Supported by:

National Institutes of Health
National Institute of General Medical Sciences
BASIC DISCOVERIES FOR BETTER HEALTH

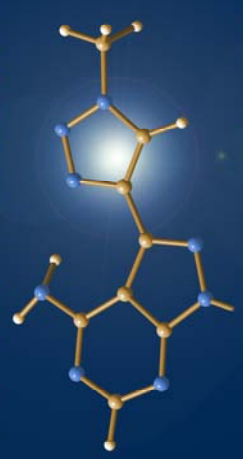
NIH

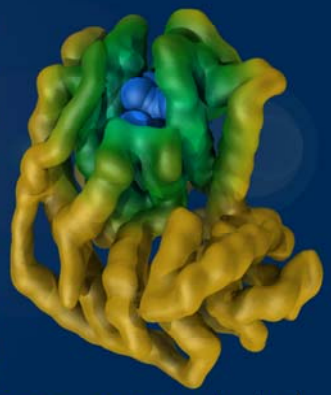
Training, Workforce Development, & Diversity

UC Davis Chemical Biology Program | chembio.ucdavis.edu

UC DAVIS

CHEMICAL BIOLOGY PROGRAM





2017

UC Davis

3rd Annual CBP Retreat

September 15, 2017
Student Community Center

Schedule of Events

8:30am—9:00am Breakfast and Registration

9:00am—9:10am Welcome and Introduction
Dr. Pete Beal

Session I

Chair: Angela Zhang (Atsumi)

9:10am—9:30am Calvin Ly*** (Olson)
Psychedelics Promote Neural Plasticity

9:30am—9:50am Austin Carroll (Atsumi)
Biological 2,3-butanediol production in freshwater and marine cyanobacteria

9:50am—10:10am An Xiao (Chen)
Sialidase-catalyzed one-pot multienzyme (OPME) synthesis of sialidase transition state analog inhibitors

10:10am—10:30am Nina McCulley*** (Tantillo)
A Mechanistic Examination of the Influence of Alkene Substitution on Rates of Biomimetic Platinum-Promoted Polyene Polycyclizations

Coffee Break and Posters

10:30am—10:50am

Session II

Chair: Samantha Hartanto (Fisher)

10:50am—11:10am Andrea Coleman*** (Ames)
Structural Basis of Ca^{2+} - Sensitive Localization of Neuronal Voltage-Gated Ca^{2+} Channels

11:10am—11:30am Peter Dang (Chen)
Lipid Nanoparticle Delivery of Artificial Transcription Factor in a Huntington's Disease Mouse Model

A Semi-synthetic organism that stores and retrieves increased genetic information

Abstract

Since the last common ancestor of all life on earth, the biological diversity has been encoded in a four letter, two base pair genetic alphabet. Expansion of the genetic alphabet to include a fifth and sixth letter than for a third, unnatural base pair not only has immediate utility for a number of applications, such as site-specific oligonucleotide labeling, but also serves as the foundation for an organism with an expanded genetic code. Toward this goal, we have examined a large number of different unnatural nucleotides bearing mainly hydrophobic nucleobase analogs that pair based on packing and hydrophobic interactions rather than H-bonding. Optimization based on extensive structure-activity relationship studies and two screens resulted in the identification of a class of unnatural base pairs that are well recognized by DNA and RNA polymerases. More recently, we have engineered E. coli to import the requisite unnatural triphosphates and shown that DNA containing the unnatural base pair is efficiently replicated, transcribed, and translated within the cell, resulting in the first semi-synthetic organism that stores and retrieves increased information.

Join us in the Chemistry Courtyard after Dr. Romesberg's talk for a brief reception!

Keynote Speaker

Floyd Romesberg's research combines the tools of chemistry, molecular biology, microbiology, genetics, and modern spectroscopy to study different aspects of evolution. Projects include the identification and development of novel antibiotics, the development of tools to apply steady state and time-resolved UV/vis and IR spectroscopy to understand how proteins are evolved for biological function, the artificial evolution of DNA polymerases with novel activities, the investigation of the cellular response to DNA damage in prokaryotic and eukaryotic cells, and the development of unnatural base pairs with which to expand the genetic alphabet and code. Recently Floyd's lab succeeded in generating a semi-synthetic organism that stably propagates six-letter DNA, paving the way to living factories to produce novel proteins for biotechnological and medical applications. Floyd is also a co-founder of Achaogen Inc. (IPO 2014, NASDAQ AKAO), and RQx, Inc. (acquired by Genentech/Roche in 2013), two companies working to develop novel antibiotics, as well as Synthorx, Inc., a new synthetic biology company.

11:30am—11:50am **Cody Palumbo*** (Beal)**
The Use of Nucleoside Analogs to Stabilize RNA-Protein Complexes

11:50am —12:10pm **Katie Beglinger*** (Fraser)**
Analysis of Eukaryotic Translation Initiation Factor (eIF) Phosphorylation by Mass Spectrometry

Lunch
12:10pm—1:00pm

Poster Session
1:00pm—2:10pm

Session III
Chair: Cindy McReynolds (Hammock)

2:10pm —2:30pm **Nicole Nunez (David)**
MUTYH: Harnessing Metals for the Repair of DNA Damage

2:30pm—2:50pm **Sean Kodani (Hammock)**
Dual sEH/FAAH Inhibitors: Chemical Probes for Exploring Biological Synergy

2:50pm—3:10pm **Terry O'Brien (Tantillo/Siegel)**
Finding the right piece of hay in a haystack

Cookie Break
3:10pm—3:30pm

Keynote Talk
Chair: Cody Palumbo

3:30pm—4:30pm **Dr. Floyd Romesberg**
A Semi-synthetic organism that stores and retrieves increased genetic information

***CBP Trainee

Poster Presentations

#	Name and Title
1	Olivia Buonarati (Hell) *Proteolytic Processing of the L-type calcium channel CA v1.2 alpha 1 subunit occurs mostly in its C-terminus*
2	Andrea Coleman (Ames) *Structural Basis of Ca^{2+} - Sensitive Localization of Neuronal Voltage-Gated Ca^{2+} Channels*
3	Qinhong Yu (Ames) *NMR Structural Analysis of a Red/Green Cyanobacteriochrome, NpR6012g4*
4	Julia Kirpich (Larsen) *Unraveling the Mixed Ultrafast and Cryo-trapped Light-induced Dynamics of Tri-cysteine Violet/Blue CBCR Domain from Moorea producens*
5	Amy Bellinghiere (Gervay-Hague) *Natural Products Isolation of Bioactive Glycolipids in Tea, Camellia sinensis*
6	Crystal Ye (Gervay-Hague) *Metabolic profiling of tea (Camellia sinensis) glycolipids using mass spectrometry*
7	Ace Galermo (Lebrilla) *Development of Molecular Photoswitches as MRI Contrast Agents*
8	Derek Gagnon (Britt) *Radical Intermediates in Radical S-adenosyl-L-methionine Enzymes Characterized with Electron Paramagnetic Resonance*
9	Angela Zhang (Atsumi) *Hybrid Synthesis of Scopolamine in Engineered Escherichia coli*
10	Shih-Wei Chuo (Goodin) *Effect of Ligand Binding on the Structure of the Mammalian P450 3A4 in Solution*
11	Heesung Shim (Wulff) *Rational Design of a Kca Channel Activators*

#	Name and Title
12	Nicole Cooper (Shaw) *Development of Molecular Photoswitches as MRI Contrast Agents*
13	Bowen Shen (Louie) *Antioxidant Sensing of Spiropyrans*
14	Jing Guo (Louie) *Macrophage Targeted Nanoparticles for Multimodal Imaging of Inflammation*
15	Xander Wilcox (Fisher) *Structure-Guided Engineering of Glycosyltransferases*
16	Katie Beglinger (Fraser) *Analysis of Eukaryotic Translation Initiation Factor (eIF) Phosphorylation by Mass Spectrometry*
17	Abhishek Santra (Chen) *Facile chemoenzymatic synthesis and purification of glycolipids - Glycosphingolipids*
18	Riyao Li (Chen) *N. meningitidis W135 Capsular Polysaccharide (CPS) Polymerase NmSiaDW135 – An efficient catalyst for one-pot multienzyme (OPME) CPS synthesis*
19	Robert Van Ostrand (David) *Revealing the target recognition mechanism of MutY/MUTYH using modified oligo nucleotides containing synthetically prepared N2-analogs of 8-oxo-2'-deoxyguanosine*
20	Leanna Monteleone (Beal) *Site-Directed RNA Editing with Mutant Adenosine Deaminases Acting on RNA (ADARs)*
21	SeHee Park (Beal) *Covalent trapping of human ADAR catalytic domain using thiol modified dsRNA*
22	Scott Suter (Beal) *Reduction of Off-target effects in RNAi by Using Major Groove Modified siRNAs*