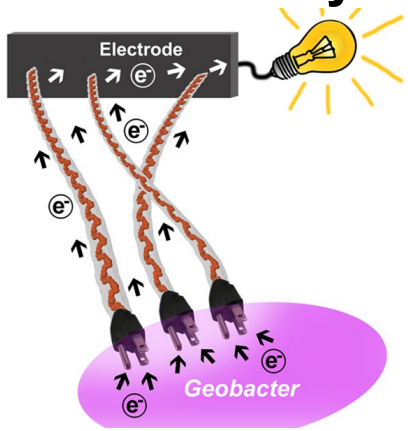
Computing



Light Harvesting

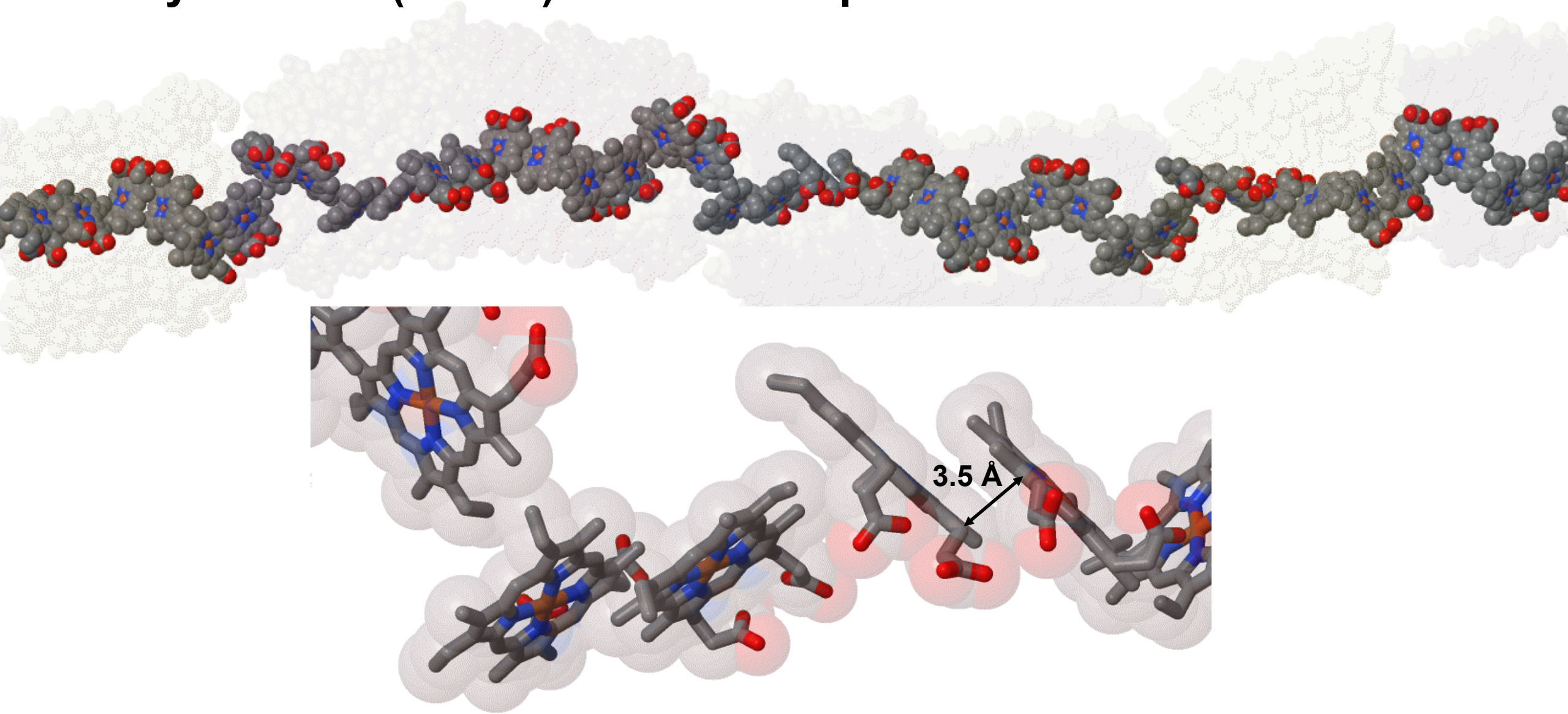


Self-Powered Body Sensors



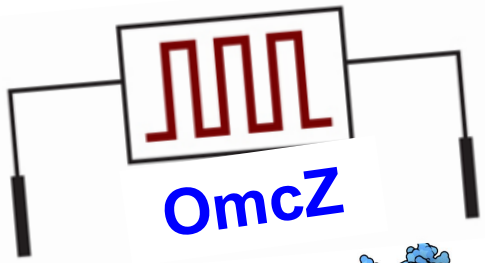
Bacteria convert glucose/ humidity to electricity via *protein nanowires*

Closely-stacked (~3.5 Å) hemes transport electrons over micrometers

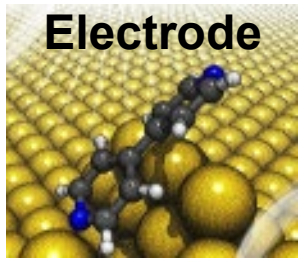


Quantum Behavior (of Electrons, Spins, Ions, & Excitons) Enhances Nanowire Conductivity 30,000-fold to Accelerate Cell Growth

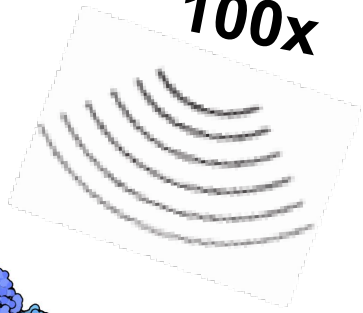
Electric Field
1000x

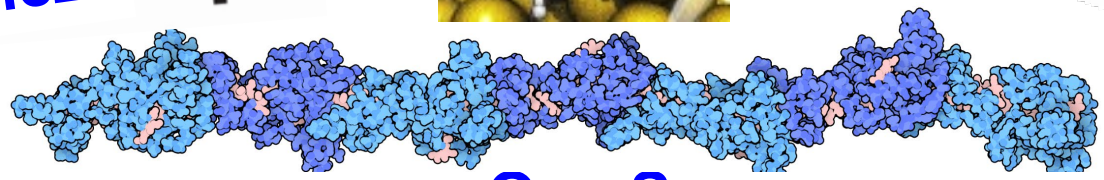


Adsorption
100X

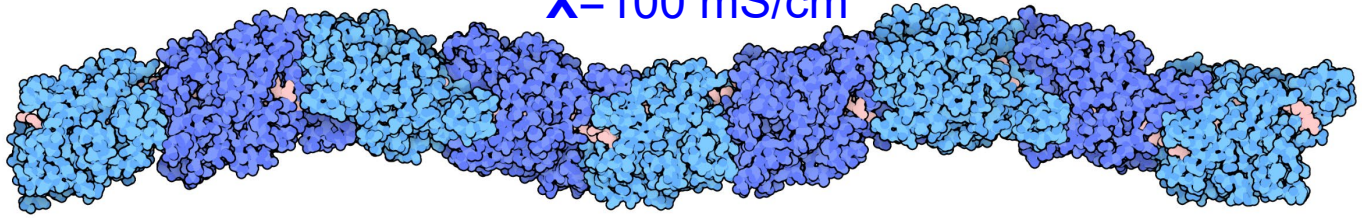


Compression
100x





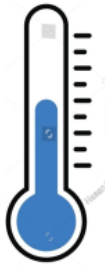
OmcS
X=100 mS/cm



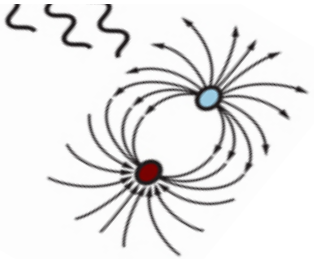
Humidity
30,000X

100X

Light
100x



Cooling
100X



Magnetic Field
10,000x

Nikhil Malvankar, Assoc. Professor

Mol. Biophys. & Biochem., Microbial Sci. Institute

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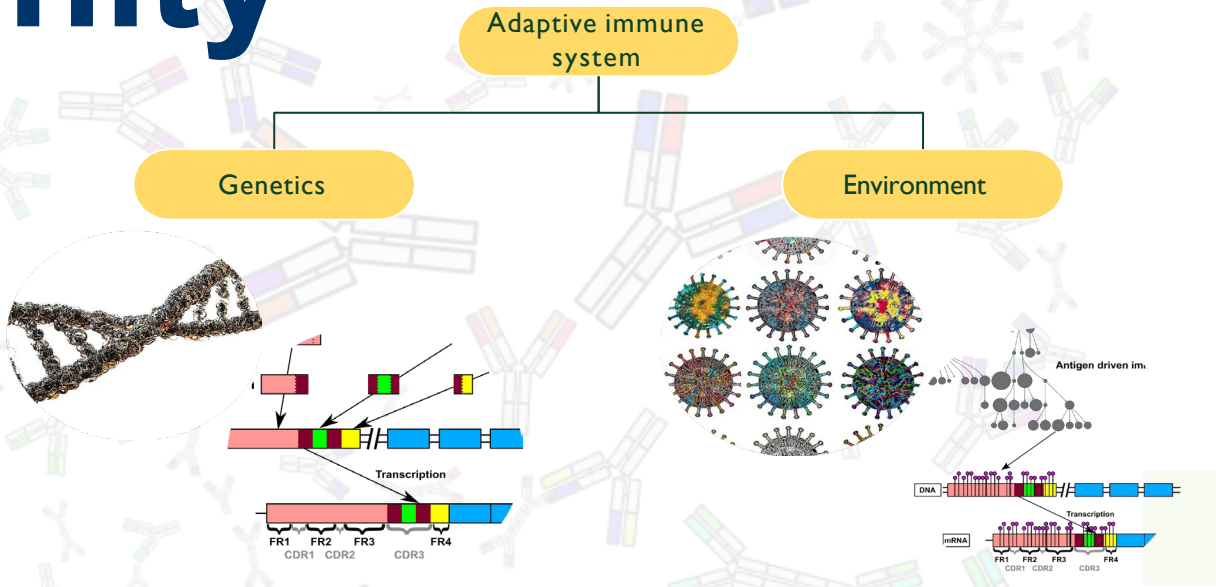
I combat climate change, pollution & diseases.

I need help with developing use of nanowires.

How genetic and environmental factors are shaping adaptive immunity

Gur Yaari, Ph.D.
Department of Pathology



Brief History

Maths and Physics
B.Sc. HUJI

High Energy Physics
M.Sc. HUJI

Physics of Complex Systems
P.hD HUJI

EEB & Computational Immunology

Yale
Post Doctorate

Systems Immunology Bioengineering

Bar Ilan University

Department of Pathology

Yale

Computational Immunology

- My Research
- Method development to represent and analyze high dimensional data
- Antibody and TCR repertoire sequencing analysis
- Genetic and evolution of the adaptive immune system

I am seeking …

- Challenging data types that require innovative analysis approaches
- Unique clinical cohorts
- Interesting questions ;)

Gur Yaari, Ph.D.

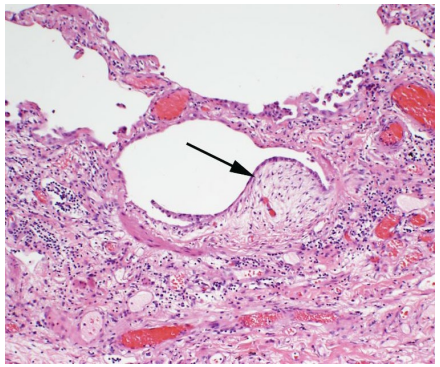
Department of Pathology

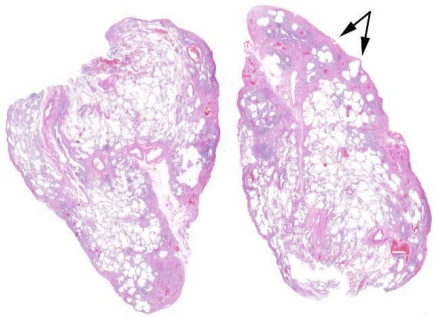
gur.yaari@yale.edu

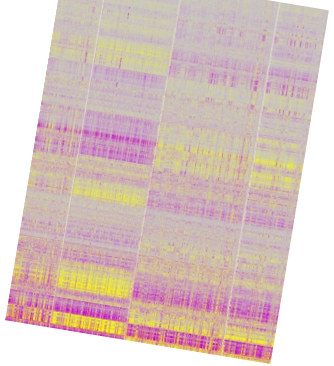
. https://medicine.yale.edu/profile/gur-yaari/

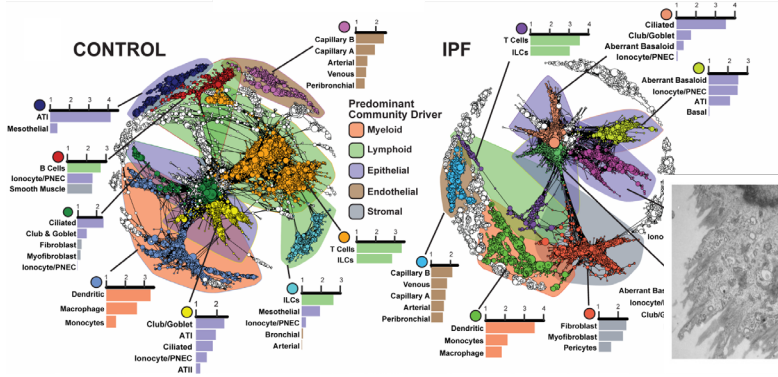
. Data analysis and modeling

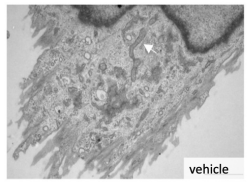
. Interesting questions ;)

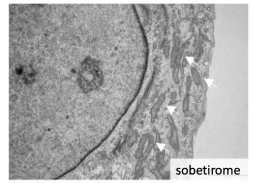




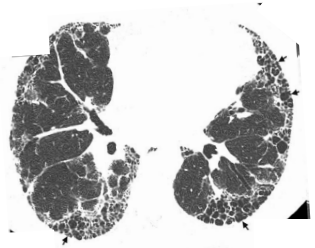


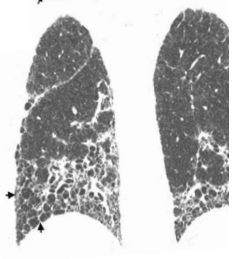


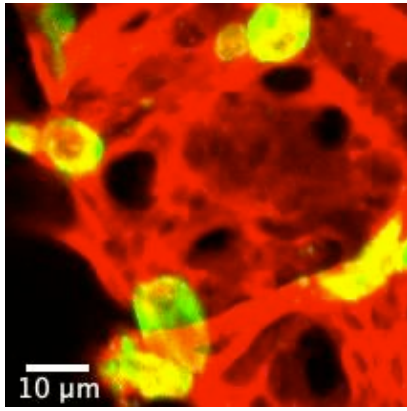




A Digital Twin of Human Pulmonary Fibrosis







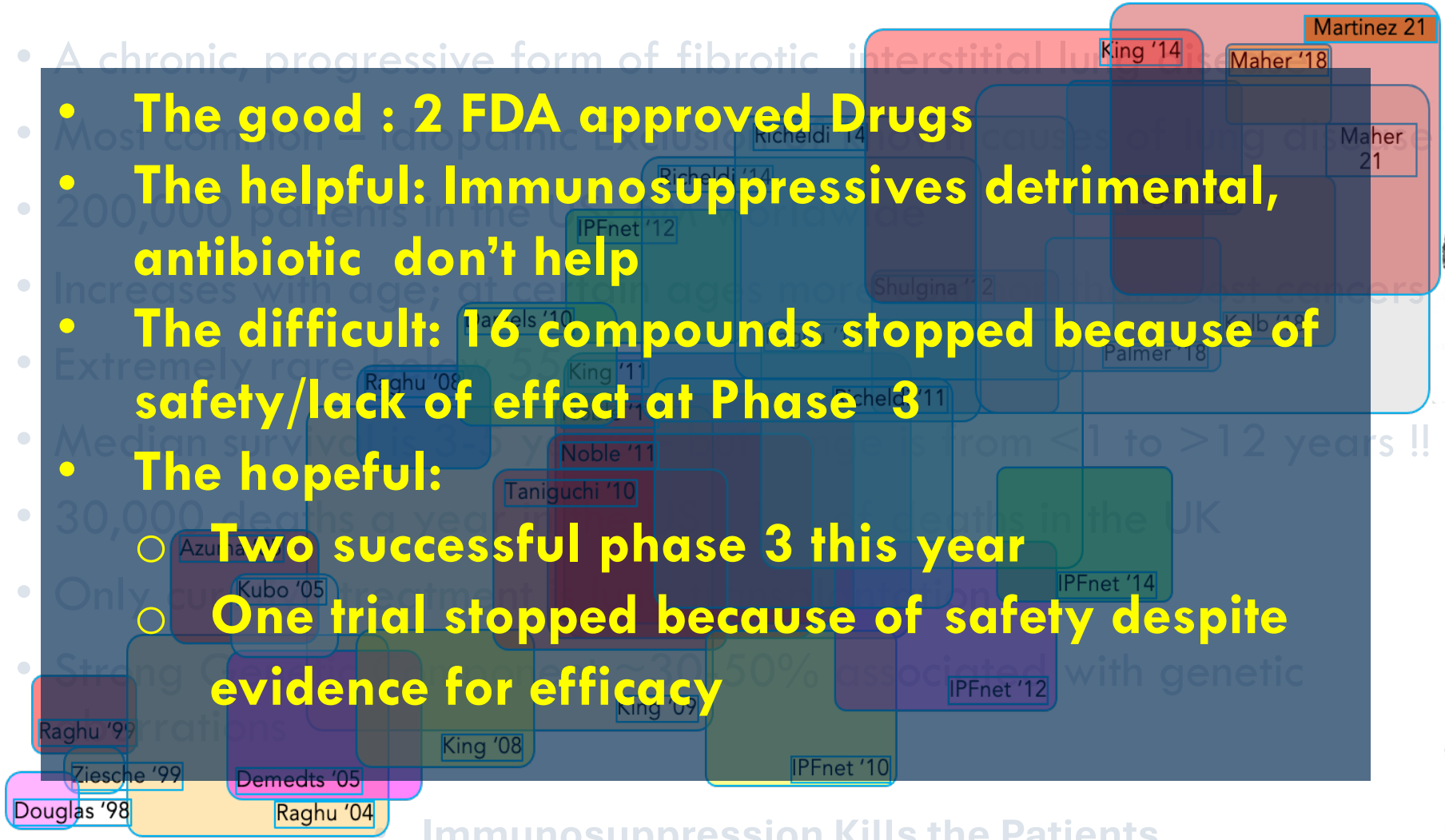
Naftali Kaminski MD

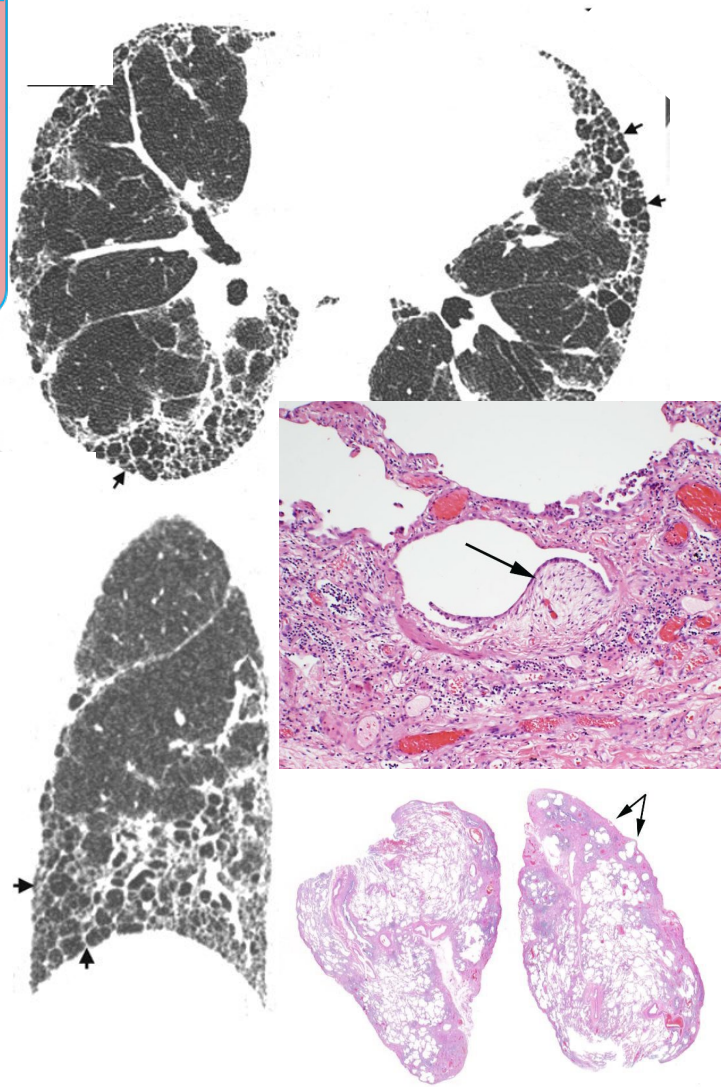
Pulmonary, Critical Care and Sleep Medicine

Naftali.kaminski@yale.edu

Pulmonary Fibrosis

- The good : 2 FDA approved Drugs
- The helpful: Immunosuppressives detrimental, antibiotic don't help
- The difficult: 16 compounds stopped because of safety/lack of effect at Phase 3
- The hopeful:
  - Two successful phase 3 this year
  - One trial stopped because of safety despite evidence for efficacy





Immunosuppression Kills the Patients

- But Some Drugs can slow down the disease!

“Omics’ of Advanced Lung Disease

Peripheral blood biomarkers

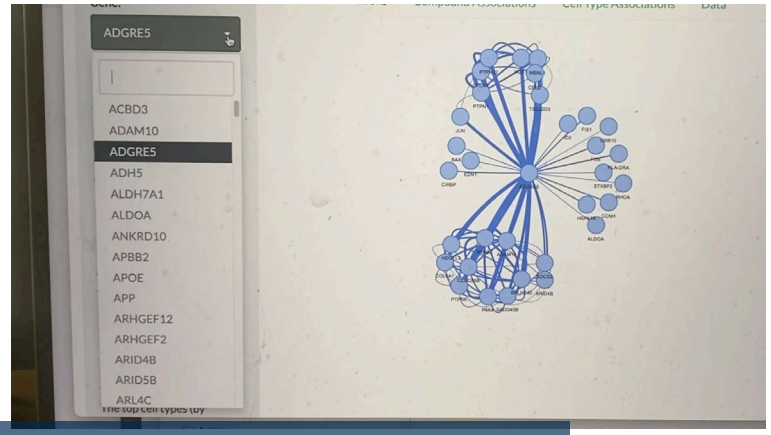
Numerous targets

‘omics of lung diseases (lung, BAL, LLN, blood)

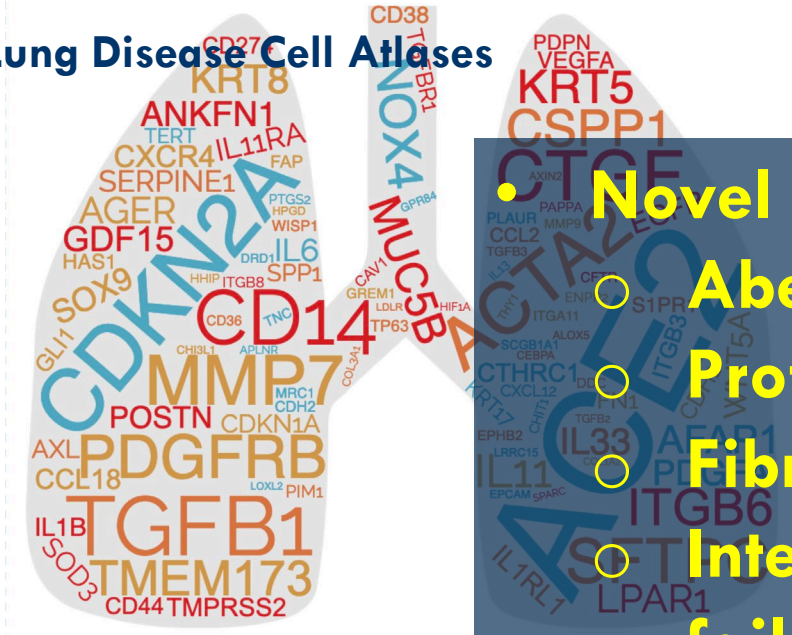
Single cell profiling technologies

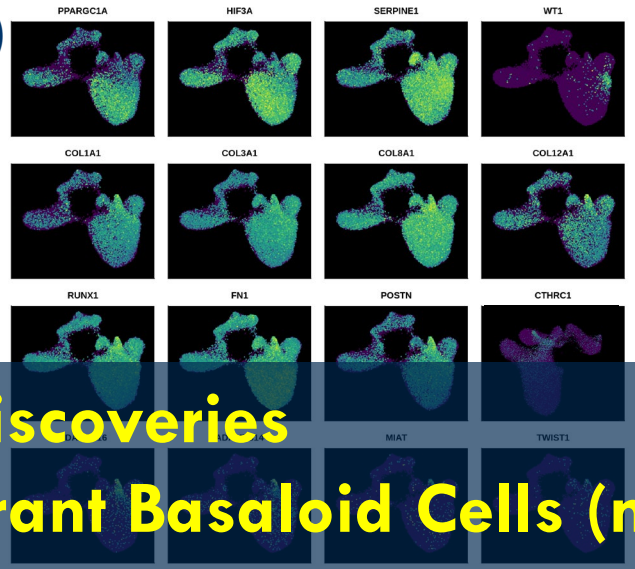
Systems biology

Dynamic computational modeling of drug effects



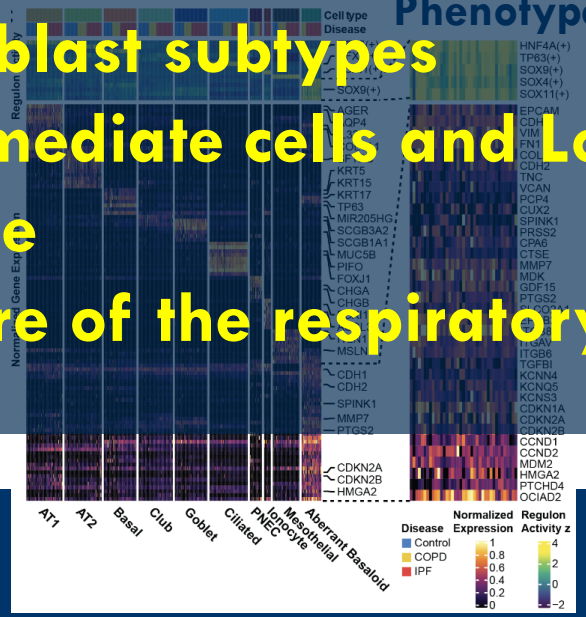
Lung Disease Cell Atlases

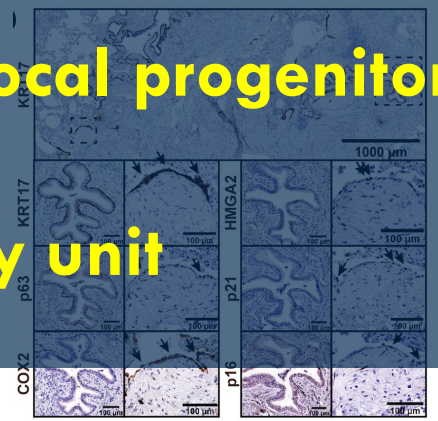


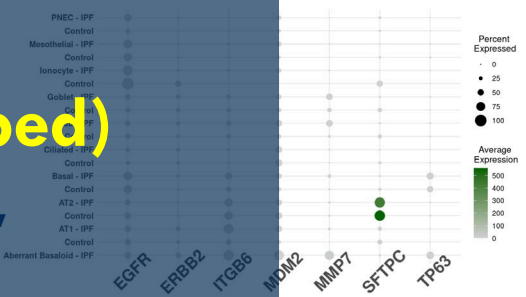


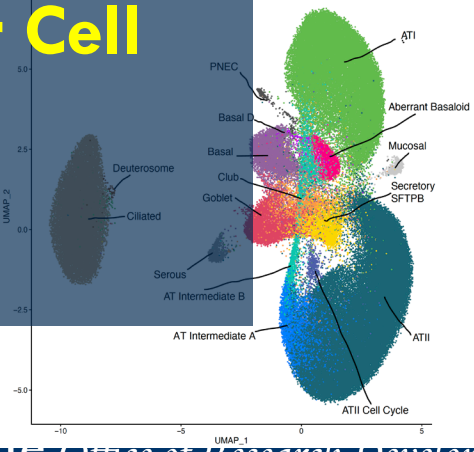
- **Novel Discoveries**
  - **Aberrant Basaloid Cells (never described)**
  - **Profibrotic macrophages**
  - **Fibroblast subtypes**
  - **Intermediate cells and Local progenitor Cell failure**
  - **Failure of the respiratory unit**

Scan me









Yale Idea Exchange

Yale Office of Research Development

A Digital Twin of Human Pulmonary Fibrosis

What I have:

Pulmonary Fibrosis Resources

- Unprecedented amount of cellular and spatial data
- Substantial mechanistic information
- Emerging knowledge on disease trajectories
- Industry interests

I am seeking …

- Collaborations in establishing Foundational models that allow utilization of all data to create a digital twin of the human fibrotic lung on all its cellular components to accelerate drug development
- Users and testers of specific hypotheses and models
- Disruptive ideas and fresh looks at our data

Naftali Kaminski MD

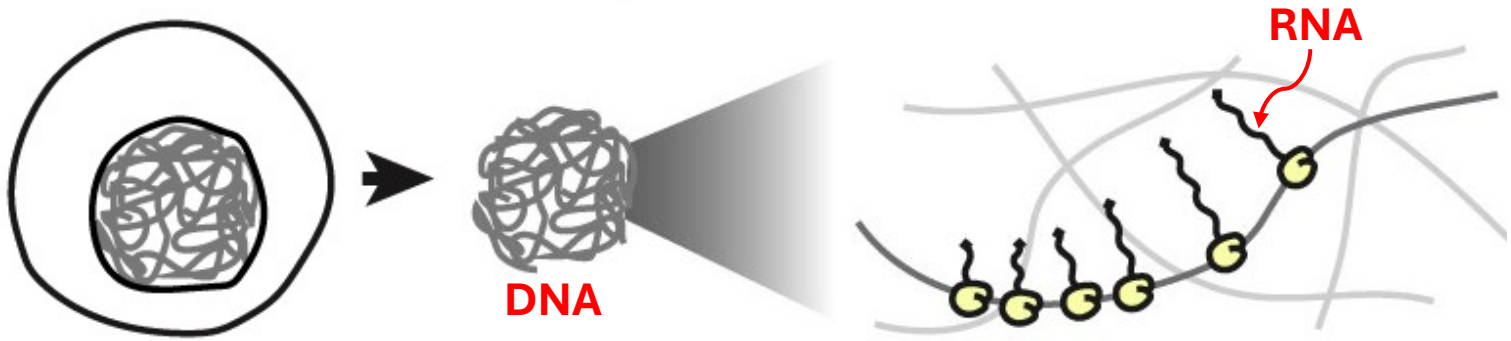
Pulmonary, Critical Care and Sleep Medicine

Naftali.kaminski@yale.edu

https://medicine.yale.edu/lab/kaminski/

Translational Medicine, Fibrosis, Genomics

AI, machine learning, drug design



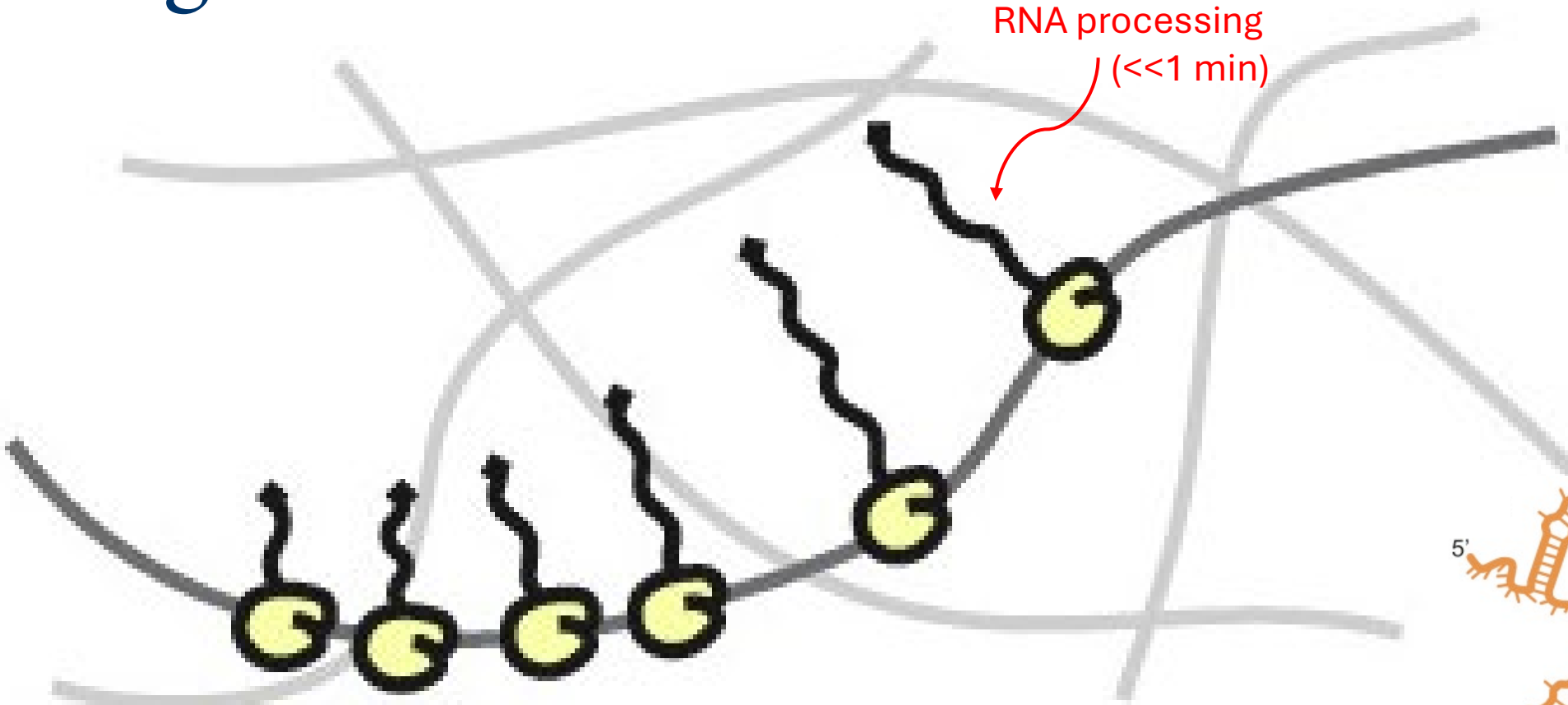
RNA senses cellular change

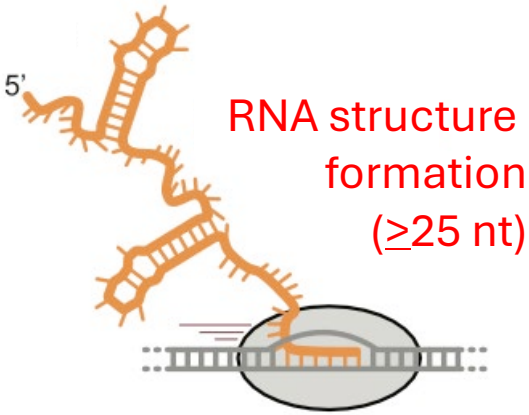
Karla Neugebauer

Molecular Biophysics and Biochemistry

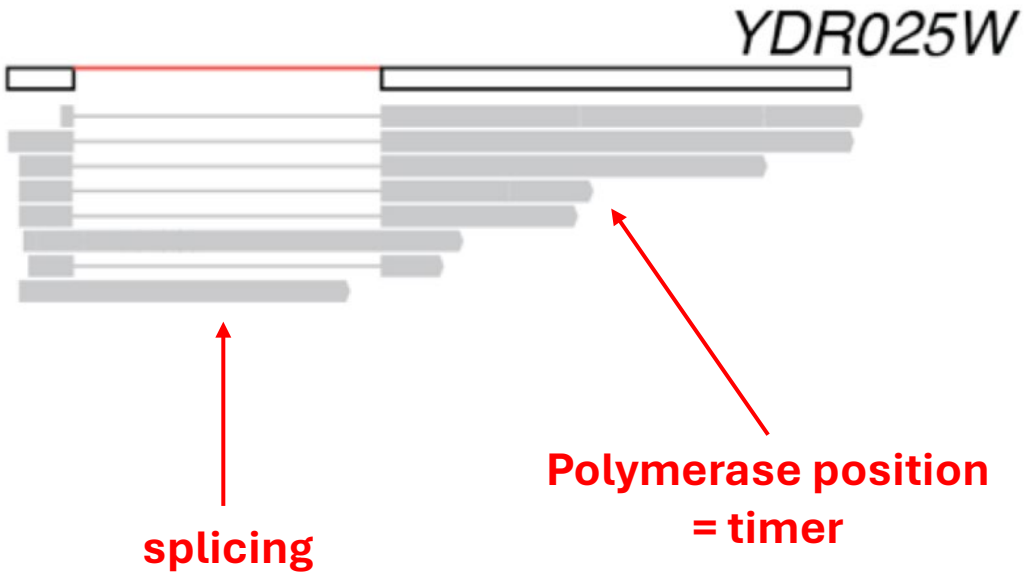
Karla.Neugebauer@yale.edu

Imagine nascent RNA

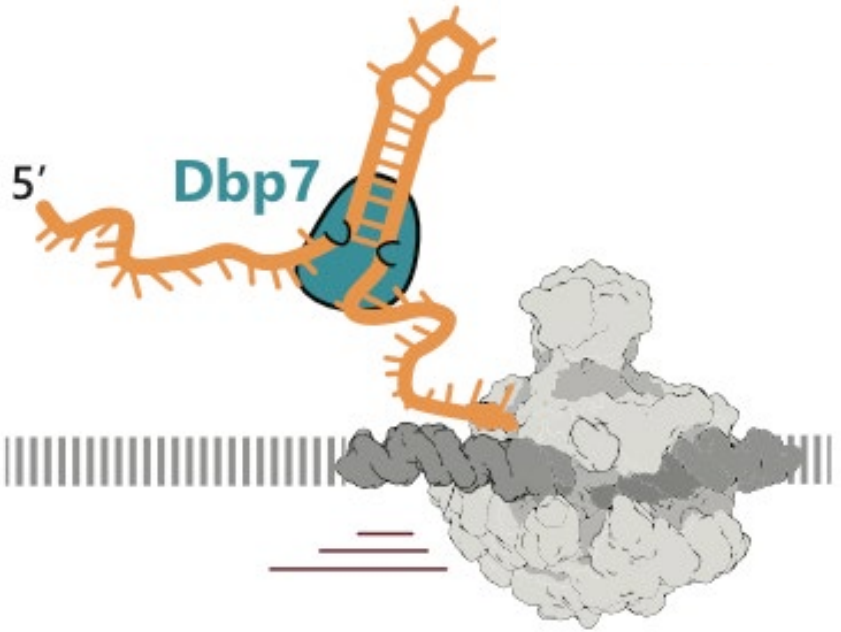




Custom sequencing approaches



Long read sequencing of nascent RNA

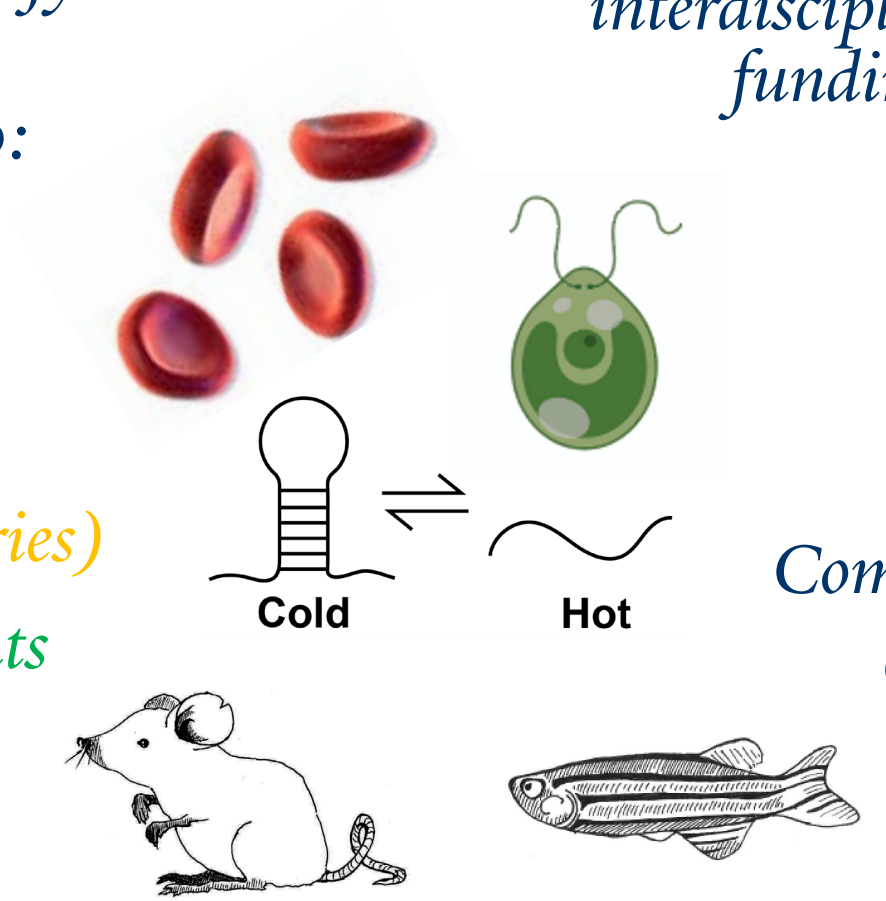


CoSTseq tracks structure formation

RNA senses cellular change

My Research can discover and quantify rapid changes in RNA abundance, sequence and structure in response to:

- *Cancer/chemotherapeutics*
- *Blood diseases*
- *Temperature change, nutrient availability (acclimation, biofactories)*
- *Neural development (splicing events associated with autism)*
- *Neurological disease… and more!*



I am broadly interested in interdisciplinary research and funding opportunities…

Neuroscience

Ecology

Hematology

Cancer Biology

Computational biology

Green Engineering

AI

Professor Karla Neugebauer

MB&B

karla.Neugebauer@yale.edu

https://www.neugebauerlab.com/

RNA biochemistry

Measuring change in living systems

Biophysical mechanisms of gene regulation

Kirstin Meyer

MCDB & Systems Biology Institute

Kirstin.Meyer@yale.edu

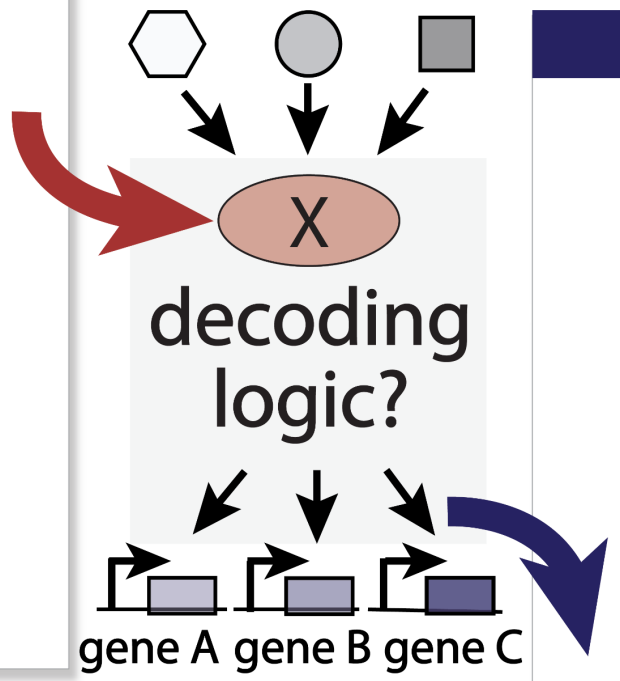
Biophysical mechanisms of gene regulation

Our Research

Understanding emergent gene regulatory behaviors through the lens of chromatin biophysics

- single-molecule imaging
- optogenetics
- synthetic approaches
- mouse embryonic stem cells

SYNTHETIC INPUT



SIGNALING OUTPUT

Meyer et al., 2023, Nature Communications
Meyer et al., 2025, Nature Communications, in revision
Meyer et al., 2025, Nature Reviews Genetics, accepted

Looking for collaborators

- Theoretical-computational approaches to understand condensates, chromatin biophysics (e.g. RNA-protein interactions)

- Spatial transcriptomics analysis (e.g. cell-cell communication)

Kirstin Meyer

MCDB

Kirstin.meyer@yale.edu

meyerlab@yale.edu

Phase separation, biophysics, gene regulation, optogenetics, imaging

Theoretical-computational approaches underlying phase separation, spatial transcriptomics

Dark matter of the genome: microproteins

Sarah Slavoff

Yale Chemistry

sarah.slavoff@yale.edu

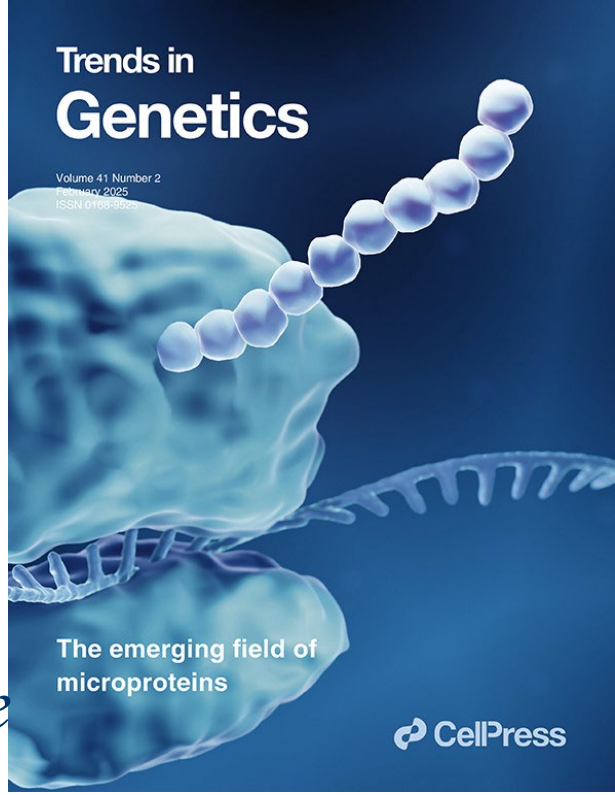
Microproteins: technology, basic biology and applications

My Research

- *How many proteins and peptides are really encoded in the human genome?*
- *Technology: proteomics and sequencing for microprotein discovery and characterization*
- *Molecular mechanisms and cellular functions*
- *Collaborations: model organisms, human disease, big questions*

I am seeking …

- *Disease applications: biomarkers, mechanism*
- *New biological questions: microproteins are everywhere*
- *We are always ready to generate preliminary data to test ideas and support grant applications*



Funding landscape for microprotein research

With Grace Chen and Joe Craft, Yale IBIO

In response to a specific call for research on microproteins in the immune system

Discovery of micropeptides in human immune cells and systemic lupus erythematosus

With Ruth Halaban, Yale Dermatology

The Mark Foundation for Cancer Research

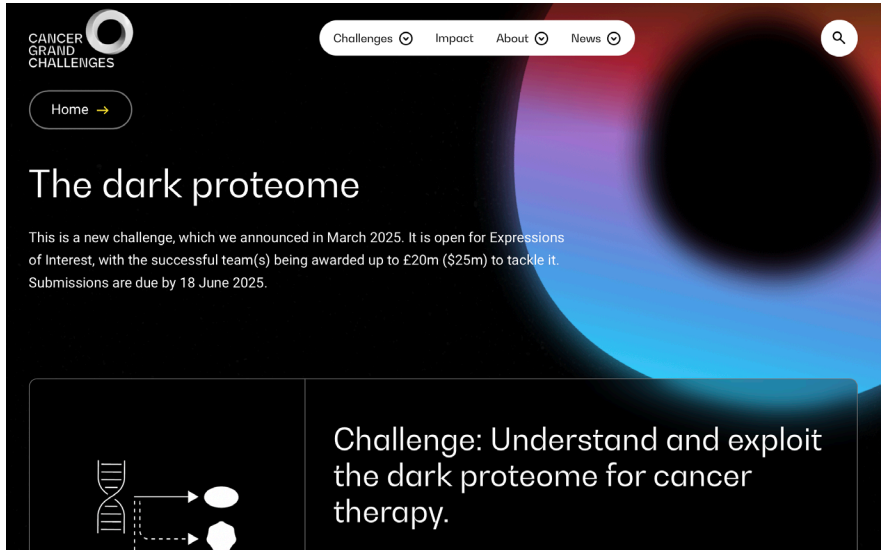
About Us · Research · Workshops · Investments · Impa

Discovery of Microproteins in Melanoma

2022 Emerging Leader Award

Sarah Slavoff, PhD, Yale University

Current RFA, part of international team



The time to think big on collaborative microprotein research is now

Sarah Slavoff, Associate Professor Tenure

Chemistry (secondary, MB&B)

sarah.slavoff@yale.edu

slavofflab.yale.edu

Microproteins, proteomics, genomics

Cancer, immunobiology, structural biology,
and anyone who finds this question inspiring!

Understanding gene module evolution using AI-based approaches

Kejue Jia

Department of Molecular, Cellular and Developmental Biology

Kejue.jia@yale.edu

Associate Research Scientist

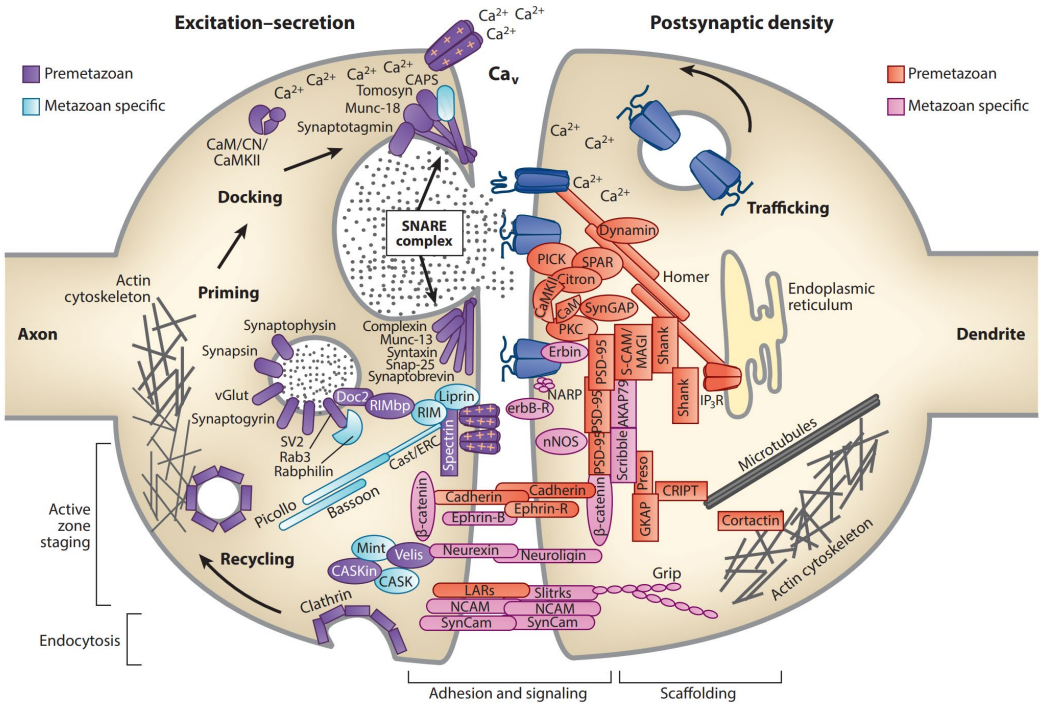
My Research

- *Tracking synaptic protein interactions across different organisms*
  - *Advanced protein homolog detection*
  - *Protein-Protein interaction prediction*
  - *Cross species cell type comparison (scRNA seq analysis)*

We are seeking …

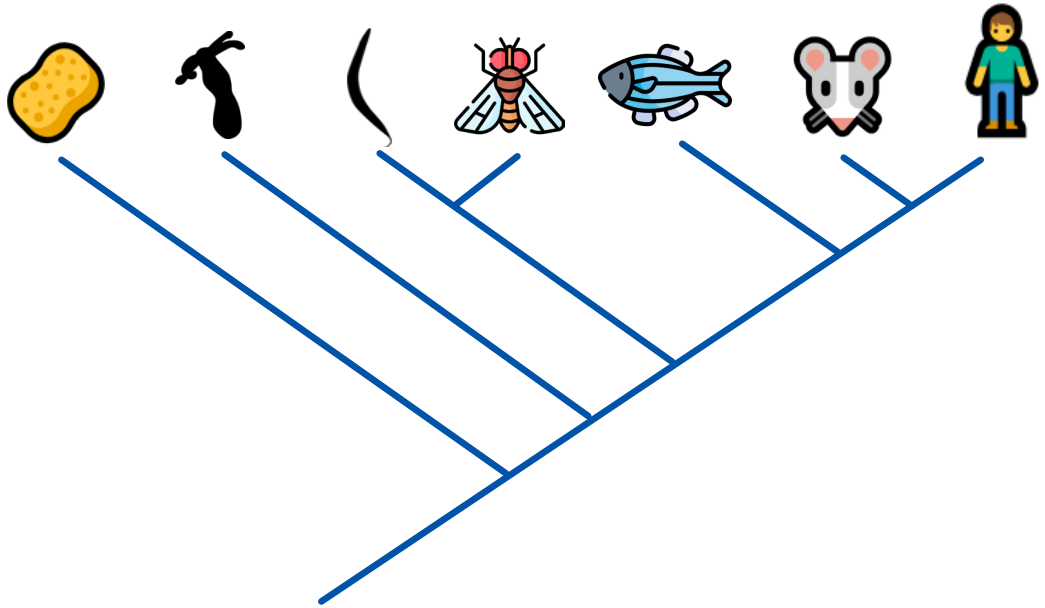
- *Biologists interested in comparative study of gene module/protein machinery across different organisms*
  - *Gene homolog detection and annotations, Protein interaction predictions, …*
- *Teams with AI expertise / resources*
  - *Can work together to build AI-based computational infrastructures for solving biological questions*

Tracking synaptic protein interactions across different organisms



Liebeskind, Benjamin J., et al. 2017. *Annual review of ecology, evolution, and systematics*

Complex protein machineries working together within a synapse



When those interactions start to take place in the history of evolution

Synaptic proteins with interactions

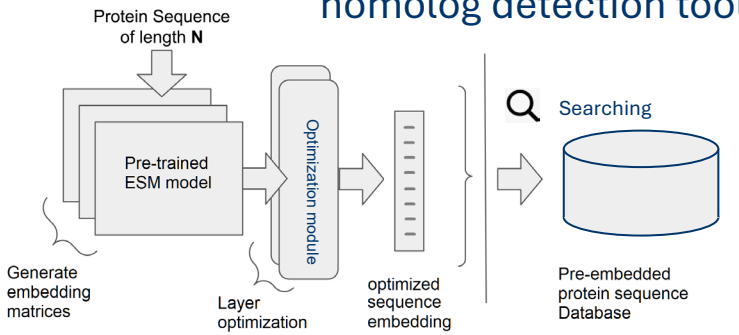
Similar proteins in

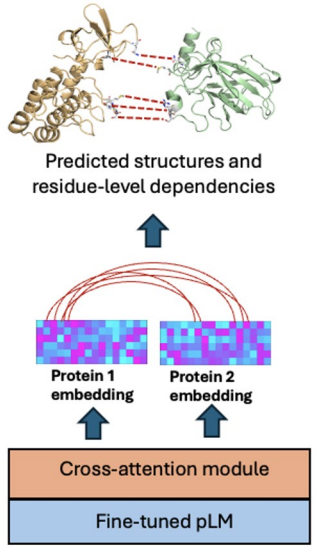
Candidate protein pairs

Deep learning model

Interaction prediction

AI-based protein homolog detection tool





Using language model to predict how proteins “talk” to each other

Kejue Jia, Associate Research Scientist

Molecular, Cellular and Developmental Biology

kejue.jia@yale.edu, jacob.musser@yale.edu

https://www.musserlab.org/

AI-based tools for studying gene module evolution

Biologists OR AI specialists

Yale Idea Exchange

Networking

Examples of YRD Supported Large Grant Opportunites

- NSF-AFRL REsearch in FLoquet Engineered QuanTum Systems (NSF-AFRL REFLEQTS)
- National Artificial Intelligence Research Institutes
- Biology Integration Institutes (BII)
- NSF Regional Innovation Engines (NSF Engines)
- Engineering Research Centers
- Expeditions in Computing (Expeditions)
- Centers for Chemical Innovation (CCI)
- Industry-University Cooperative Research Centers Program (IUCRC)
- Materials Innovation Platforms (MIP)
- Materials Research Science and Engineering Centers (MRSEC)
- Quantum Leap Challenge Institutes (QLCI)
- Science and Technology Centers: Integrative Partnerships

DARPA — QBI: Quantum Benchmarking Initiative

Defense University Research Instrumentation Program (DURIP)

Energy Frontier Research Centers (EFRCs)

NIH — P01, P30

Yale *Office of Research Development*

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YRD | *Supporting Yale's research community from concept to collaboration.*