Capturing and modifying cell fates bioengineering, interfaces and informatics

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Raga Krishnakumar
Systems Biology Department
Sandia National Laboratories

Engineering cells for antibacterial therapy

Studying neuronal responses with models for brain-computer interfacing

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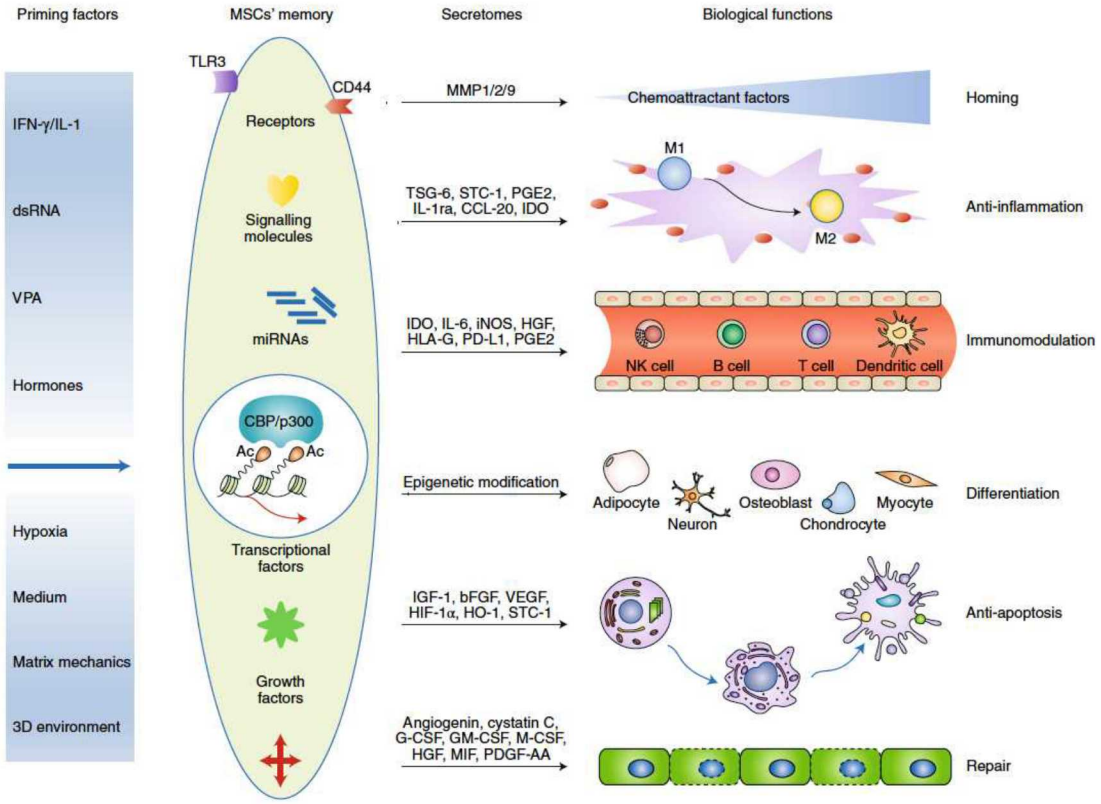
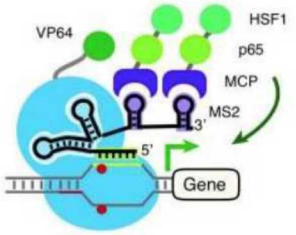
Mesenchymal stromal cells (MSCs) in therapy – potential and challenges



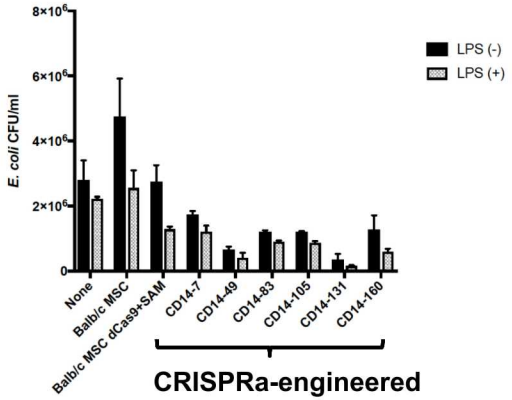
Yin et al. 2019

Goal – to engineer MSC-like cells and convert them into consistently and stably therapeutic cells

Methods to characterize and engineer MSCs

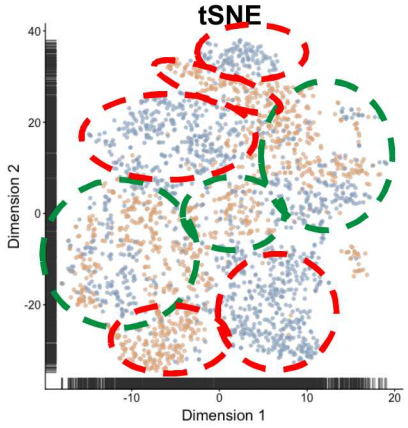


dCas9–SAM

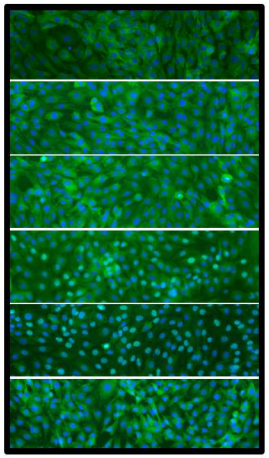


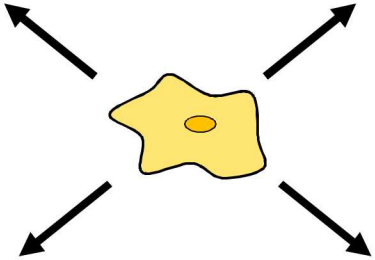
CRISPRa-engineered

10x Chromium single cell sequencing

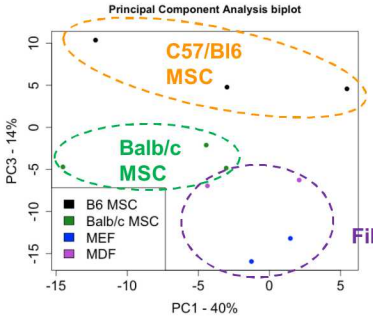


Thermo CX7 high-throughput imaging

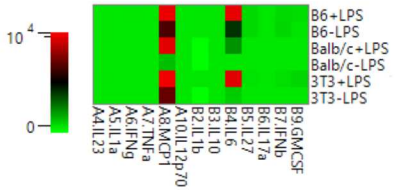




Proteomic/secretomic analysis



Fibroblasts



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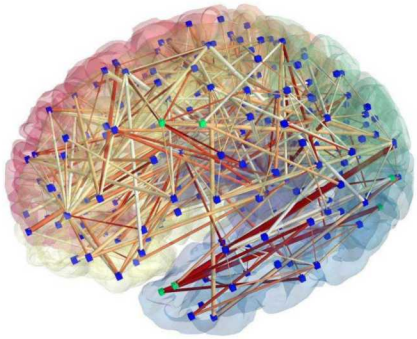
Understanding neural communication and harnessing the brain for computing

Complex connectivity underlies the function of the human brain



Integrated Learning Systems

High-performance computing

UT Austin

Communication and Synergy

Brain-computer interfacing (BCI)

- **Prosthetics**
- **Deep-brain stimulation**
- **Engineered systems**

Basic understanding of neuronal and brain function

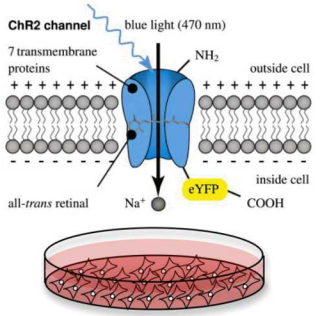
Low-power high-density computing systems

A neuromorphic device that can sense neuronal activity

Science

Parallel programming of an ionic floating-gate memory array for scalable neuromorphic computing

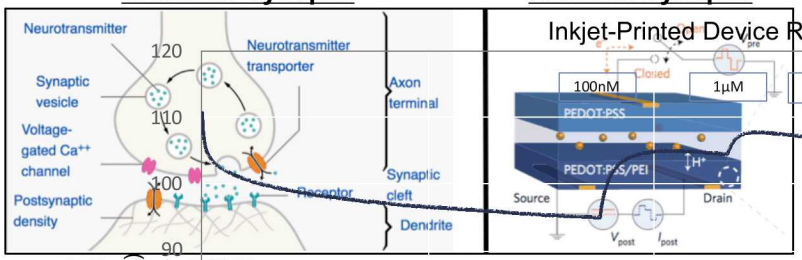
Elliot J. Fuller[1], Scott T. Keene[2*], Armantas Melianas[2*], Zhongrui Wang[3], Sapan Agarwal[1], Yiyang Li[1], Yaakov Tuchman[2], Conrad D. James[4], Matthew J. Marinella[4], J. Joshua Yang[3], Alberto Salleo[2]†, A. Alec Talin[1]†



Neurotransmitter release

Cells engineered for optogenetics

Neuronal Synapse **Artificial Synapse**



Inkjet-Printed Device Response to Dopamine Addition

van de Burgt et al, 2017

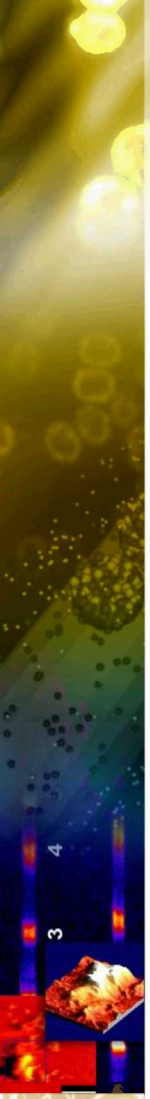
Neural connectome

Can changes in a neural connectome be captured by the artificial neural network?

Artificial neuromorphic device

Areas of potential partnership

- In vitro tissue models
  - 3D cell culture
  - 3D growth matrix
  - Microfluidic systems
- Delivery systems *in vivo*
  - Small molecule delivery
  - Gene delivery
  - Cell delivery
- Alternative methods for cellular engineering (potentially non-invasive, or not involving gene modification)



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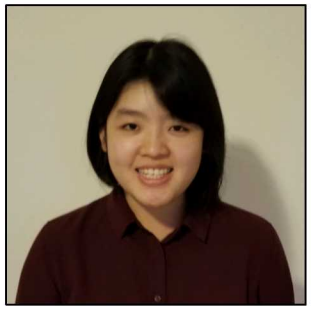
Acknowledgements




Nikki Tjahjono | Matthew Hirakawa | Alec Talin | Carlos Casadevall

Engineering MSCs for antibacterial therapy

Real-time monitoring of neuronal responses

Steven Branda, Kimberly Butler, Yooli Light, Elliot Fuller, Joe Schoeniger

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