# UC San Diego MRSEC



# **UC SAN DIEGO MRSEC LEADERSHIP**







# **IRG1: PREDICTIVE ASSEMBLY**

Andrea Tao & Tod Pascal



Polymer-Grafted Nanocrystals: Tao/Arya

1 µm

# **IRG1: PREDICTIVE ASSEMBLY**



- Rational materials design and development guided by a computational framework, validated by experimental measurements
- In silico design of functional materials





# A MULTI-SCALE, INTERDISCIPLINARY, MANY-BODY TEAM



MESO

MATERIALS RESEARCH SCIENCE AND ENGINE

## ATOMIC



Joshua

**Figueroa** 



Akif **Tezcan** 



Alex Fraño



NANO

**Nicole Steinmetz** 





Tao



Tod **\*** 

**Pascal** 



**Francesco** 

Paesani









Gaurav

Arya





# A MULTI-SCALE, INTERDISCIPLINARY, MANY-BODY TEAM



**MESO** 

MATERIALS RESEARCH SCIENCE AND ENGINEE



ATOMIC

Tod **\* Pascal** 



**Francesco** Paesani

Joshua

**Figueroa** 



Akif **Tezcan** 



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NANO



Susan Habas Tony van Buuren @NREL @LLNL





Andrea ★ Tao













# IRG2: STIMULI-RESPONSIVE LIVING POLYMERIC MATERIALS

Jonathan Pokorski & Nicole Steinmetz





# **IRG2: ENGINEERED LIVING MATERIALS (ELMS)**



- Polymeric materials constructed and controlled by living constituents
- Materials that sense, communicate and regenerate





# **IRG2: AN INTEGRATED MATERIALS BIOLOGY TEAM**



#### **RESPONSIVE BIOLOGY**

#### **MATERIALS BIOLOGY**





Susan Golden

Jim Golden

Rachel Dutton



Mike **Burkart** 



Steve Mayfield





**POLYMERIC MATERIALS** 



Nicole\* Steinmetz

Jon ★ Pokorski

Darren Lipomi

Jinhye Bae



- Materials scientists harnessing biology
- Biologists focused on *materials science* •
- Expertise in *robust* organisms for materials
- Capability to scale to real-world functional materials





# FACILITIES Y. Shirley Meng



## ENGINEERED LIVING MATERIALS (ELM) FOUNDRY SYN-BIO FOR ALL



UC San Diego

# **MESOMATERIALS DESIGN FACILITY**





- High-Performance Computing Parallelization and code optimization, computing beyond lab scale
- Data Science Solutions Big-data benchmarking, machine learning (AI), statistics, and data visualization
- Cyberinfrastructure Services Storing sensitive data, hosting virtualized platforms and databases



# EDUCATION & HUMAN RESOURCE DEVELOPMENT

Stacey Brydges



# SUMMER SCHOOLS: RESEARCH IMMERSION IN MATERIALS SCIENCE AND ENGINEERING (RIMSE)



**Training** for **incoming graduate students**, **undergrad transfer students**, high school students, postdocs and international scholars.

# SUMMER SCHOOLS: RESEARCH IMMERSION IN MATERIALS SCIENCE AND ENGINEERING (RIMSE)

Driven by IRG research

Run by Pls



Trainees become

mentors

**Training** for **incoming graduate students**, **undergrad transfer students**, high school students, postdocs and international scholars.

Hands-on, immersive

# SUMMER SCHOOLS: SCOPING DISCOVERY PROJECTS



Winnie Huang



Charles Wertans

Electrochemical etching of a surface relief grating generates a conformal photonic multilayer (rugate filter). The structure displays both diffraction and an optical stop band. The three-dimensional porous structure can be removed, preserving the surface relief through at least 6 generations of electrochemical etch.

# hands-on training during Covid-19...

# Traveling Spectrometer try this at home...





Claire Zhang

# FLEET SCIENCE CENTER PARTNERSHIP



UC San Diego

# Suds & Science

A "Spirited" Discussion





CLIMATE

**SCICOM:** Science communications training of FACULTY and students by Fleet Science Center public communications experts

Suds & Science

Suds & Science

Barborn Strates

Barborn Strates</

work, so that they are able to judge the risks and benefits of scientific advances, that might affect their personal, professional or civic experiences. At the same time, to achieve scientific excellence and advancements in science that benefit all members of society, we need a strong diversity of thought and experience to be able to find unique solutions to the problems we, as a society, are facing. So how can we make the (chemical) sciences accessible, inclusive and relevant for all students? What evidence-based teaching strategies can we use to foster learner engagement, wonder, reflection, and ultimately, retention in the sciences? Stacey Brydges, a Teaching Professor and Vice-Chair of Equity Diversity, Inclusion and Climate in Chemistry and Biochemistry at UC San Diego, will discuss these and other questions related to recent research advances in chemistry teaching and learning in higher education.

