UC San Diego
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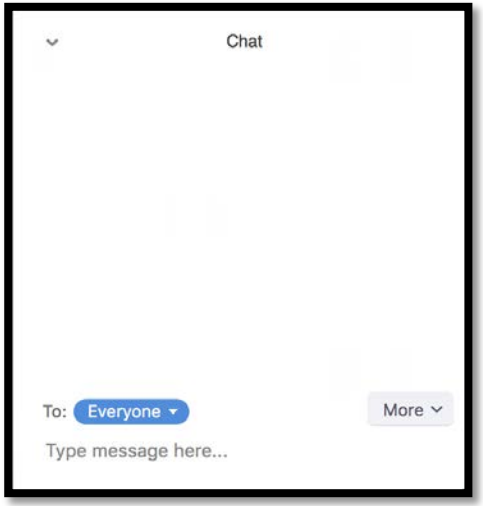
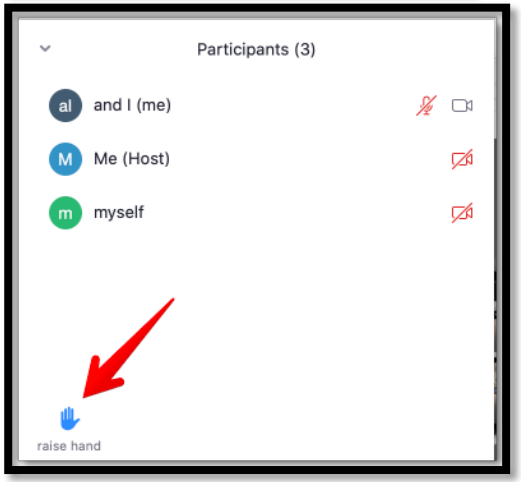
Corporate Affiliates Program

Welcome
CAP Executive Board
June 4, 2020

Meeting Protocol

- We will be recording this meeting
- Mute all, use chat function for comments
- Will use “raise hand” feature during discussion session





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Agenda

5:00-5:05pm - Welcome and protocol
5:05-5:10pm - CAP Executive Board Chairman Welcome
5:10-5:40pm - Dean's Report

5:20 - *AI Tools for Engineering Practice,* Professor Ramamohan Paturi, Computer Science & Engineering

5:25 - *Convergent Systems Engineering,* Professor Jon Wade, Mechanical & Aerospace Engineering

5:40-5:55pm - CAP Executive Input: What pivot is your company making, and how can the Jacobs School align with your company?
5:55-6:00pm - CAP Business and final remarks
6:00pm - Adjournment

CAP Chairman and Vice Chairman

GB Singh

Director, Package & Systems Engineering
Solar Turbines

John Black

Senior Vice President, New Product Development
Brain Corporation

Welcome

Welcome New CAP Partners

DATASTAX

NOVO ENGINEERING®
Better products to market. *Faster.*

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Welcome Guests

HME

IN-Q-TEL

NV5

SOUTHERN CALIFORNIA DESIGN COMPANY

Dean’s Report

Albert P. Pisano

Dean, Jacobs School of Engineering

Accelerating the March to Cachet

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THE JACOBS SCHOOL BROKE INTO THE TOP NINE

What Keeps Me Up at Night

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How can we maintain upward momentum, and deliver on our education and research mission, while in midst of crisis?

- Academics
- Research
- Partnerships
- Operations

Building Momentum

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An Early Look at 2020 Faculty Hiring:

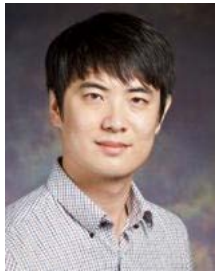
Most Successful Year for Diversity Hiring - 127 in 6 years

Brian Aguado
Bioengineering

Silvia Herbert
Mechanical and Aerospace Engineering

Patricia Hidalgo-Gonzalez
Mechanical and Aerospace Engineering

Zeinab Jahed
NanoEngineering



Mingu Kang
Electrical and Computer Engineering

Stephanie Lindsey
Mechanical and Aerospace Engineering

Florian Meyer
Electrical and Computer Engineering

Lonnie Grove Petersen
Mechanical and Aerospace Engineering

Lisa Poulikakos
Mechanical and Aerospace Engineering

Aaron Rosengren
Mechanical and Aerospace Engineering

Yuanyuan Shi
Electrical and Computer Engineering

Benjamin Smarr
Bioengineering and Data Science

Jon Wade
Mechanical and Aerospace Engineering

Rose Yu
Computer Science and Engineering

Yang Zheng
Electrical and Computer Engineering


Franklin Antonio Hall
GROUNDBREAKING CELEBRATION | NOVEMBER 15, 2019

Franklin Antonio Hall Construction Underway

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Live feed: fah.ucsd.edu

Research Vision for the Digital Future

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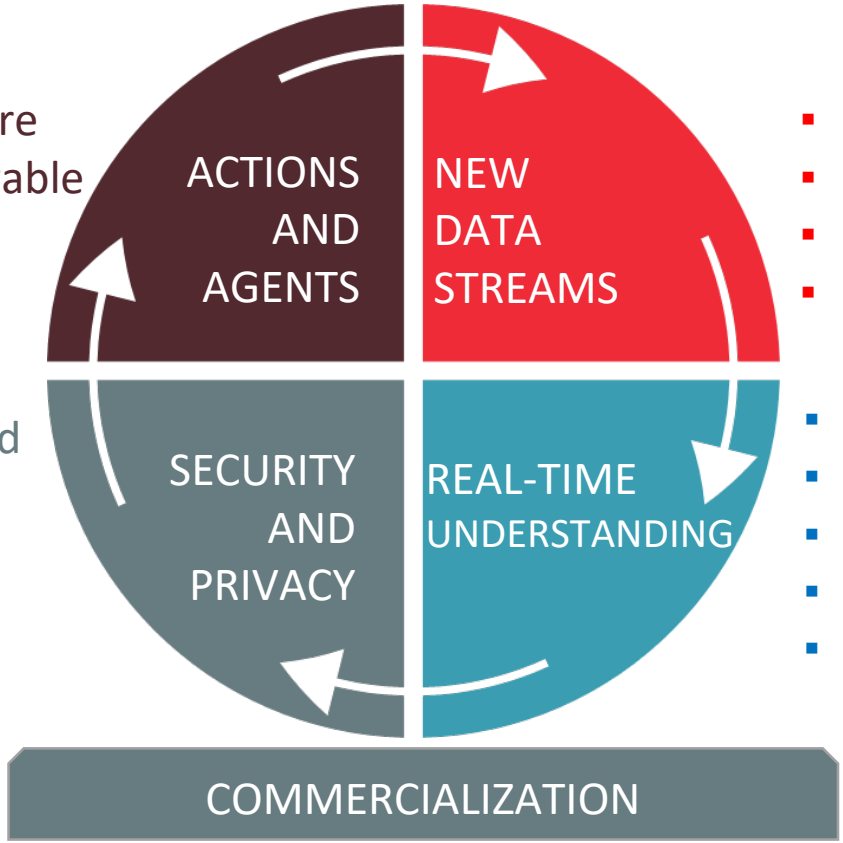
- Precision Healthcare
- Distributed Renewable Energy
- Smart Materials
- Autonomy

- Machine-Integrated Security
- Cryptography
- Privacy
- Authentication



- Sensors
- Hardware
- Machine Vision
- 5G Networks

- Data Science
- Machine Learning
- Edge Computing
- Bioinformatics
- Engineered Intelligence

Education Initiatives

AI Tools for Engineering Practice

Convergent Systems Engineering

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AI Tools for Engineering Practice

- AI and Machine Learning tools have become fundamental engineering skills for research and industry daily practice.
- School-wide faculty committee developing cross-department view of core competencies required to use AI tools.
- In the coming academic year 2020-2021, we will have AI/ML courses in all of our engineering majors.
- Students from any engineering major can take any of the AI elective courses offered throughout the Jacobs School.

Professor Ramamohan Paturi
Computer Science & Engineering

Framework for AI Curriculum

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- Students will have a menu of AI electives to choose from across the Jacobs School of Engineering
- Each department offers at least one course where AI principles/applications are the dominant theme
- Each department commits to make the course successful: content, teaching quality, student perceptions
- Each department will offer the AI courses regularly consistent with the demand
- A course guide will be maintained to provide information for students

AI/ML Undergraduate Courses in Jacobs School

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Bioengineering

- BENG 100: Statistical Reasoning for Bioengineering Applications

Computer Science and Engineering

- CSE 150A: Introduction to Artificial Intelligence: Probabilistic Reasoning and Decision Making
- CSE 150B: Introduction to Artificial Intelligence: Search and Reasoning
- CSE 151A: Introduction to Machine Learning
- CSE 151B: Deep Learning
- CSE 156: Statistical Natural Language Processing
- CSE 158: Web Mining and Recommender Systems

Electrical and Computer Engineering

- ECE 175A: Elements of Machine Intelligence: Pattern Recognition and Machine Learning
- ECE 175B: Elements of Machine Intelligence: Probabilistic Reasoning and Graphical Models
- ECE 176: Intro to Deep Learning and Applications

Mechanical and Aerospace Engineering

- ***MAE 14X: Introduction to Machine Learning Algorithms (under development) - New!***
- MAE 145: Introduction to Robotic Planning and Estimation

Nano Engineering

- ***NANO 181: Data Science in Materials Science (under development) - New!***

Structural Engineering

- ***SE XXX: Machine Learning for Structural Engineering (under development) - New!***

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Convergent Systems Engineering (CoSE)

Jon Wade
Director, CoSE
June 4, 2020

INCOSE, "INCOSE Systems Engineering Vision 2025.", 2014.

Industry is leading a revolution in complex, massively distributed, data-driven systems that rely on data, analytics, and machine learning and modeling to constantly evolve and improve, during ever-shorter iterations.

To meet this demand, new systems engineering methods, processes and tools must be created and translated into modern systems engineering research and education programs.

CoSE Approach

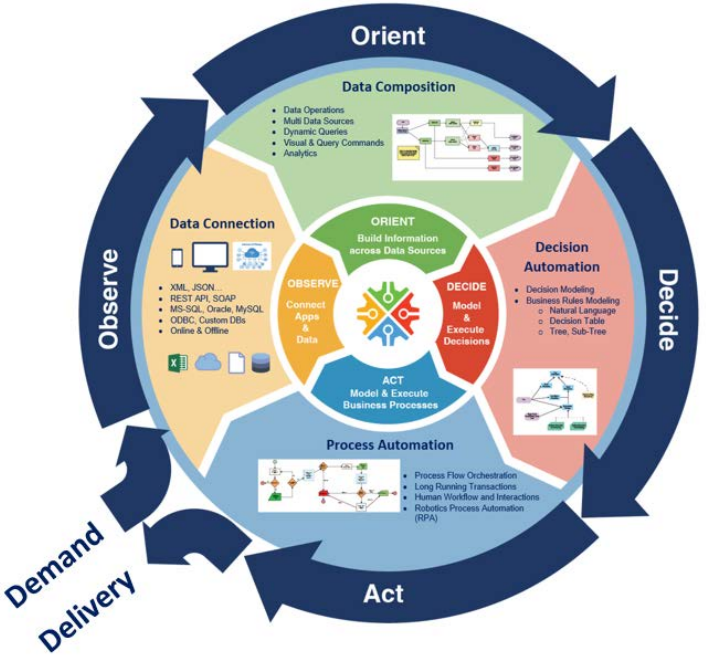
Apply *Closed-Loop* Systems Engineering 2.0

1) *Build transdisciplinary, collaborative teams, using agile, model and data driven approaches, with rapid, small units of work, focusing on learning with agile OODA-loops to provide valuable and innovative solutions for society.*

2) *Tightly couple research and education, using the classroom as a laboratory to test new concepts, and research as a classroom for new approaches.*

3) *Focus on the convergence of human and machine decision-making, resulting in augmented intelligence and continually evolving learning systems. Incorporate ethical decision-making in the foundation.*

4) *Provide the means to rapidly scale the impact of our work globally.*



CoSE Major Initiatives

1. Institute of Convergent Systems Engineering
2. Doctoral Program
3. Systems Engineering 2.0
4. Masters & Certificate programs
5. BS Senior Transdisciplinary Projects
6. BS/MS COOP Program for SE

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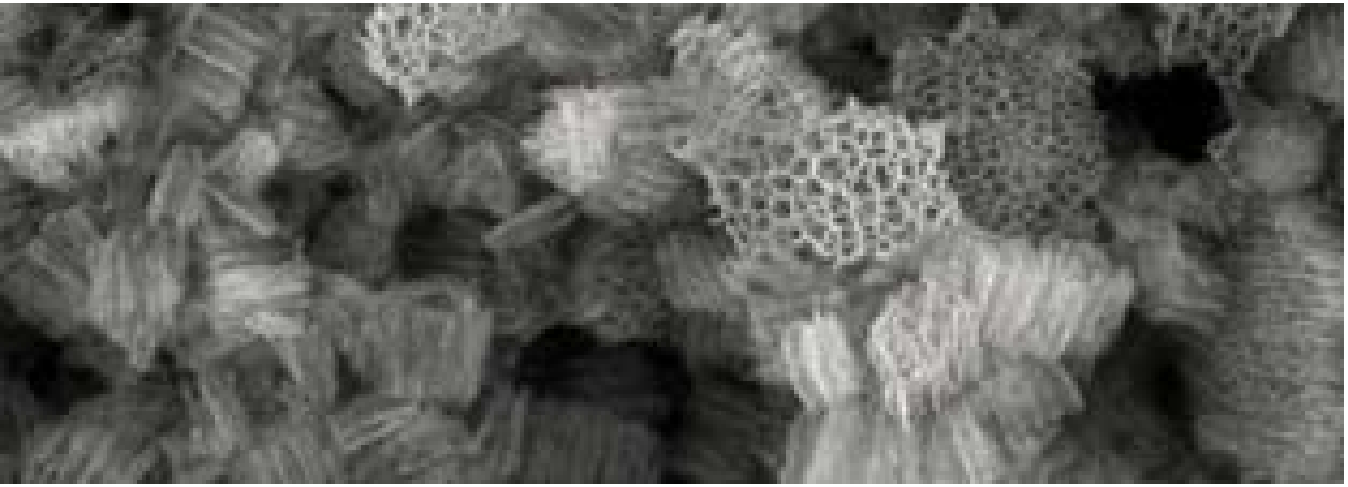
Institute for Materials Discovery and Design



Apply machine learning and rapid materials synthesis/characterization to accelerate development of novel functional materials for energy, information technology, medicine and more.

Shirley Meng,
Prof of NanoEngineering

Michael Sailor
Prof of Chemistry

UC San Diego MRSEC

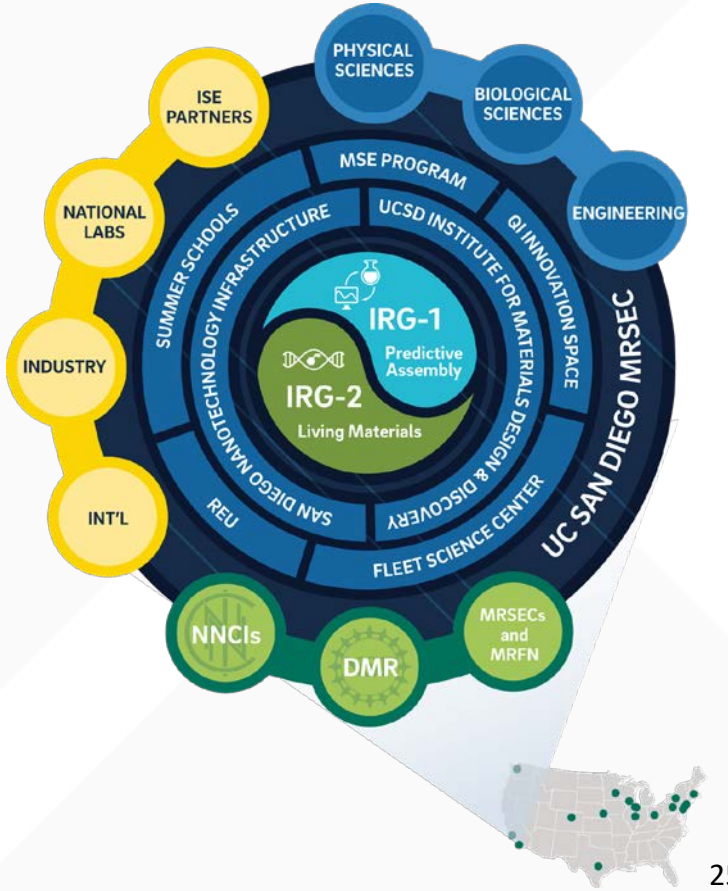
MATERIALS RESEARCH SCIENCE AND ENGINEERING CENTER

National Science Foundation
MRSEC
Materials Research Science and Engineering Centers

iMDD
Institute for Materials Design & Discovery

ECOSYSTEM: MAJOR INNOVATIVE ELEMENTS

- **Industry exchange** (student internships, Researcher-in-Residence) and **Entrepreneurship programs** are key education and broader-impact accelerators
- **Engineered Living Materials (ELM) Foundry:** Bio-synthesis laboratory and soft-matter characterization tools
- **Mesomaterials Design Facility:** Computational virtual facility available world-wide via web portal
- **Summer Schools:** Innovative training model; fully engages all MRSEC faculty; excellent vehicle for participation and recruitment of URMs; postdoc and student mentoring
- **Fleet Science Center:** Communications training and engagement of all MRSEC personnel; high impact at scale



The Fight Against Coronavirus

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Low-Cost Emergency Ventilator Design

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FDA EUA Pending

James Friend
Mechanical and Aerospace Engineering

Lonnie Grove Petersen
Mechanical and Aerospace Engineering

Collins Aerospace

Korvis

D&K engineering

KRATOS
FROM STRENGTH TO SUCCESS

Transforming low-cost hand-pump ventilator into simple automatic ventilator for emergency treatment of patients in acute respiratory distress.

At-Home Monitoring of COVID-19+ Patients

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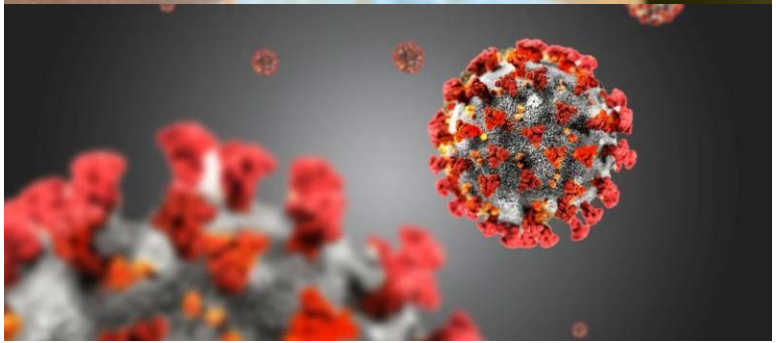

- UCSD Health patients who test positive for COVID-19 can opt in for at-home monitoring.
- Patients will use a wearable device to monitor their vital signs (heart rate, respiratory rate, temperature, CO2 levels), and self report their symptoms from home everyday through an app developed by Dey's team.
- The data is compiled into a dashboard, which will help the care team know which patients need priority attention, and possible hospitalization.
- Future AI add-on will predict the trajectory of the patient, to ensure quicker healthcare response, and aid hospitals in resource planning.

Sujit Dey
Professor of Electrical and Computer Engineering

Co-Principal Investigators
Steven Li, MD
Marlene Millen, MD
Michele Ritter, MD
Melissa A. Wong, MD

Drive-thru Screening of Healthcare Workers at Rady Children's Hospital

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CENTER FOR microbiome INNOVATION

Rob Knight
Computer Science and Engineering, and Pediatrics

More than 1,000 people per week are screened for Coronavirus infection or antibodies.

NanoEngineers Using Plant Virus to Deliver Future Coronavirus Vaccines

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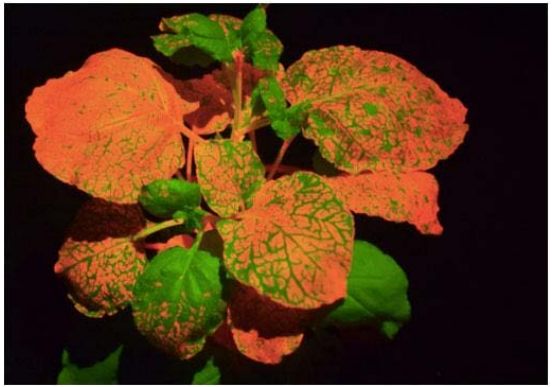

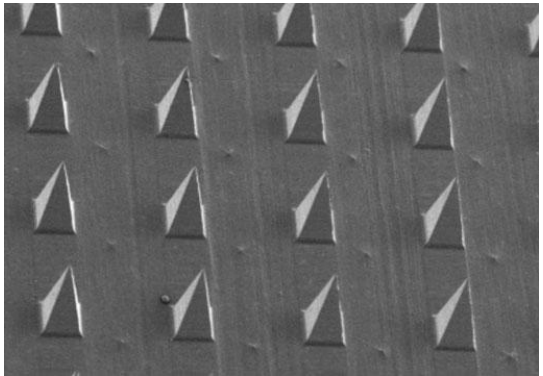

- To create the vaccine, the team is using a plant virus that infects legumes and engineering it to look like the novel Coronavirus (SARS-CoV-2).
- Vaccine can be produced at scale through molecular farming in plants.
- Vaccine packaged in slow-release microneedle patches that patients can wear on the arm to painlessly self-administer the vaccine in a single dose
- Vaccine patches can be shipped worldwide without refrigeration.
- Project received NSF Rapid Response Research Grant.

Nicole Steinmetz
Center for NanoImmunoEngineering

John Pokorski
Center for NanoImmunoEngineering

Cellular Nanosponges for Treating COVID-19

Cellular Nanosponges are made of the plasma membrane derived from human cells that are naturally targeted by coronaviruses. Upon binding with the coronavirus, the nanosponges block entry of the coronavirus into healthy cells, thus rendering them biologically inactive.

UNIVERSITY of CALIFORNIA, SAN DIEGO
MEDICAL CENTER MOORES CANCER CENTER

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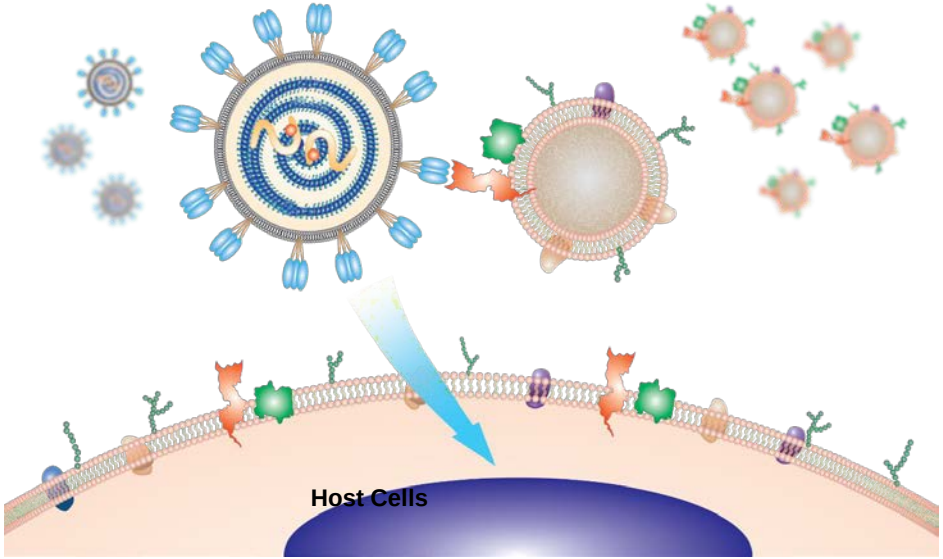
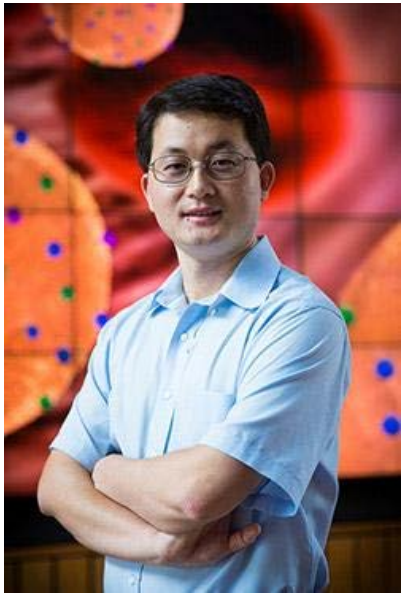
Center for Nano Immuno Engineering





- **Fast effect:** Upon encountering coronavirus, the Nansoponges immediately bind with the virus showing therapeutic effect.
- **Broad-spectrum:** The Nanosponges can bind to any strains of coronavirus (*i.e.* SARS-CoV-2, SARS, MERS) and are independent of viral mutations.

Coronavirus Pivot

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Campus

- Moved community of 60,000+ students, faculty and staff enmasse to remote operations in days.

- Developed protocols for handling positive cases, including privacy-preserving reporting, contact tracing, and surface cleaning.

Jacobs School

- Transformed hundreds of courses to remote learning format and assessment in two weeks.

- All faculty rewrote research plans and created lab safety protocols impacting thousands of research projects and graduate students.

Questions, Comments, Feedback?

Discussion with CAP Executives

What pivot is your company making, and how can the Jacobs School pivot along with you?

- Business priorities
- Research Foci
- Talent

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CAP Business

Wil Dyer

Director, Corporate Affiliates Program

CAP Updates

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Jacobs School Corporate Affiliates Program

CAP Talent Pivots

- Survey of CAP Partners: recruitment must be more targeted
- CAP positioned to assist now more than ever
- Virtual offerings for Fall quarter
- Alumni access to our career portal
- Maintain your brand with our students
- Welcome additional input

jacobsschool.ucsd.edu/talent

Going on paternity leave;
see you in August!

Acting CAP Director:
Rocio de Lis
mdelis@eng.ucsd.edu

Other Jacobs School inquiries:
JacobsCAP@eng.ucsd.edu


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Thank you!
Next CAP Executive Board Meeting
October 8, 2020