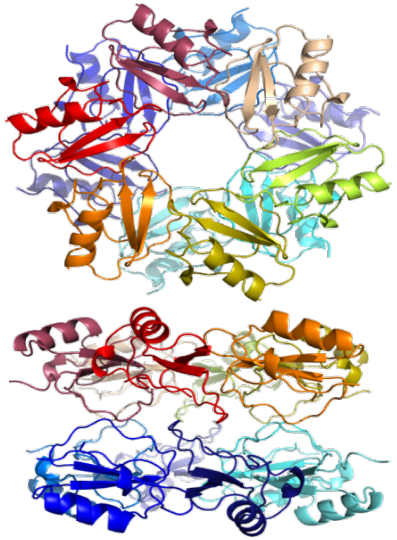
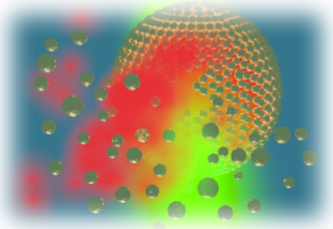
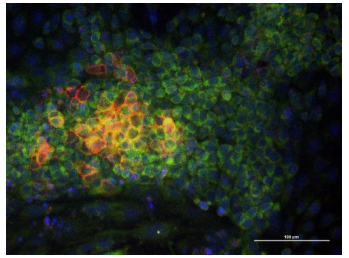
CCBM
NSF-CREST
CENTER FOR CELLULAR AND BIOMOLECULAR MACHINES



NSF-CREST
Center for Cellular and Biomolecular Machines (CCBM)



University of California Merced



CCBM Retreat
August 16, 2018

This work is supported by funding from the National Science Foundation: NSF-CREST: Center for Cellular and Biomolecular Machines (CCBM) at the University of California, Merced (NSF-HRD-1547848).

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Presentation Outline

- Center overview: Muñoz (5 min)
- Graduate education: Gopinathan (3 min)
- Undergraduate programs: Ghosh (3 min)
- Broadening participation & outreach: Kouadio and Cole (2 min)
- Project Scientist updates: Sadqi and Quint (2 min each)
- Reporting/citing grant: Kouadio (1 min)
- Budget 5-year overview: Kouadio (1 min)
- Upcoming events, opportunities & resources: Kouadio (3 min)
- Highlights and future plans: Gopinathan (3 min)
- Q & A: all (4 min)

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Center Overview

About the **National Science Foundation-funded**
CREST Center for Cellular and Biomolecular Machines (CCBM):

Interdisciplinarity	Research Focus	Research Objectives	Education and Training	Outreach
• **physical,** • **biological** • **chemical** • **engineering**	• **multi-scale assemblies of biomolecules and cells** • **natural and synthetic**	• **understand** biological function • **develop** design principles • **implement** bioinspired nanomachines	• enhance education **graduate undergraduate** • biophysics, biochemistry, and bioengineering	• **develop K-12 STEM** activities • students and teachers • Merced area

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CCBM Organization

Executive Structure

Research & Training Structure

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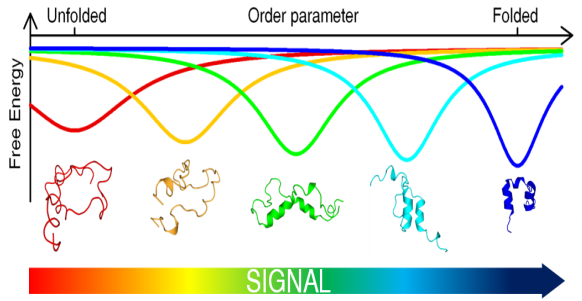
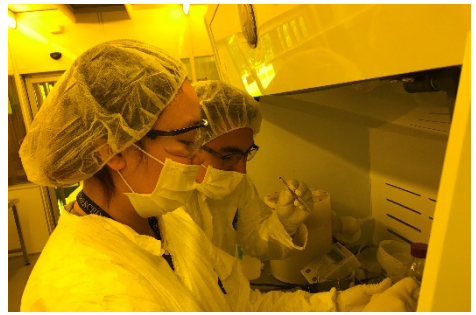
Center Overview

Strategic Goals

- **Strengthen existing research programs**
- **Develop a mesh of multidisciplinary collaborations**
- **Nucleate new research programs across departments**
- **Establish research networks with other institutions**





Education and Outreach

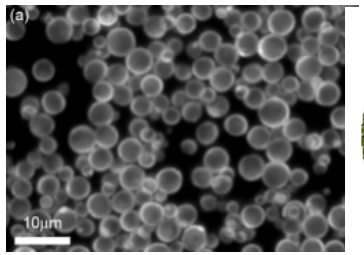
Pipeline for highly qualified STEM workforce

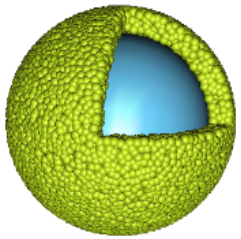
Produce high caliber trainees at all levels

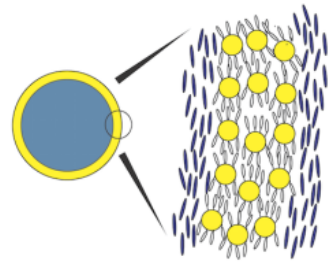
Spur growth in Central Valley

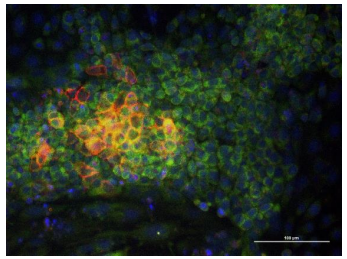
Significance

- multi-scale biomolecular and cellular assemblies
- control over biological systems and designs
- Grow onto an Organized Research Unit (ORU) at UC Merced
- Nobel Prize 2016—molecular machines









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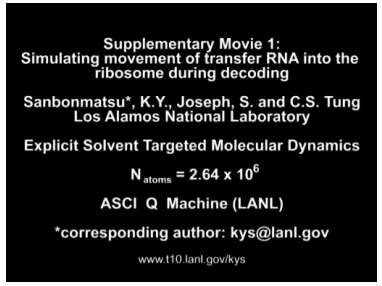
Research Thrusts

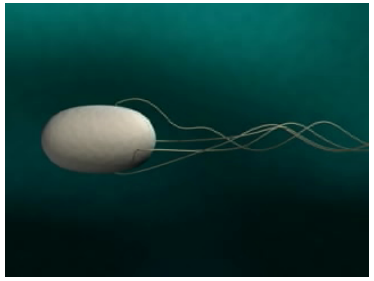
Biomolecular Machines

-Circadian Molecular Clocks
-Analogic Single-Molecule Biosensors
Victor Muñoz (co-director), Ariel Escobar, Michael Colvin, Andy LiWang



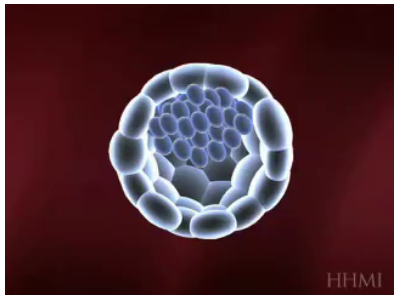
Macromolecular Assemblies and Hybrid Devices

-Designer Vesicles for Transport
-DNA Origami-Nanocomposites
-Graphene-based Biosensors
Ajay Gopinathan (co-director), Linda Hirst, Jing Xu, Sayantani Ghosh, Tao Ye, Lin Tian, Vincent Tung, Wei-Chun Chin, Anand BalaSubramanian, Anand Gadre



Cellular and Multicellular Systems

-Differentiating Tissue
-Bacterial Community Motility
Kara McCloskey, Ajay Gopinathan, Jennifer Lu, Bin Liu, Arvind Gopinath



Thrust 1: Biomolecular Machines, Prof. Victor Muñoz (Bioengineering) leads
Proteins are the cellular nanomachines
Exploit thermal energy to change shape in response to specific stimuli
Understand and build protein-based nanoscale instruments

Thrust 2: Macromolecular Assemblies and Hybrid Devices, Prof. Ajay Gopinathan (Physics) leads
Realize nanomaterials with interesting new properties
Use them for building hybrid devices in conjunction with biomolecules

Thrust 3: Cellular and Multicellular Systems, Prof. Kara McCloskey (Bioengineering) leads
Large scale assemblies of multiple cells: from tissue to biofilms
Emergent behaviors controlled by cell mechanics and cell-cell interactions.

New CCBM Faculty:
Eva de Alba, Yue (Jessica) Wang, Kevin Mitchell, Ryan Baxter, Stephanie Woo, Joel Spencer