30th Annual Biotechnology Training Retreat

Co-sponsored by:

UC Davis Designated Emphasis in Biotechnology Graduate Program (DEB)

UC Davis Biotechnology Program

Saturday, April 8, 2021

Zoom
Table of Contents

Designated Emphasis in Biotechnology, UC Davis .......................................................... 3
UC Davis Biotechnology Program .................................................................................... 4
Retreat Agenda .................................................................................................................. 5
Oral Presentation Abstracts.............................................................................................. 6
Industry Talks.................................................................................................................... 15
Company Affiliates .......................................................................................................... 18
Mission of UC Davis Biotechnology Program ............................................................. 20
Goals and Mission of Designated Emphasis in Biotechnology Program .................... 21
The Value of Internships ................................................................................................. 24
Designated Emphasis in Biotechnology (DEB) Graduate Program

https://deb.ucdavis.edu/

Executive Committee

Abhaya Dandekar (Chair)
Karen McDonald
David Rocke
Shota Atsumi
Kasey Markel, Student Member

Denneal Jamison-McClung
Director
UC Davis Biotechnology Program
https://biotech.ucdavis.edu/

Denneal Jamison-McClung, Ph.D.
Director

Jacki Balderama; Program Manager
Kelly Meade; Financial Analyst

One Shields Ave
301 Green Hall
Davis, CA 95616
biotechprogram@ucdavis.edu
(530) 752-3260
# 30th Annual Biotechnology Training Retreat  
*April 8, 2021*

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 – 1:10 pm</td>
<td>Welcome</td>
</tr>
</tbody>
</table>
|            | Denneal Jamison-McClung, PhD  
|            | Director, Biotechnology Program |
| 1:15 – 2:15 pm | Presentations         |
| 1:15       | Houston Saxe, DEB Student .............  
| 1:30       | Jake Gonzales, DEB Student .............  
| 1:45       | Rachel Valenzuela, Industry Partner...  
| 2:00       | Anirudh Gaur, DEB Student .............  
|            | Horticulture and Agronomy  
|            | Plant Biology  
|            | Memphis Meats  
|            | Biochemistry, Molecular, Cellular & Developmental Biology  
| 2:15 – 2:25 pm | Break               |
| 2:30 – 3:30 pm | Presentations         |
| 2:30       | Lavanya Anandan, Industry Partner.....  
| 2:45       | Marcus Deloney, DEB Student..........  
| 3:00       | Chidera Alim, DEB Student .............  
| 3:15       | Oscar Muñoz, DEB Student..............  
|            | Merck KGaA  
|            | Biomedical Engineering  
|            | Molecular, Cellular & Integrative Physiology  
|            | Pharmacology & Toxicology  
| 3:30 – 3:40 pm | Voting on STEM-Talks  
| 3:40–4:00 pm | STEM-Talk Awards, Closing Remarks and Break-Out Room Networking |
30th Annual Biotechnology Program
Retreat
April 8, 2021

STEM-Talk Abstracts
1. Houston Saxe

**TRANSCRIPTIONAL BIOMARKERS OF IMMUNITY TO BOTH PHYTOPHTHORA AND CROWN GALL DISEASES IN UNCHALLENGED JUGLANS REGIA (ENGLISH WALNUT) HYBRID ROOTSTOCKS**

**Presenter:** Houston Saxe  
**Graduate Group:** Horticulture and Agronomy  
**Preceptor:** Abhaya Dandekar  
**Authors:** Houston Saxe, Sriema Walawage, Charles Leslie, and Abhaya M. Dandekar

The rootstock pathogens Agrobacterium tumefaciens (crown gall disease) and Phytophthora cinnamomi (Phytophthora crown and root rot) are currently the leading hazards for walnut in California. A. tumefaciens is a rod-shaped, Gram-negative soil bacterium while P. cinnamomi is a soil-borne water mold. These microbes either kill root tissue directly (P. cinnamomi) or obstruct the vasculature with tumors (A. tumefaciens). Both are detrimental by inhibiting the flow of nutrients and water to the grafted scion (upper portion of the plant), reducing crop productivity and plant health. Recent walnut breeding efforts have generated several hybrid rootstocks with varying degrees of resistance to both A. tumefaciens and P. cinnamomi simultaneously. We selected six of these hybrid rootstocks and performed transcriptomic analysis without pathogen challenge. Our objectives were to identify potential biomarkers and molecular mechanisms driving basal immunity to these pathogens. Principal component analysis revealed unique transcriptomic profiles for each hybrid rootstock based on their level of resistance to both pathogens, suggesting the uninfected transcriptional repertoires are critical for resistance. Partial least squares discriminant analysis (PLS-DA) with priors guided by disease phenotype identified 2,368 RNAs underlying the phenotypic variation. Several of these transcripts encoding arabinogalactan proteins and one encoding a trichome birefringence protein were selected as biomarkers for immunity due to their lack of expression in resistant genotypes. Resistance from non-expressed genes is of particular interest because they can be edited in susceptible rootstocks without transgene insertion. Their potential for regulation-friendly scarless genome editing and relevance to plant immunity are discussed.
2. Jake Gonzales

DIVERSIFYING PHOTOMIXOTROPHIC CHEMICAL PRODUCTION IN SYNECHOCOCCOUS ELONGATUS PCC 7942

Presenter: Jake Gonzales
Graduate Group: Plant Biology
Preceptor: Shota Atsumi
Authors: Jake Gonzales, Shota Atsumi

We are utilizing untapped carbon sources such as atmospheric CO2 and crude sugar extracts derived from lignocellulosic biomass to synthesize industrially valuable chemicals in microbes. The chemical production capacity of CO2 fixing microbes is currently too low to be commercially viable. To ameliorate this, the Atsumi group has engineered the cyanobacteria species Synechococcus elongatus PCC 7942 (S. elongatus), an obligate photoautotroph, to grow on supplied glucose in the presence and absence of light by introducing exogenous E coli sugar transporters1. Lignocellulosic lysate derived from abundant and accessible agricultural waste products has become of great interest, it is largely composed of glucose and xylose. Our group has found that growth and chemical production using this crude lysate as a substrate is possible. Additionally, overexpression of key elements of the Calvin Benson cycle (CBB) and pentose phosphate pathway further improved product titer2. Xylose is the second most common sugar and is rarely catabolized in nature. In this project we have observed that by overexpressing key elements of the CBB and introducing E coli transporters we greatly improved product synthesis using xylose as a substrate. We are in the process of engineering a strain capable of utilizing glucose, xylose, and CO2 concurrently to generate a wide variety of chemicals of interest.
Insulin secretion by pancreatic β-cells is stimulated by the incretin hormone GLP-1, producing the “incretin effect”. Two common genetic variants of the GLP-1 receptor (GLP-1R), R131Q and G168S, alter the incretin effect in humans. We have found that neither GLP-1 affinity nor efficacy are altered by these mutations, presenting a “pharmacological mystery” as to how the mutations affect incretin function. Here we examined whether these mutations alter the endocytic/post-endocytic trafficking of the GLP-1R. A cell-surface biotinylation protection/degradation assay was used to measure 1) the degree of receptor endocytosis and 2) the extent of post-endocytic degradation in HEK293 cells expressing wild-type (WT), R131Q and G168S GLP-1R. WT GLP-1R was degraded after endocytosis through interaction with the sorting protein GASP1. Intriguingly, we found that the G168S variant is more rapidly degraded than WT and that the R131Q variant is recycled after endocytosis. To examine the role of GASP1-mediated GLP1-R degradation on incretin function, we used CRISPR to delete GASP1 from INS-1 cells. We then compared incretin-mediated cAMP accumulation and insulin release in WT and GASP1-KO INS-1 cells both acutely and following prolonged pretreatment. Deletion of GASP1 had no effect on incretin-mediated signaling acutely. However, prolonged incretin treatment produced a complete loss of incretin response or “tolerance” in WT INS-1 cells. Importantly, in GASP1-KO INS1 cells, prolonged incretin treatment did not produce tolerance. Taken together, these results suggest that GASP1 regulates degradation of GLP-1R after endocytosis and that altered receptor trafficking could account for the variable incretin effects in patients with receptor mutations.
Degradation of hyaluronic acid (HA) following joint trauma and inflammation stimulates inflammatory cytokine recruitment which results in cyclic degradation of articular cartilage leading to post traumatic osteoarthritis (PTOA). In healthy cartilage, aggrecan is bound to HA and protects it from degradation, however, it is the first casualty following joint inflammation. Following injury inflammatory cytokines recruit aggrecanase which degrade aggrecan, exposing HA allowing it enzymatic cleavage by hyaluronidases. We hypothesize that binding to the exposed HA, mimicking the protective effect of aggrecan, may halt its degradation and ultimately the cyclic stimulation of inflammatory cytokines, thus preventing the degradation of articular cartilage and eventually PTOA. HA binding peptides (HABP) present a potential solution by binding to aggrecan depleted HA – competitively inhibiting its enzymatic degradation. However, the HABPs themselves are susceptible to proteolytic degradation in the extracellular space. To overcome peptide degradation while in tandem inhibiting HA degradation, we have successfully conjugated HABP to the surface of both our non-fluorescently-labeled (hNP) and fluorescently-labeled (hNPsRBITC) thermoresponsive, degradable nanoparticles. HABP conjugation to the surface of the hNP and hNPsRBITC surfaces results in a roughly 50% increase in surface charge and resulted in 45% increase in the dynamic...
viscosity of a HA-solution, compared to unconjugated particles, indicating successful conjugation as well as functionality. Furthermore, osteoarthritic cartilage plugs treated with 313 mM HABP-hNP had a statistically identical equilibrium modulus to healthy cartilage plugs, and was over twice that of untreated osteoarthritic cartilage plug modulus, suggesting an inhibition of HA fragmentation and matrix degradation. These data on HABP functionalized nanoparticles provide a reproducible platform to the prevention of PTOA. Furthermore, our system has the potential to be translated and used to treat a multitude of conditions by conjugating tissue specific peptides to the surface of our hNPs and delivery site specific therapeutics to diseased tissue.
Mechanical stress can affect Ca2+ dynamics in cardiomyocytes and lead to cardiac remodeling, hypertrophy, arrhythmias, and heart failure. Both nNOS and CaMKII signaling pathways have been identified as mediators of mechano-chemo-transduction (MCT) whereby afterload promotes enhanced Ca transients. Here, we test the hypothesis that these two pathways are linked directly via S-nitrosylation of Cys290 on CaMKII β to activate the kinase. Hereto we used nitrosylation-resistant CaMKII δ knock-in mice (C290A substitution) and their wildtype littermates (WT). Using a previously described cell-in-gel system to exert multiaxial 3D mechanical stress during contraction, we measured Ca2+ handling by confocal imaging of Fluo-4 loaded cardiomyocytes.

We found that compared to WT where mechanical load increases Ca2+ spark rate in load-free cells (from 0.11 ±0.02 to 0.34 ±0.05 sparks/100µm/sec), the C290A mutation prevented afterload induced Ca2+ sparks (0.07 ±0.01 in load-free vs. 0.05 ±0.01 sparks/100µm/sec in loaded myocytes). Additionally, in WT, afterload increased the systolic Ca2+ transient (F/F0, 3.7±0.25 in load-free to 5.4±0.37 in loaded cells), which enhanced contractility to better meet mechanical load. In the C290A CaMKII β mutants, that increase in systolic Ca2+ transient was eliminated (5.5±0.29 in load-free vs. 4.0±0.33 in loaded cells). Thus, our data show that CaMKII activation by nitrosylation at the C290 site is essential to mechanical-stress induced Ca2+ regulation in cardiomyocytes. These findings provide new mechanistic insight into the role of CaMKII in mechanical-stress induced Ca2+ dysregulation and its potential as a therapeutic target for treating arrhythmias and cardiomyopathy.
6. Oscar Muñoz

**FUNCTIONAL HDL FOR PROMOTING A FUNCTIONAL PHENOTYPE IN MONOCYTIC CELLS**

**Presenter:** Oscar Muñoz  
**Graduate Group:** Pharmacology & Toxicology  
**Preceptor:** Angela Zivkovic  
**Authors:** Oscar M. Muñoz Herrera and Angela M. Zivkovic

Neuroinflammation is found to be causally linked to Alzheimer’s Disease (AD), and evidence points to the specific involvement of dysfunctional, activated microglia. Apolipoprotein E (ApoE) is the single strongest genetic predictor of AD risk and has been shown to contribute to AD pathology in several ways, including modulating Aβ peptide synthesis, deposition, clearance, and aggregation. ApoE is an apolipoprotein that participates in the transport and trafficking of lipophilic molecules, especially cholesterol, between cells and tissues both in the periphery and in the central nervous system. Cholesterol metabolism is fundamentally involved in neurodegenerative processes involving inflammation. The cholesterol efflux function of ApoE facilitates the degradation of Aβ by microglia. Not only are microglia key mediators of inflammation in AD, but their peripherally derived cousins, macrophages, may also be recruited to the brain and involved in Aβ clearance directly, or may induce clearance indirectly. Fundamental cellular processes such as rates of endocytosis, exocytosis, and the formation/disassociation of multi-protein signaling platforms which determine cellular function and phenotype are determined by membrane cholesterol content. We show, in the THP-1 human cell line, that the cholesterol efflux capacity of macrophages is dramatically reduced in their activated states when compared to their resting state. The activated macrophages have substantially reduced efflux capacity both in the presence and absence of cholesterol acceptor, high density lipoprotein (HDL). Our preliminary data also demonstrate that activated macrophages have an increased mitochondrial cholesterol content compared to non-activated macrophages, and that cholesterol loading increases the mitochondrial cholesterol content of resting macrophages to the same level as non-loaded activated macrophages. We are interested in elucidating mitochondrial dysfunction by mitochondrial-membrane cholesterol enrichment. Our intent constitutes rescuing the phagocytic function in macrophage and microglia by inducing a shift away from a dysfunctional phenotype and thus improve their ability...
to clear neurotoxic substances. One way we aim to achieve this is by exploring the
properties of differently modified HDL and their ability to alleviate any cholesterol
burden in monocytic cells.
Industry Talks
1. Dr. Rachel Valenzuela, Memphis Meats

SHAPING THE SCIENCE OF CELL-CULTURED MEAT

Bio: Dr. Rachel Valenzuela is a Senior R&D Scientist at Memphis Meats in Berkeley, CA. She earned her PhD in Chemistry from UC Davis and was part of the Designated Emphasis in Biotechnology (DEB) program. Her PhD research focused on chemical biology approaches to the RNAi pathway. She did her postdoctoral research at the Innovative Genomics Institute in UC Berkeley where she used high-throughput genome wide CRISPR screening to determine the genetic factors involved in non-alcoholic fatty liver disease. Rachel has transitioned to the food science (cell-based meat) industry and joined Memphis Meats in 2018, where she is creating and optimizing safe and delicious animal-based food products using cell and tissue biotechnologies.
2. Dr. Lavanya Anandan, Merck KGaA

ENABLING THE EMERGING INDUSTRY OF CULTURED MEAT

Bio: Dr. Lavanya Anandan is the Director of Innovation Field- Cultured Meat, within the Strategy & Transformation group at Merck KGaA, Darmstadt, Germany, a global life science and pharmaceutical company. Based at the company’s Innovation Hub in the San Francisco Bay Area, she and her team are building a new business dedicated to developing enabling technologies to accelerate cultured meat production at scale.

Lavanya has held diverse roles in sales, marketing, partnerships and strategy development over her decade long career in the biotech industry. She holds a PhD and BS in Molecular & Cellular Biology from the University of Illinois at Urbana-Champaign. She is an advisor to AiiM Partners, an impact investment fund focused on addressing climate change and on the advisory board of University of California-Davis’ Biotechnology Program.
Company Affiliates
Company Affiliates ** Support Biotech Training at UC Davis

Agilent Technologies
Amgen, Inc.
Amyris, Inc.
Bayer Crop Science**
Bayer HealthCare Pharmaceuticals, Inc.
BioMarin Pharmaceutical, Inc.
Celgene Corp.
Cytokinetics
Genencor (A Danisco Division)
Genentech, Inc.**
Igenica
Marrone Bio Innovations, Inc.
Novartis AG
Novozymes, Inc.**
Nunhems
OncoMed Pharmaceuticals, Inc.
Sutro Biopharma, Inc.
Tethys Bioscience, Inc.

**These Biotechnology companies have donated at least $20,000 per year for a Biotechnology fellowship, have offered an internship site for our DEB graduate students, and have presented at the annual Biotechnology Training Retreat. Company representatives also serve as advisors for training grants and other education programs.

The success of our biotech fellows depends on the continued support of our affiliates. The Biotechnology Program would like to thank them for their committed sponsorship.
The Mission of the Biotechnology Program:

The Biotechnology Program was created in 1986 to assist in the organization of university activities related to biotechnology and to coordinate such activities with other efforts on the Davis campus. It is a central facility of the Office of Research. The Program’s missions include:

• Promoting and coordinating the development of biotechnology and biotechnology-related research on the campus;
• Assisting with development of new and improved facilities for biotechnology research;
• Promoting research interactions between faculty and private industry and public agencies;
• Recommending and implementing curriculum development and training in biotechnology;
• Serving as an information and education resource on biotechnology for the campus and the public.

The Program serves as the Administrative Home for educational programs:

• Designated Emphasis in Biotechnology (DEB) graduate program
  o http://deb.ucdavis.edu
• Advanced Degree Program (ADP) for corporate employees
  o A PhD program for the working professional
• BioTech SYSTEM – K-14 educational consortium

Biotechnology Program Office:
Dr. Denneal Jamison-McClung – Director
Jacki Balderama – Program Manager
Kelly Meade – Financial Analyst
Office location: 0301 Green Hall
Telephone: (530) 752-3260 (main line)    FAX: (530) 752-4125
Email: biotechprogram@ucdavis.edu
Website: biotech.ucdavis.edu
Designated Emphasis in Biotechnology Program (DEB)

Goals and Mission of the DEB

The Designated Emphasis in Biotechnology (DEB) is an inter-graduate group program that allows Ph.D. students to receive and be credited for training in the area of biotechnology. The DEB provides a nurturing interactive environment to promote integration of multiple disciplinary approaches to the conduct of research and to promote learning in biotechnology. The mission is to prepare well-educated students to approach problems with creativity and flexibility. The program will provide tools for the students to be leaders, visionaries, entrepreneurs, researchers and teachers in the broad area of biomolecular technology.

DEB Mission:
• To provide well-coordinated, cross-disciplinary training of graduate students in critical areas of biomolecular technology research.
• To promote interdisciplinary research environments that integrate basic biological science, engineering and computational disciplines.
• To allow cross-disciplinary training and trainee experience in a biotechnology company or cross-college laboratory.

Students come from a wide array of disciplines: Participating graduate programs currently include 29 programs: Agricultural & Environmental Chemistry; Animal Biology; Applied Science Engineering; Biochemistry, Molecular, Cellular & Developmental Biology; Biological Systems Engineering; Biomedical Engineering; Biophysics; Chemistry; Chemical Engineering; Civil & Environmental Engineering; Comparative Pathology; Computer Science, Electrical & Computer Engineering; Entomology; Food Science Technology; Genetics; Immunology; Materials Science & Engineering; Mechanical & Aeronautical Engineering; Microbiology; Molecular, Cellular and Integrative Physiology; Neurosciences; Nutritional Biology; Pharmacology and Toxicology; Plant Biology; Plant Pathology; Soils & Biogeochemistry; and Statistics. The DEB program supplements a student's Ph.D. curriculum and those completing the program will obtain an official designation on their diploma & transcript indicating a qualification in biotechnology. Example: Doctoral Degree in Microbiology with a Designated Emphasis in Biotechnology
Brief History:

The DEB was formally established in 1997 as an outgrowth of the first NIH Training Grant in Biotechnology (funded in the early 1990s). The DEB became the formal training program for the current NIH Training Grant in Biomolecular Technology (1-T32-GM08799: July 1, 2002-June 30, 2017). The DEB provides a very effective multidisciplinary biotechnology concentration, which includes exposure to bioethics, business and legal aspects of biotechnology as well as a 3-6 month internship in a biotechnology company or research laboratory in another college or national laboratory. As of 2012, the DEB has 29 affiliated graduate groups or departmentally based graduate programs. The number of students in the Designated Emphasis in Biotechnology has increased dramatically over the last several years with many being first year students. We have graduated 303 students with a DEB notation on their diplomas as of 2016.

Program Administration:

The administrative home for the DEB is the UC Davis Biotechnology Program. Dr. Denneal Jamison-McClung serves as the DEB Program Coordinator for the DEB, in addition to directing the Biotechnology Program. She works closely with the DEB chair, Abhaya Dandekar (Department of Plant Sciences) and the rest of the executive committee: Shota Atsumi (Chemistry) and David Rocke (Applied Science/Biostatistics) to oversee the day-to-day activities of the graduate program.

Course Work:

The DEB has a required core curriculum for students regardless of whether their graduate major is in biological science, engineering, statistics, etc. A key feature of the DEB is its requirement for a research internship at a cooperating biotechnology company or a cross-college site. When the students complete their Ph.D. requirements as well as the DEB requirements, their diploma notes not only their graduate major, but also that they have completed the DEB (e.g., “Ph.D. in Chemical Engineering with a Designated Emphasis in Biotechnology”).

We have created a website for the Designated Emphasis in Biotechnology (deb.ucdavis.edu/) to advertise the program.

1. **Course Requirements**
   a. **DEB 263** (2 units): Biotechnology Fundamentals and Application (winter quarter, alternate odd numbered years)
      An interdisciplinary course which includes: introduction to modern recombinant DNA technology; rate processes of biological systems, optimization of bioreactor performance; practical issues in biotechnology; and some specific case studies of the development of biotechnology products and processes. Grading: Letter grade; two one-hour exams, one research paper (team project) on a selected topic relevant to biotechnology, and regular reading assignments.
   b. **DEB 282** (variable): Biotechnology Internship (may be done any quarter)
      The internship will expose qualified graduate students to research activities in a biotechnology company, to company culture, to legal and business aspects of industry, and to another career option. A minimum of 3 months internship at a local biotechnology company or cross college or national laboratory (i.e. Lawrence Berkeley Laboratory, Lawrence Livermore National Laboratory, etc.). S/U grading; research performance (student
report) will be evaluated by the professor in charge and in consultation with the company trainer.

c. DEB/ECH 294 (1 unit): Current Progress in Biotechnology (fall, winter and spring quarters). Three quarters of seminar are required for the DEB Program.

This course is an interdisciplinary seminar, featuring speakers from industry as well as academia. The students will have an opportunity to discuss the seminar topic with the lecturers, to learn about biotechnology research activities at companies and to network with speaker. Grading: S/U grading, attendance is required, and a summary report on the seminars is required at the end of the quarter.

d. MIC 292 (1 unit): From Discovery to Product - An Introduction to Biotechnology at the Industrial Level. (winter quarter; even numbered years). MIC 292 is an approved seminar elective for the DEB program (may substitute for one quarter of DEB/ECH 294).

This course is designed to provide a unique opportunity to gain insight into basic and applied biotechnology at the industrial level. Lectures are presented by senior scientists from Novozymes Biotech, Inc. in Davis California (www.novozymes.com). A tour of the industrial facilities will be arranged. Grading: S/U grading, attendance is required, and a summary report on the seminars is required at the end of the quarter.

e. GGG 296 (2 units): Scientific Professionalism and Integrity (fall quarter) or approved bioethics course.

The course will allow the student to become familiar with their roles and responsibilities as a professional scientist and/or instructor. While some standards of acceptable scientific behavior will be presented in class, most of the time will be spent discussing various "gray zone" scenarios, in which proper conduct is unclear. Grading: S/U grading; active class participation in class discussions is required. This course is currently highly recommended, but will be required, pending approval.

2. Qualifying Exam Requirements:

The Ph.D. qualifying exam should demonstrate appropriate knowledge with the area of biotechnology. At least one faculty member of the designated emphasis shall participate in the qualifying examination.

3. Thesis Requirements:

The dissertation committee shall include at least one faculty member of the designated emphasis. The major professor must be a participating DEB member.

4. Additional Requirements:

Regular attendance at the annual Biotechnology Training retreat and at the informal Pizza Chalk Talk Seminars (talks by students and faculty on current research) is expected.
The Value of Internships

Over the last 20 years (even before the formal DEB program was established), we have placed pre-doctoral students in a variety of biotechnology companies for their industrial research experience. They include:

- Advanced Micro Devices (AMD)
- Agilent Technologies
- AgraQuest (a Bayer company)
- Alza
- Amgen
- Amyris
- Antibodies, Inc.
- Aqua Bounty
- Bayer
- Berlex Biosciences
- BioMarin Pharmaceuticals, Inc.
- Carollo
- Celera AgGen
- Cytokinetics
- DuPont
- Exelixis
- Expression Systems
- Genencor
- Genentech
- Hoffmann Eitle
- ICOS
- Igenica
- Institut Charles Sadron
- Marone Bio Innovations
- Maxygen
- Novartis (formerly Chiron)
- Novozymes
- Nunhems
- OncoMed
- Scios
- Somagenics
- Syntex
Industry Partners gain many things from internships:
• Access to highly talented creative researchers
• Opportunity to gain inside track on future employees
• Through students, further collaboration with scientists on campus
• Participate in the annual retreat to meet UC scientists students, potential interns, other company scientists
• Potential to use UC facilities through the collaboration
• Opportunity to participate in weekly campus seminars

Students gain much from internships:
• Ability to work in a highly creative non-academic environment
• Opportunity to participate in focused team approach to defined research goals
• Ability to use equipment and facilities not available on campus
• Discover the type of environment, which suits future career goals
• Participate in industry seminars
• Enhanced curriculum vitae: reference letters and new skills
• Access to potential employment opportunities

Currently, there are ~220 students enrolled, so we need more Academic-Industry Partnerships.