



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 <i>-Michael Crair, VPR</i>
10:05 a.m.		YRD Introduction <i>-Christina McDonald, Director</i>
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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Mission: 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

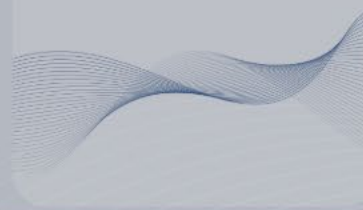
MEET THE TEAM



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

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

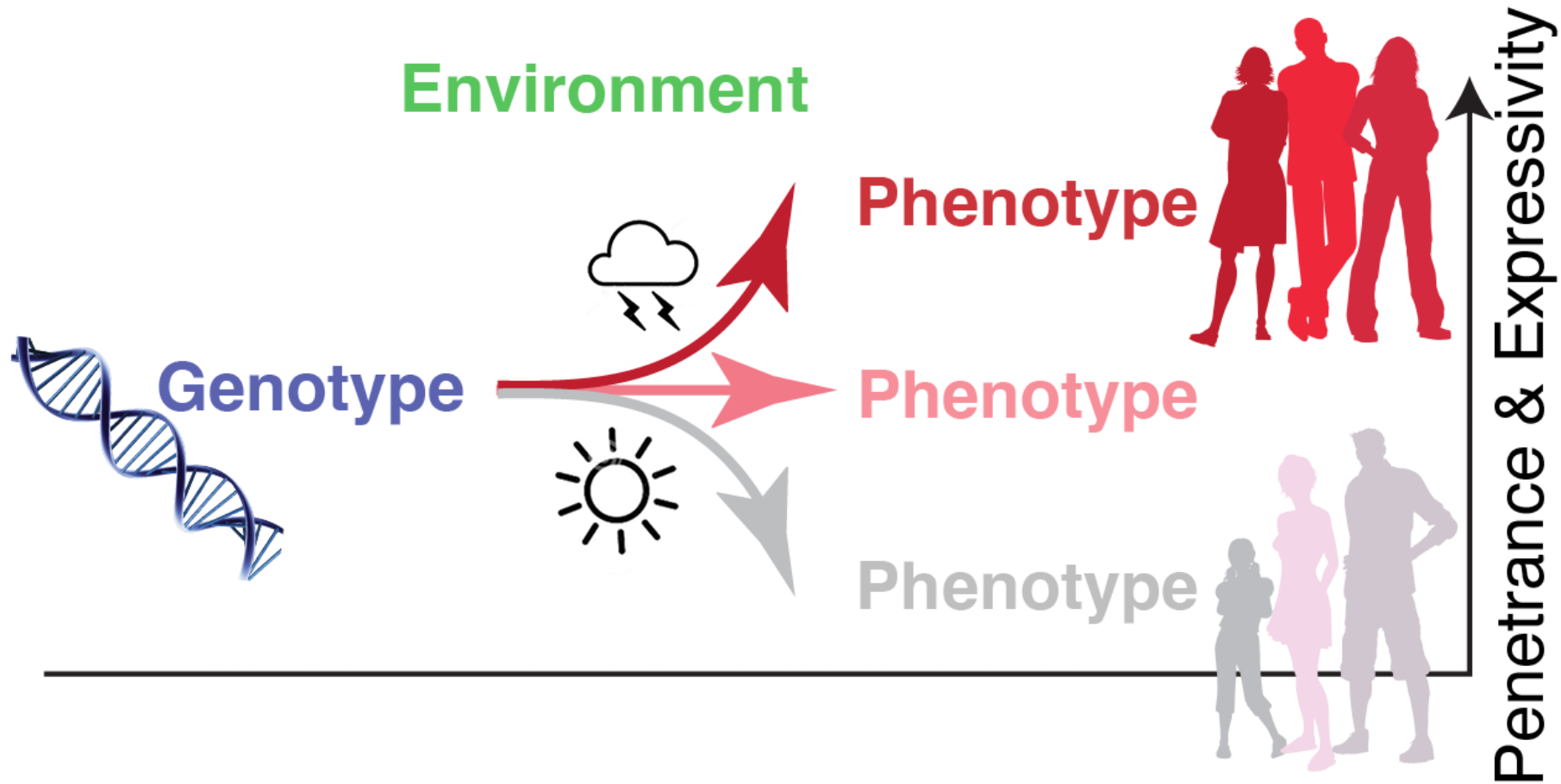
I am seeking ...

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

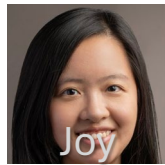
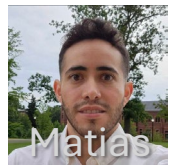
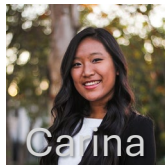
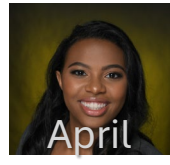
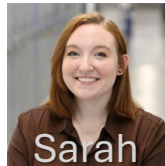
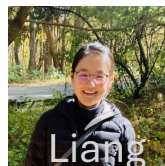


Kristen Brennand, PhD

Can we **modify** the impact of genetic risk?

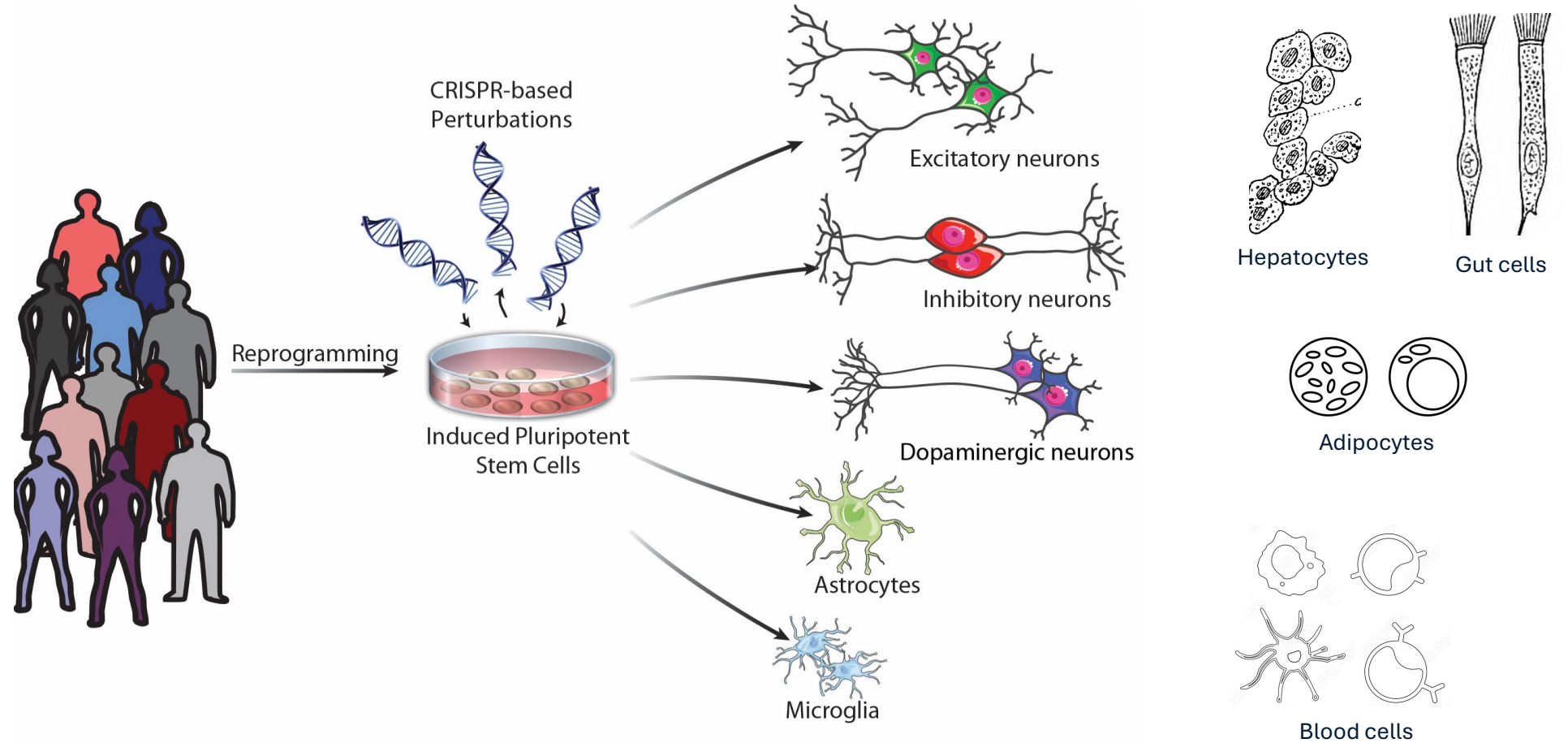


How does **context** modify genetic risk?



- Donor genetics
- Development
- Cell type
- Sex
- Environment
(e.g. stress, inflammation, injury, metabolism, drugs, toxins)

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

 nitya.bakshi@yale.edu

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

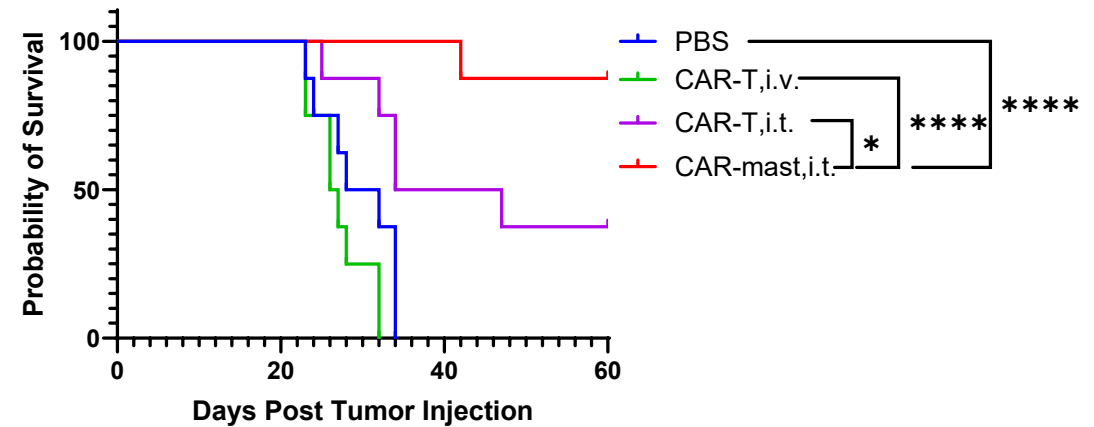
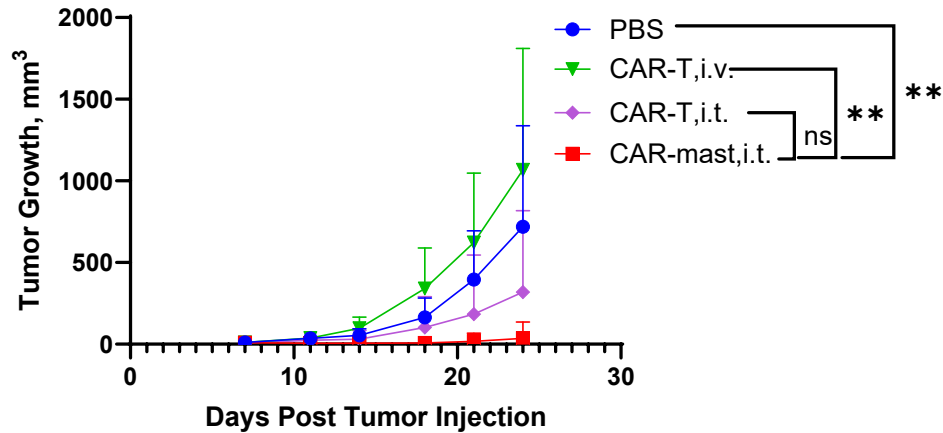
My Research

- Engineered mast cells targeting solid tumors.
 - Long-lived in tissue
 - Rechargeable
 - Dual 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

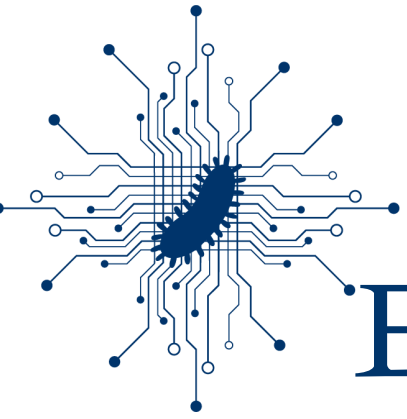
 Cell Biology

 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

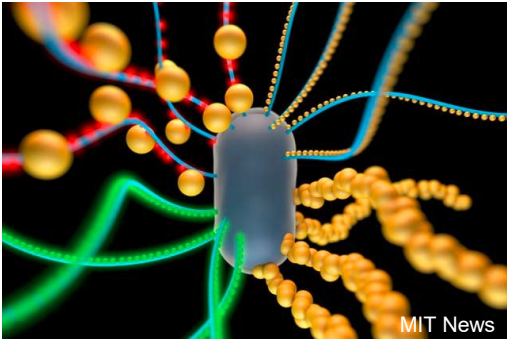
- *Diverse environmentally & clinically important bacteria use hair-like protein “nanowires” to transfer metabolic electrons to extracellular molecules to respire w/o O₂*
- *Efficiently connect bacterial and biomolecular systems electronically using metal & metal-free nanowires for high-throuput environmental & health monitoring*
 1. **Removal** of pollutants (U, Oil) & gases (CH₄, 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 ...

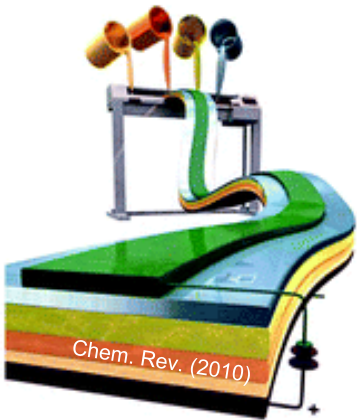
- *Help with developing use of conductive bacteria & nanowires*
- *Understanding the transport of electrons, spins, ions, and excitons at unprecedented ultrafast (<100 fs) rates & over distances 10,000 times the size of an individual cell*
- *Leveraging charge transfer from microbe-to-microbe/plants/hosts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

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

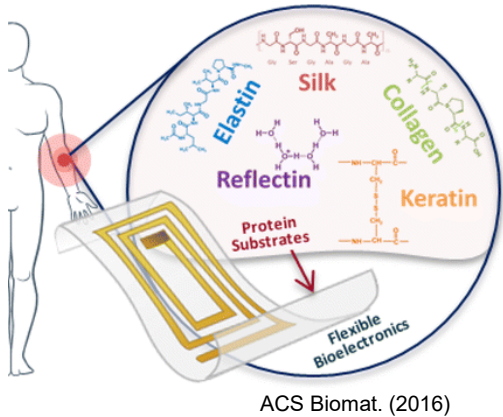
Bacterial Factory Electronics & Photonics



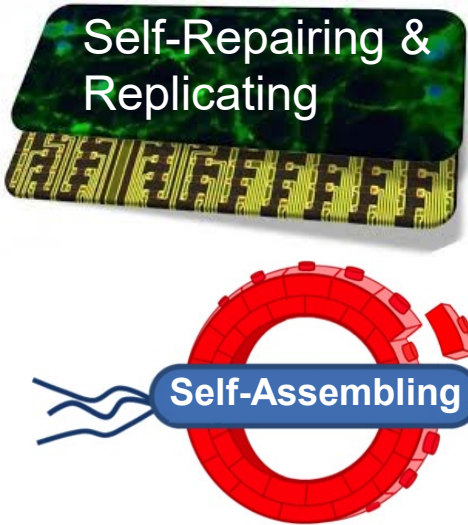
Fast & Scalable Synthesis 5 seconds for 1GB Chip



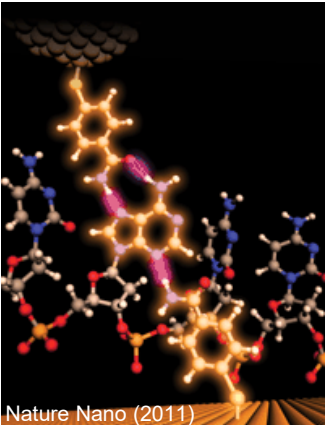
Flexible



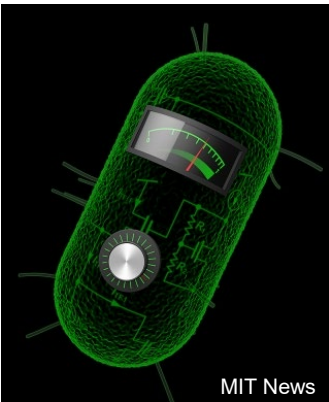
Regenerative Electronics



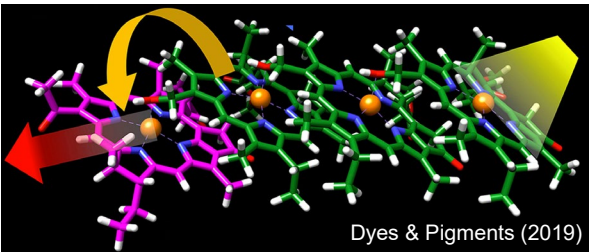
DNA Sequencing



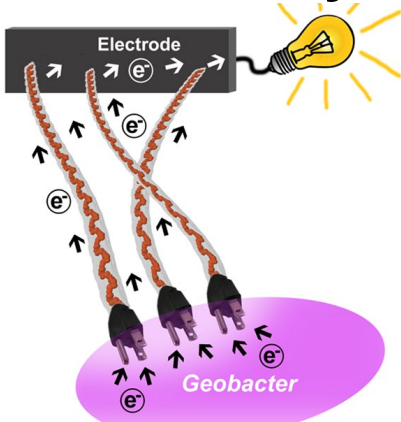
Computing



Light Harvesting

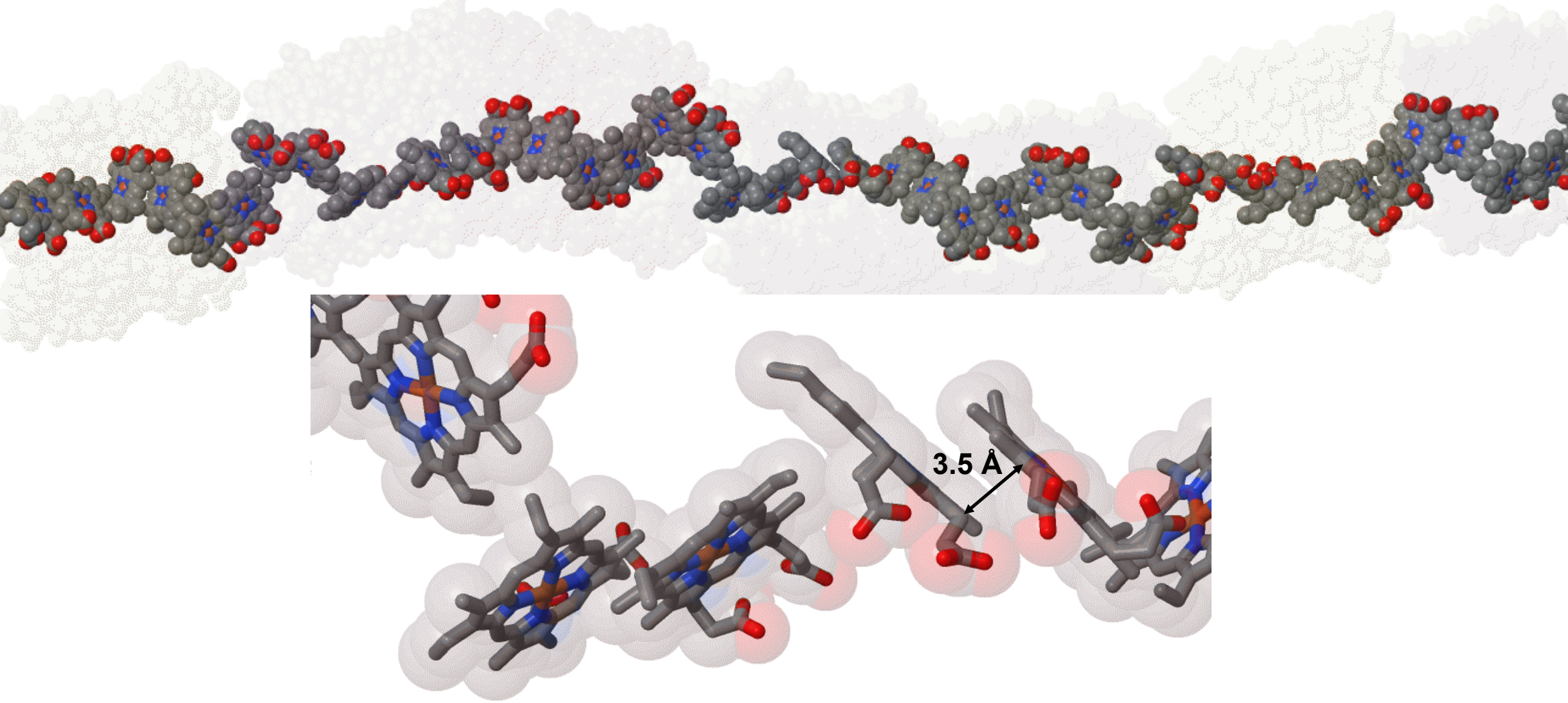


Self-Powered Body Sensors



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

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

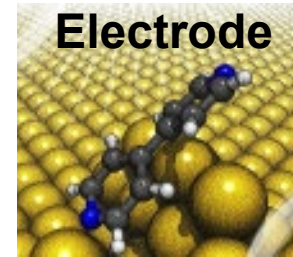


**Quantum
Behavior
(of Electrons,
Spins,
Ions, &
Excitons)
Enhances
Nanowire
Conductivity
30,000-fold
to Accelerate
Cell Growth**

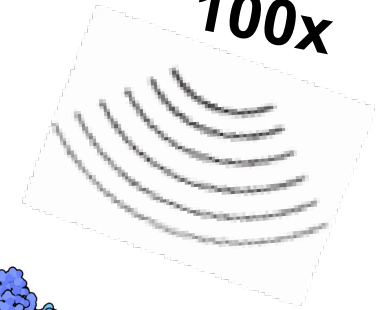
**Electric Field
1000x**



**Adsorption
100X**



**Compression
100x**

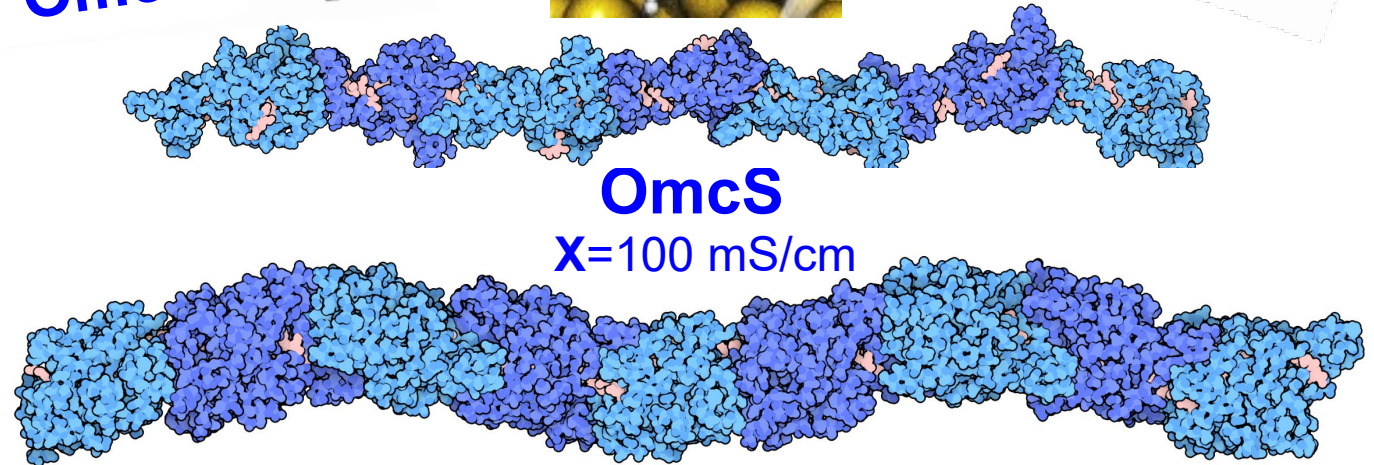


**Humidity
30,000X**



OmcS

X=100 mS/cm

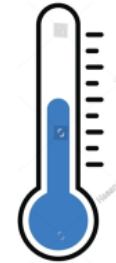


100X

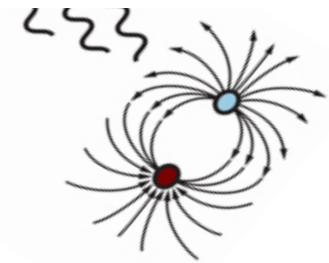
**Light
100x**



**Cooling
100X**



**Magnetic Field
10,000x**





 Nikhil Malvankar, Assoc. Professor

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

 Nikhil.Malvankar@yale.edu

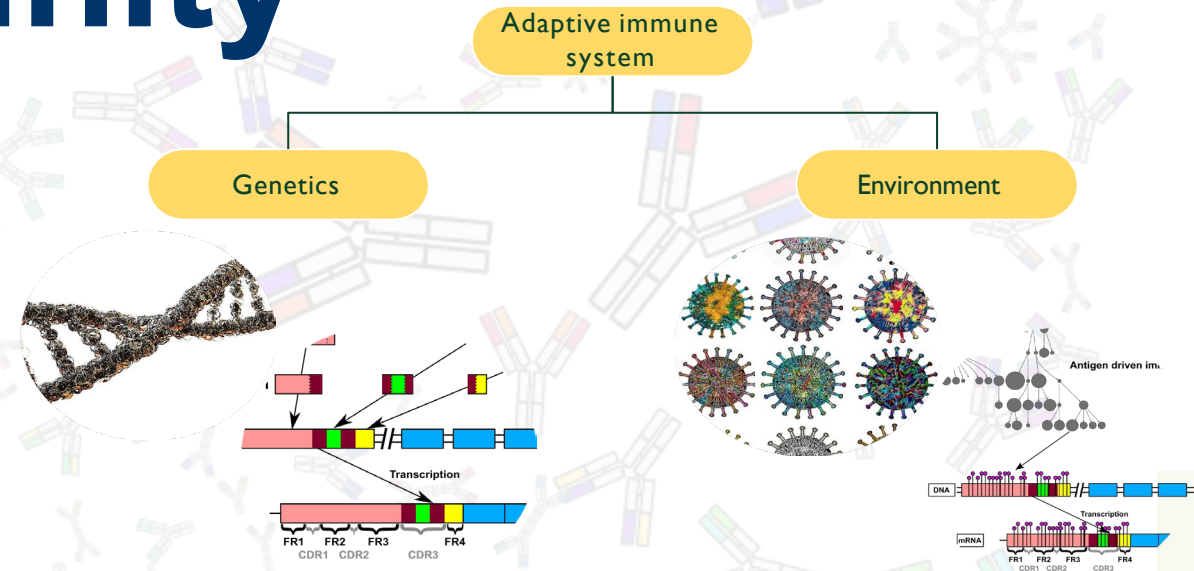
 Malvankarlab.yale.edu

 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



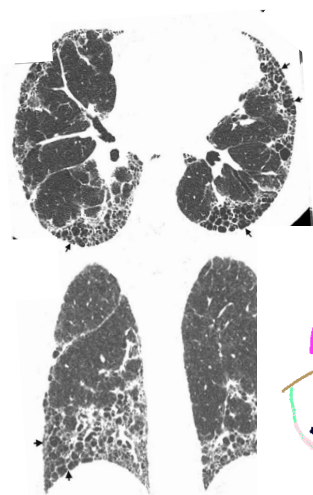
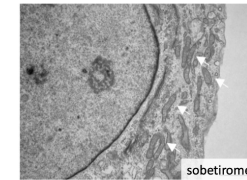
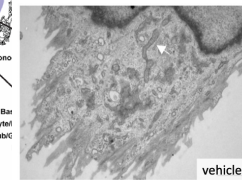
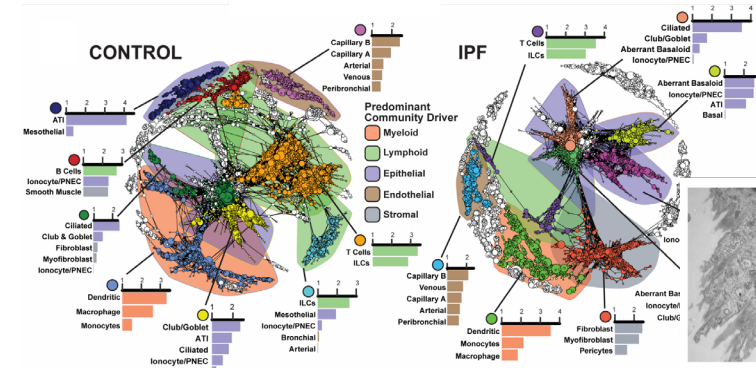
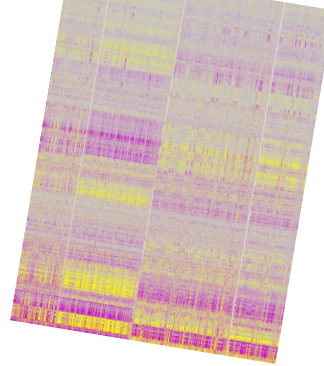
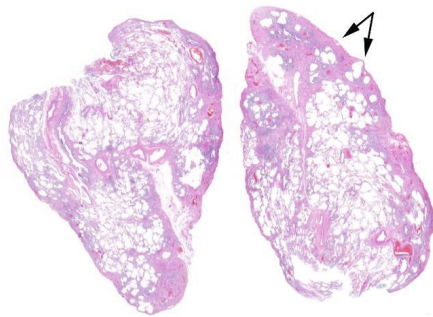
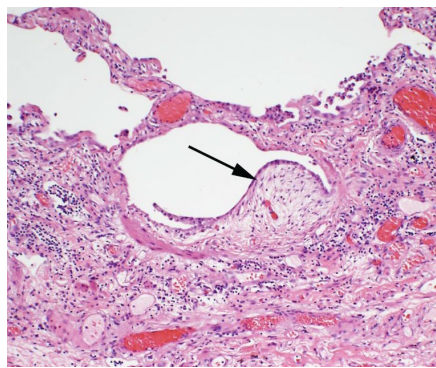
<https://medicine.yale.edu/profile/gur-yaari/>



. Data analysis and modeling



. Interesting questions ;)

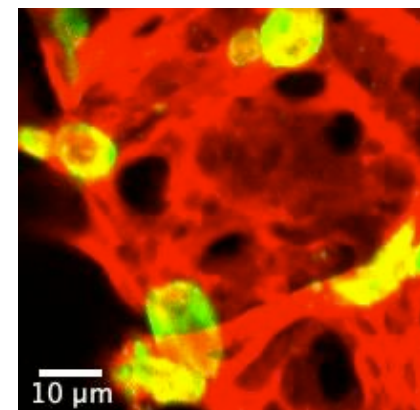


A Digital Twin of Human Pulmonary Fibrosis

Naftali Kaminski MD

Pulmonary, Critical Care and Sleep Medicine

Naftali.kaminski@yale.edu

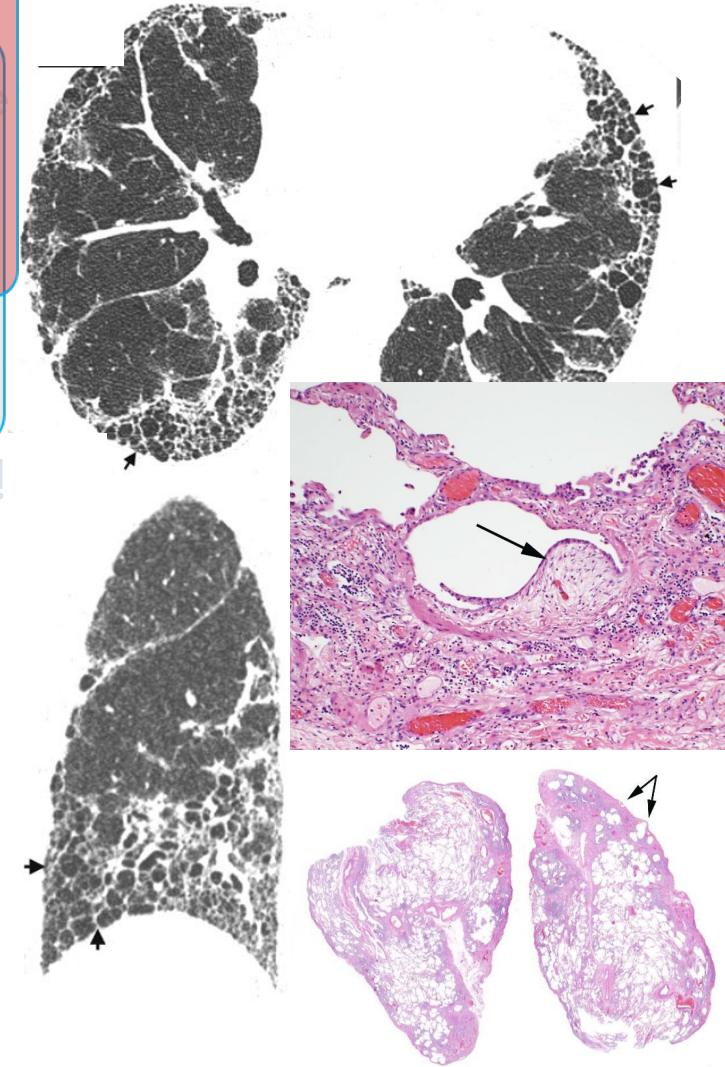


Pulmonary Fibrosis

- 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!



Systems biology

Gene symbols visible in the lung-shaped word cloud include: ANKFN1, CXCR4, IL11RA, SERPINE1, AGER, GDF15, HAS1, SOX9, GLI1, CDKN2A, CD36, TNC, CD14, MMP7, POSTN, CDKN1A, AXL, PDGFRB, CCL18, IL1B, SOD3, TMEM173, CD44, TMPRSS2, NOX4, BR1, GPR84, CAV1, GREM1, LDLR, TP63, HIF1A, MUC5B, CD3, CD4, CD5, CD6, CD7, CD8, CD9, CD10, CD11, CD12, CD13, CD14, CD15, CD16, CD17, CD18, CD19, CD20, CD21, CD22, CD23, CD24, CD25, CD26, CD27, CD28, CD29, CD30, CD31, CD32, CD33, CD34, CD35, CD36, CD37, CD38, CD39, CD40, CD41, CD42, CD43, CD44, CD45, CD46, CD47, CD48, CD49, CD50, CD51, CD52, CD53, CD54, CD55, CD56, CD57, CD58, CD59, CD60, CD61, CD62, CD63, CD64, CD65, CD66, CD67, CD68, CD69, CD70, CD71, CD72, CD73, CD74, CD75, CD76, CD77, CD78, CD79, CD80, CD81, CD82, CD83, CD84, CD85, CD86, CD87, CD88, CD89, CD90, CD91, CD92, CD93, CD94, CD95, CD96, CD97, CD98, CD99, CD100, CD101, CD102, CD103, CD104, CD105, CD106, CD107, CD108, CD109, CD110, CD111, CD112, CD113, CD114, CD115, CD116, CD117, CD118, CD119, 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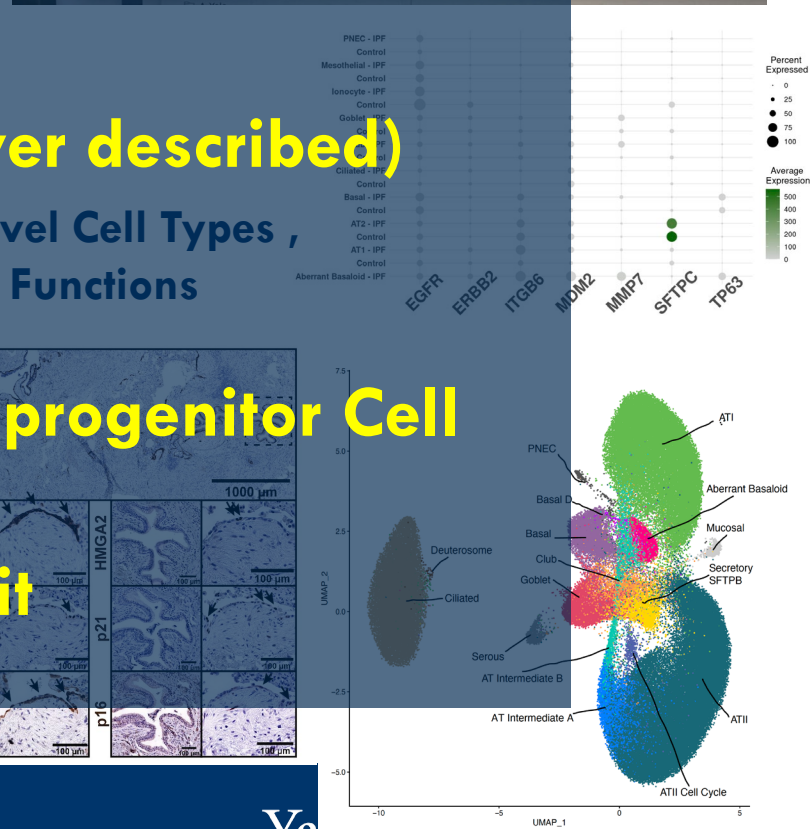
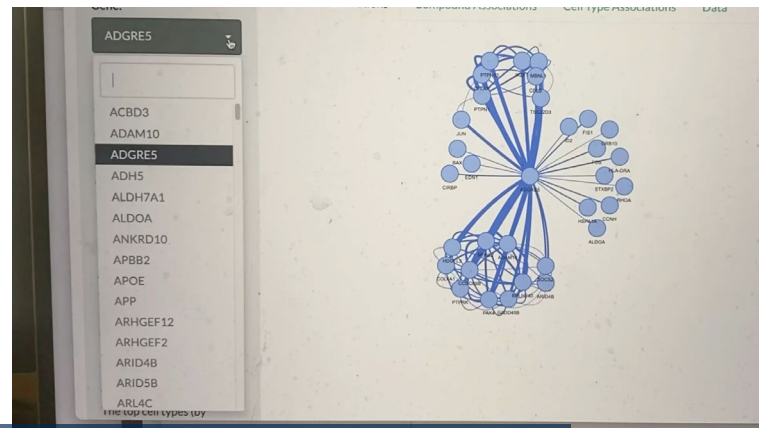
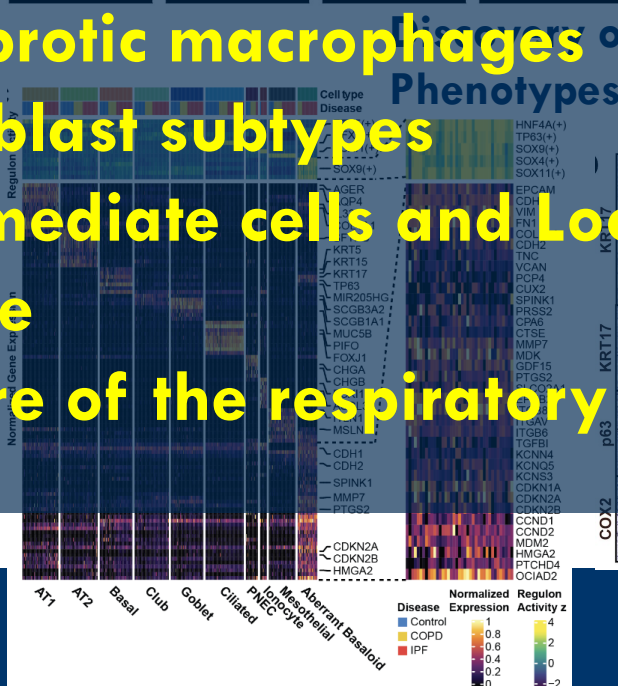
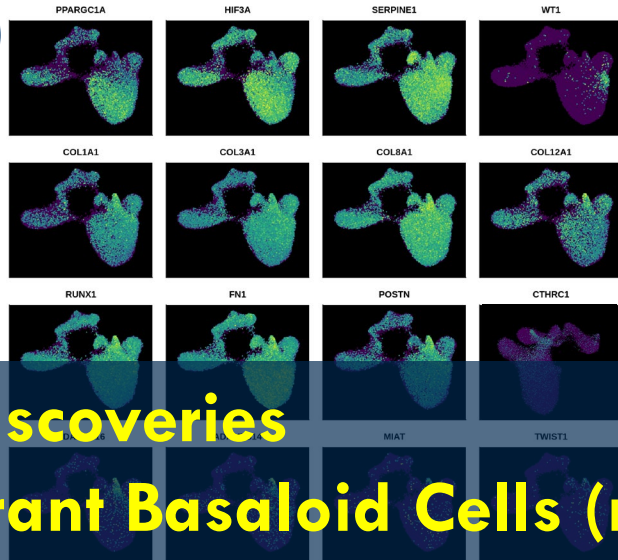
Aberrant Basaloid Cells (never described)

Profibrotic macrophages

Fibroblast subtypes

Intermediate cells and Local progenitor Cell failure

○ Failure of the respiratory unit



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

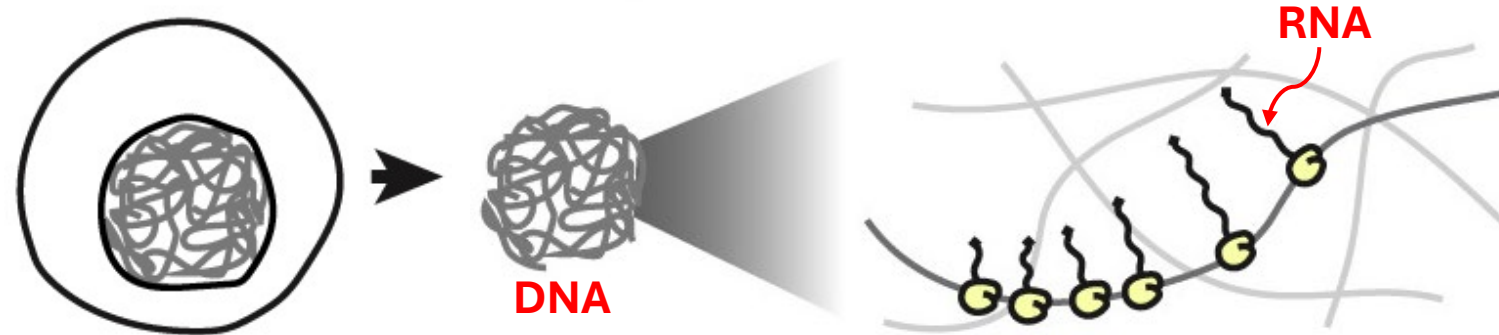
 Naftali.kaminski@yale.edu

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

 Translational Medicine, Fibrosis, Genomics

 AI, machine learning, drug design





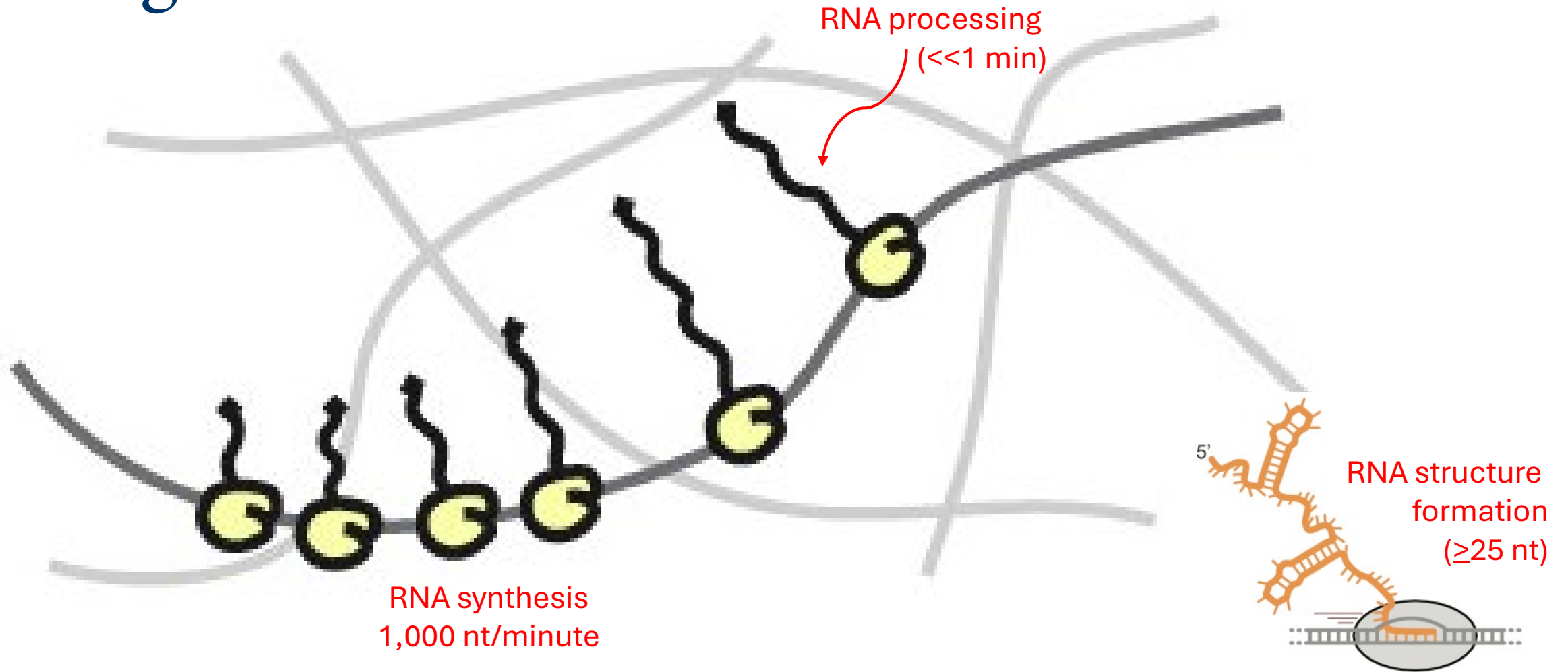
RNA senses cellular change

Karla Neugebauer

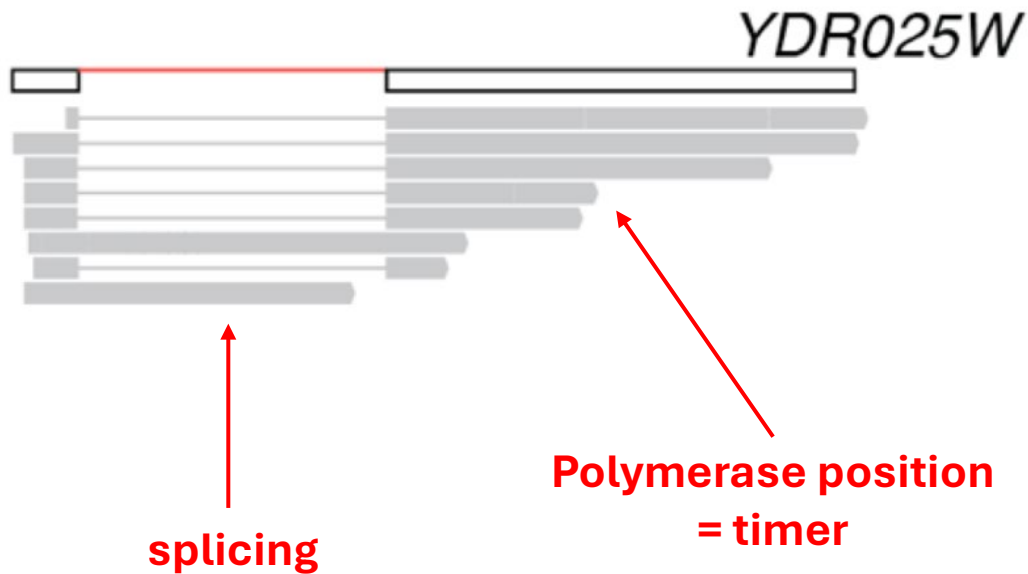
Molecular Biophysics and Biochemistry

Karla.Neugebauer@yale.edu

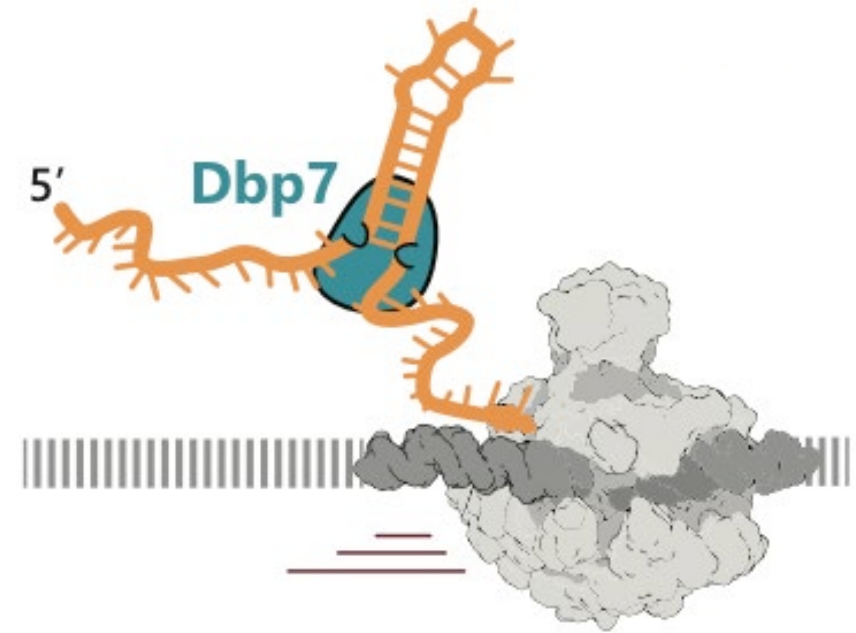
Imagine nascent RNA



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

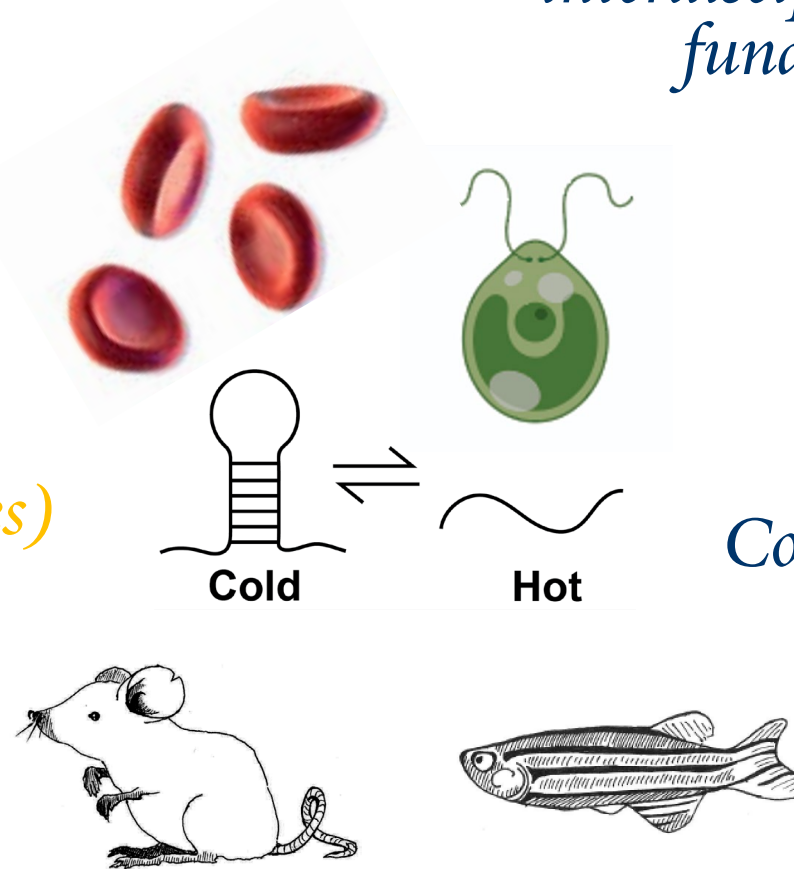
Hematology

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

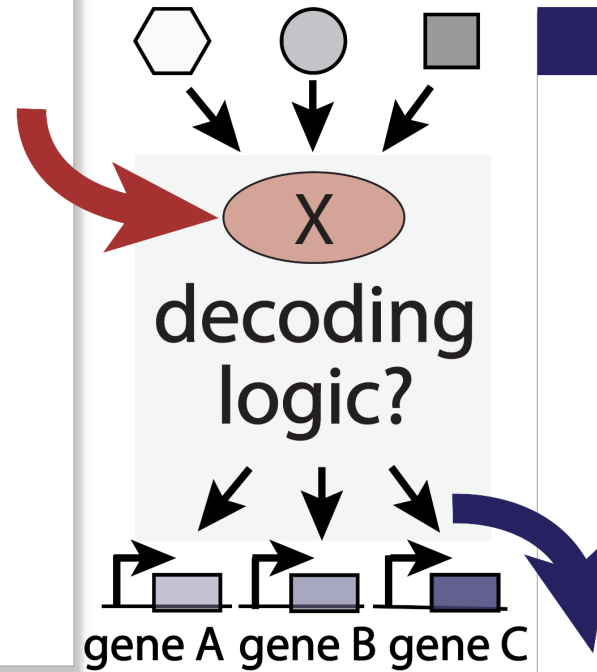
Biophysical mechanisms of gene regulation

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

Current RFA, part of international team

The time to think big on collaborative microprotein research is now

With Ruth Halaban, Yale Dermatology

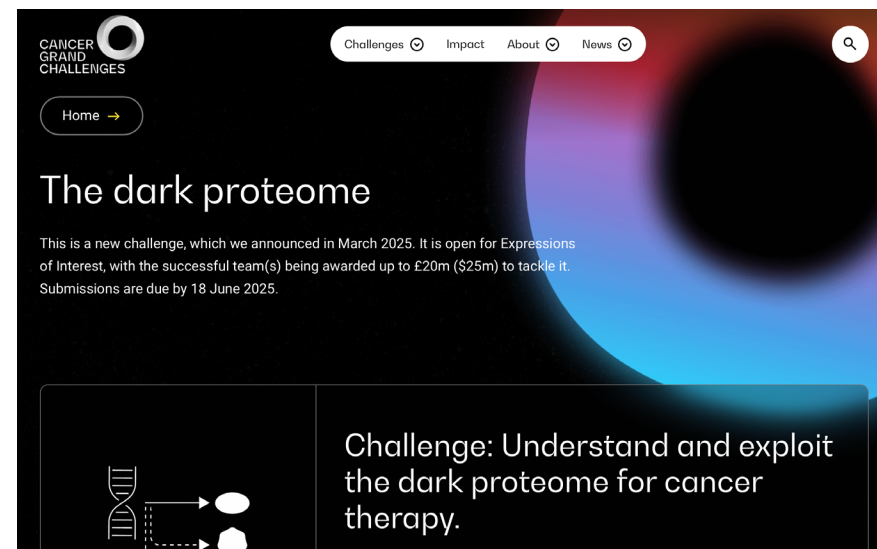


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Discovery of Microproteins in Melanoma

2022 Emerging Leader Award

Sarah Slavoff, PhD, Yale University





 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



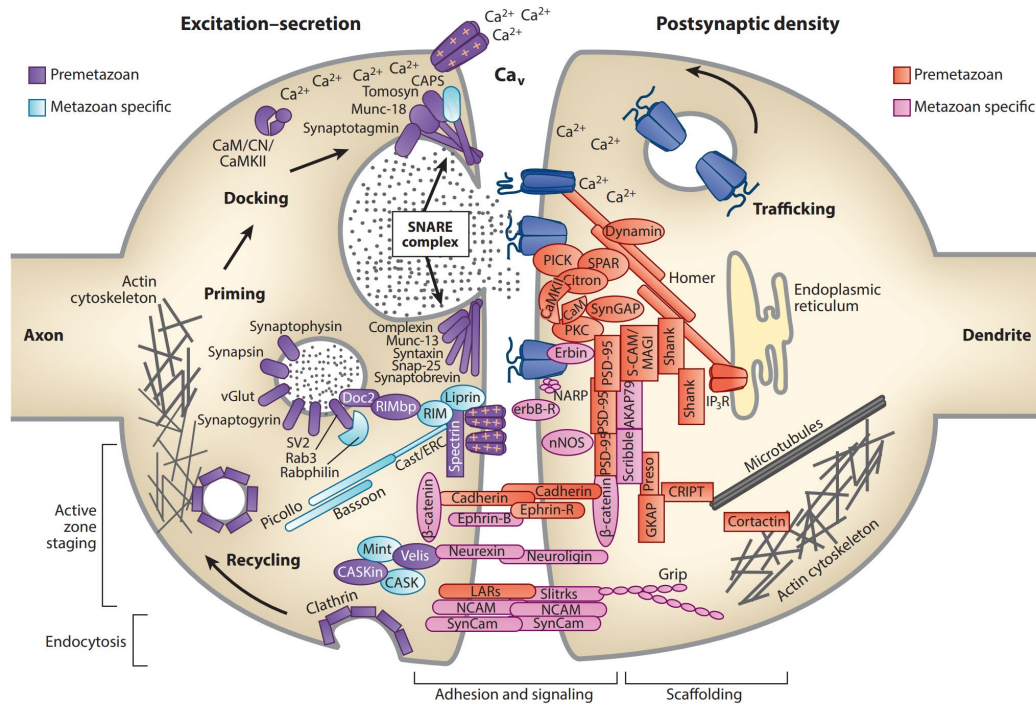
My Research

- *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 ...

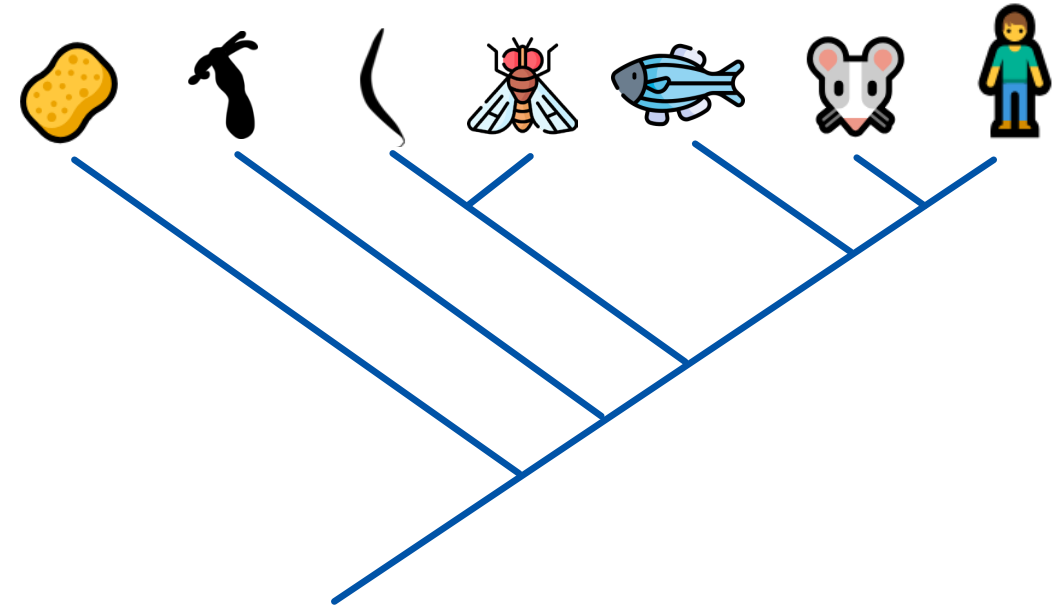
- *Biologists interested in comparative study of gene module/protein machinery across different organisms*
 - *Gene homolog detection and annotations, Protein interaction predictions, ...*
- *Teams with AI expertise / resources*
 - *Can work together to build AI-based computational infrastructures for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

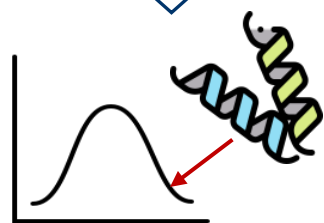
Similar proteins in



Candidate protein pairs

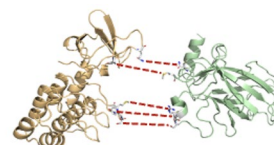
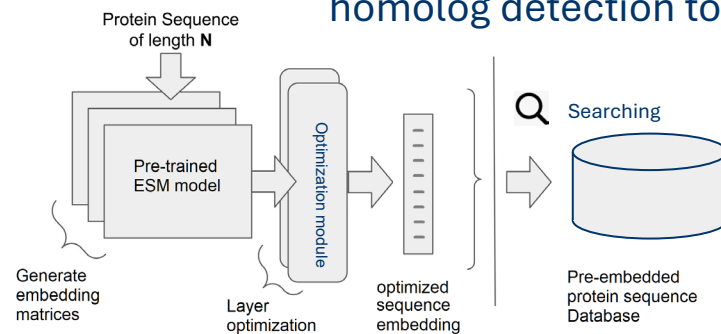


Deep learning
model



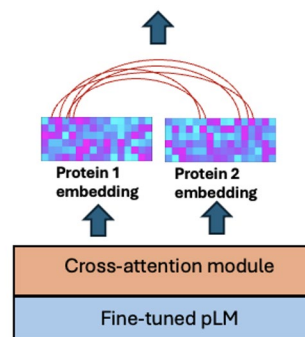
Interaction prediction

AI-based protein homolog detection tool



Predicted structures and
residue-level dependencies

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 Opportunities



- 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



QBI: Quantum Benchmarking Initiative



Defense University Research Instrumentation Program (DURIP)



Energy Frontier Research Centers (EFRCs)



P01, P30

Yale Office of Research Development



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✉ researchdev@yale.edu
🌐 researchdev.yale.edu