

P R O G R A M

APRIL 22 - 24, 2018

**RESEARCH EXPERIENCES  
FOR UNDERGRADUATES**  
PRINCIPAL INVESTIGATORS MEETING

ATKINSON HALL, UC SAN DIEGO



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## WELCOMING REMARKS



The organizing committee welcomes you to San Diego for the 2018 NSF CISE REU Site PI meeting. The meeting is held at the Qualcomm Institute on the UC San Diego campus. The primary goal of the meeting is for the PIs of the ~100 CISE REU Sites to gather and exchange best practices and network with the other PIs. We developed the program to focus on areas of most pressing concerns primarily based upon polls and other pre-meeting feedback from the PIs. Those indicated that research preparation, recruitment, evaluation, and tracking were some of the most pressing concerns. We aim to make the program interactive to facilitate sharing of best practices by mixing a slate of keynotes, panels, networking events, and breakout sessions.

The meeting commences on Sunday night April 22 with a Networking and Information Dinner at the Estancia hotel. This allows attendees to meet each other and provides information about the activities over the next couple of days.

The first day agenda starts with a session where each site gets “one minute of fame” to introduce their sites and (briefly!) discuss potential ways to transform their site. This is interspersed with a “Fresh and Refresh” breakout and report-back session where we divide into one “fresh” group (new PIs) and several “refresh” groups (other PIs) with the goal of discussing issues with each other on your site’s most pressing issues. The report back session will summarize the discussions and provide some of the more compelling best practices and challenges that the sites face. The afternoon continues with a session for the NSF Program Officers provide some higher level context and a breakout where everyone can meet their individual program officers.

The afternoon ends with a keynote session featuring UCSD Scripps Institution of Oceanography researchers Octavio Aburto and Phil Bresnahan who describe how undergraduates play a key role in their research programs related to coastal ecosystem monitoring. This naturally leads into our evening Research Outreach Event at the Birch Aquarium. Here, we will mingle with the keynote speakers, learn about related research from the undergraduate researchers on these projects, view the aquarium exhibits, have some dinner, and watch the sunset.

The second day starts with a keynote from Prof. Christine Alvarado who will lead a hands-on session discussing strategies for maximizing the success, contribution, and happiness of undergraduate researchers. We continue with another session where attendees breakout into smaller more focused groups to specifically address a topic related to their sites. This is followed by a session on recruitment, evaluation, and tracking, which was indicated as one of the more pressing concerns in the pre-meeting surveys. The morning ends with a session on best practices for communicating student research. The meeting concludes with lunch though there is more opportunities in the afternoon to network while seeing some of the interesting sites on UCSD campus.

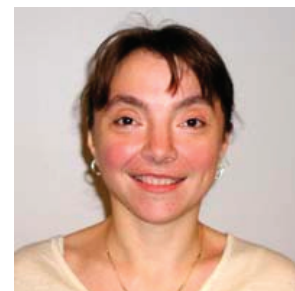
Once again, welcome and cheers to a successful meeting!



**Zachary Dodds**  
Harvey Mudd College  
dodds@cs.hmc.edu



**Ryan Kastner**  
UC San Diego  
kastner@ucsd.edu



**Daniela Stan Raicu**  
DePaul University  
dstan@cdm.depaul.edu

## AGENDA

**SUNDAY, APRIL 22, 6:00PM-9:00PM**

### NETWORKING AND INFORMATION SHARING DINNER

After registration on Sunday evening, there will be a PI get-together and dinner at the Hotel Estancia. In addition to a welcome from the meeting's hosts, there will be some shared—and REU-themed—ice-breaking activities. Bring along common questions your participants ask, your memory of recruiting history, special requests you've honored, and ways participants (and mentors) disseminated the results from your program, for an interactive session that will get your intellectual and competitive juices flowing.

**MONDAY, APRIL 23, 9:00AM-10:00AM, 1:00PM-2:00PM**

### PI SITE INTRODUCTIONS

Each site get their moment in the spotlight...for all of one minute. Attendees give a quick and efficient overview of the scientific focus of their sites and example projects and describe what they would like to do in the future to transform the site.

**MONDAY, APRIL 23, 10:30AM-11:30AM, 12:30PM-1:00PM**

### BREAKOUT: 'FRESH': TIPS AND THOUGHTS FOR NEW PIS

#### LEADERS/SCRIBES

**Katie Siek** (Indiana University) | **Huirong Fu** (Oakland University) | **Saad Biaz** (Auburn University)  
**Wendy Nilson** (National Science Foundation) | **Zach Dodds** (Harvey Mudd College)

#### OVERVIEW

This break-out session invites new-REU-Site discussion – and especially new PIs – those heading into their first or second year of an REU. Experienced PIs and an NSF representative will lead discussions on tips, thoughts, and approaches to:

- **Pre-REU concerns:** advertising, recruiting, decisions & offers, acceptances
- **Logistics:** housing, travel, money, food, etc.
- **Research efficacy:** getting up to speed, cruising/rhythms, deliverables
- **Experiential value:** social coordination, esprit de corps, reporting

Short, 5-minute overviews on each of these will leave time for community-building and experience-sharing, as well as open questions-and-dialog about concerns and opportunities that come with a new REU Site and/or new PI role.

### BREAKOUT: 'REFRESH': KEEPING THINGS FRESH

#### LEADERS/SCRIBES

**Larry Holder** (Washington State University) | **Jugal Kalita** (University of Colorado, Colorado Springs)  
**Ioan Raicu** (Illinois Institute of Technology) | **Daniela Raicu** (DePaul University) | **Mubarak Shah** (University of Central Florida)  
**Greg Pottie** (UCLA) | **Jamie Payton** (Temple University) | **Stephen Huang** (University of Houston)

#### OVERVIEW

This break-out session will discuss issues central to keeping things fresh over the years. The session will focus on how and what needed to be changed to keep things fresh. The session outcomes will include identification of best practices to keep things fresh and learn key elements for innovative and transformative models of undergraduate research. The outcomes will be presented by the PIs leaders/scribes in a 30-minute report back panel-style session.

#### BREAKOUT GROUPS

- **Pre-REU concerns:** recruitment: advertising, managing application process, choosing student, logistics
- **Promote Research Efficiency and maximize experiential value:** preparation, engagement, experiential value
- **Evolving Focus:** adapt to research areas' changes, attract new mentors, collaborators, and secure funding
- **Evaluation, dissemination, and outreach:** site evaluation, research dissemination, outreach

## AGENDA

**MONDAY, APRIL 23, 2:30PM-4:00PM**

### CONNECTING WITH NSF PROGRAM OFFICERS

NSF program directors will discuss issues relative to REU Site management, recruiting, reporting, renewals, and other issues relative to the REU Site community. At the end of the session, attendees will meet with their own program officers overseeing their site to discuss other topics in depth. See the list of sites and program directors in the booklet to determine which group you will participate in.

**Wendy Nilsen** – ADD ROOM

**Rahul Shah** – ADD ROOM

**Jonathan Sprinkle** – ADD ROOM

**Harriet Taylor and Sushil Prasad** – ADD ROOM

#### Useful Links:

Template for Annual Report: ADD ME  
OTHERS?

**MONDAY, APRIL 23, 4:00PM-5:00PM**

### KEYNOTE: TECHNOLOGIES TO PROTECT COASTAL ECOSYSTEMS

#### Mangroves: The Skin of our Coasts

*Octavio Aburto, Scripps Institution of Oceanography*

Abstract: The humble mangrove forest is one of the most biologically important ecosystems that border our oceans. They act as the skin of our coastlines, managing the energy exchange between land and sea; and provide vital ecosystem services such as waste treatment, habitat, food resource, and recreation. I have been on many expeditions throughout Mexico and other Latin American countries, where I study these ecosystems and photograph them in action: acting as a nursery for fish, hosting migratory birds after their long flight, and buffering coastlines against storms. In this presentation, I will show how my studies about valuation of mangrove ecosystem services, have received unanticipated interest and concern by Mexican and international media. Although small, I have seen a notable shift in the attitudes of governments towards mangroves and in the communities fighting to protect them.

Biography: Octavio Aburto is an Associate Professor at Scripps Institution of Oceanography (SIO), a professional photographer associate with the International League of Conservation Photographers, and a National Geographic Explorer. Dr. Aburto obtained his PhD at the Center of Marine Biodiversity and Conservation at SIO, and was awarded the Jean Fort Award by the University of California, San Diego, for his significant contribution to an issue of public concern through his doctoral research. Dr. Aburto is a Katerhyn Fuller Fellow, WWF-Science Program in 2010, was awarded the Conservation of Nature prize by the Mexican Ministry of the Environment – CONANP in 2014, and received a Hellman Fellowship, for a Junior Faculty Research Project in 2015. His research and photographs have focused on marine reserves and commercially exploited marine species and their fisheries in Mexico, Belize, Costa Rica, Ecuador, and the U.S. His photographs have been part of several conservation projects worldwide and have won international photography contests. In 2018, he was named PEW Fellow and will assess changing productivity and distribution of mangrove ecosystems using high-resolution satellite imagery and drone technology.

#### Connecting our Coasts and Coastal Communities with Smartfin

*Phil Bresnahan, Scripps Institution of Oceanography*

Abstract: Smartfin's beta program with the San Diego Chapter of the Surfrider Foundation began almost a year ago. Since then, we've deployed over 100 Smartfins—IoT surfboard fins designed for citizen oceanography—in six countries. Smartfin has brought together scientists, engineers, educators, artists, and community members in all of those regions to discuss some of the most pressing environmental issues of our time and collect coastal data. I'll describe my role with Smartfin as an R&D Engineer at Scripps Institution of Oceanography, our current infrastructure (from the fin itself through web visualizations), and upcoming modifications, including the engagement of several current undergraduate students as well as a previous REU student who is now a full-time engineer on my team. Check out smartfin.org for more on this project.

Biography: Phil Bresnahan is driven to make the planet as healthy as possible, through both professional and personal action. He is a Research & Development Engineer at Scripps Institution of Oceanography and the Lead Engineer for the Smartfin Project. Through Smartfin, he is inventing a surfboard fin capable of measuring ocean health so that surfers can become actively engaged in marine research and protection and so that we can all be better stewards of our environment. Phil leads and collaborates on other marine chemical sensor development projects, mostly focused on studying the impacts of excess, human-produced carbon dioxide on our oceans. When he's not in the lab, he's usually in the ocean collecting oceanography data from his surfboard or stand-up paddleboard.

## AGENDA

**MONDAY, APRIL 23, 6:00PM-9:00PM**

### RESEARCH OUTREACH EVENT

Learn more about the technologies developed at UCSD to protect our environment, understand large-scale ecology, and document cultural heritage. The keynote speakers Octavio Aburto and Phil Bresnahan will be on-hand to talk more about their projects. Additionally, UCSD REU students will present their research projects. Those projects and student presenters are detailed below.

The **Radio Telemetry Tracker** project is a collaboration between the San Diego Zoo's Beckman Institute for Conservation Research and UC San Diego's Engineers For Exploration. Tracking wildlife radio collars is the most effective way of monitoring animal movement patterns, however, this is limited by the speed at which researchers can traverse over the terrain in the area where these animals reside. The Radio Telemetry Tracker project addresses these challenges by using drones and software defined radios to fly over the search area, listen for the pings, and estimate the location of the transmitter with fairly high accuracy. We have done deployments across the Caribbean tracking a variety of iguanas as part of studies on how these endangered species behave.

**Presenter:** Nathan Hui, UCSD Electrical and Computer Engineering MS student and 2015 REU Summer Program alumnus.

**Operation Trash Route** is working to stop environmental pollution using drones to collect high-resolution imagery to find illegal dumpsites. Citizen scientists help us label these trash sites and we use this labeled data to train machine learning algorithms to automate the process. Once the illegal dump sites are detected, we must remove the trash. To facilitate this, we introduce a new business structure that uses a sharing economy solution to pay drivers to collect the trash and ensure it makes it to a designated waste management facility. These efforts together will help protect and restore valuable natural habitats. These initiatives give us the power to collect data on existing pollution, educate the public and policy makers about how this pollution is impacting the countries natural resources, and give these communities tools to track waste diverted from ecosystems.

**Presenter:** Nikko Dutra Bouck, UCSD Computer Science and Engineering BS student and 2017 REU Summer Program alumnus

**Mangrove Monitoring:** Mangroves provide extremely valuable services. They sequester significant amounts of carbon; they protect coastlines from strong storm systems; and they provide an ecosystem for diverse and important species. Unfortunately we have lost 35% of mangroves around the world in the last three decades. This is due to human activities and a huge lack of knowledge around how important mangroves are to the coastal ecosystem. We are using high-resolution drone imagery to classify mangrove species in order to better understand the ecosystems and how they are changing. Using crowdsourcing techniques to label data for machine learning we will be able to automate the classification of coastal ecosystems. This will give us a powerful toolbox for studying mangroves and coastal ecosystems at the macro scale. Additionally, this automation will provide the data necessary to educate policymakers and community members about the importance of these diverse ecosystems and how they are changing over time.

**Presenter:** Katherine Qi, Marine Biology BS student and 2018 REU Summer Program participant

The **Maya Archaeology 3D Modeling** project aims to equip archaeologists with faster and more precise tools such as laser scanning and robotic mapping to digitally reconstruct Maya archaeological sites. As a result, we are able to not only study the sites through a different lens, but also explore creative opportunities to open up these remote ruins to the public through virtual reality and 3D printing. We developed tools to compare the accuracy of 3D computer models of the Maya sites. We compared different data collection methods and equipment, 3D reconstruction algorithms, and post-processing algorithms to determine the best procedure for accurate, efficient, and accessible archaeological documentation.

**Presenter:** Proud Heng, Computer Science and Engineering BS student and 2017 Summer Program Alumna

**Aerial LiDAR:** With much of the Maya ruins hidden beneath dense jungle, it can be extremely hard to discover new artifacts and historic sites. The emergence of LiDAR scanning enabled scientists and archaeologists to employ aerial scanning techniques to search large areas of the jungle in a fraction of the time. However, these services run at an exorbitant cost. As the cost of LiDAR units decrease and the appearance of reliable autonomous drones increase, unmanned drones equipped with scanning payloads are becoming available for use. The goal of the Aerial LiDAR project is to build a platform, payload, and software pipeline to fly an unmanned mission over a target area. While flying this mission, the drone will take LiDAR scans of the area, combine them with position and heading data from an Inertial Navigation System (INS) and construct a 3D point cloud of the surveyed area. Once we have this data, we will be able to determine how the quality of data produced by aircraft compares to the data produced by a low-flying drone.

**Presenter:** Brian Rush, UCSD Electrical and Computer Engineering BS student and 2018 REU Summer Program participant

## AGENDA

**TUESDAY, APRIL 24, 8:30AM-9:30AM**

### **KEYNOTE: ZERO TO RESEARCH**

**CHRISTINE ALVARADO, UC SAN DIEGO**

This session focuses on hands-on strategies for maximizing the success, contribution, and happiness of undergraduate researchers. Engaging undergraduates, especially early undergraduates, in meaningful research brings a unique set of challenges. Undergraduates are used to working with highly structured problems (i.e. problem sets and programming assignments), and when faced with the open-ended, ill-structured tasks for which they might be missing the background knowledge and skills, they sometimes struggle, drift and/or lose confidence even when they are very strong students. How can we, as research mentors, help them reach their full potential?

This session presents a number of strategies for supporting undergraduate researchers based on the UCSD Early Research Scholars Program. ERSP engages 40 mostly second-year students in supported, academic-year-long research apprenticeships in computer science, with a particular focus on engaging women and student from other groups underrepresented in computer science. The session begins with a discussion about challenges faced by audience members in engaging undergraduates in REUs and continues with a discussion on strategies for: 1) Introducing undergraduates to the research process and getting them up to speed on background knowledge, 2) Keeping undergraduates accountable for their work, and helping them make steady progress, 3) Mentoring and communicating with undergraduate researchers effectively, as well as issues that come up during the opening discussion. Finally we will conclude with a guided discussion session where audience members can share best-practices and strategies with each other.

Biography: Christine Alvarado is an Associate Teaching Professor and Vice Chair for Undergraduate Affairs in the Computer Science and Engineering Department at the UC San Diego. Her current efforts are focused on designing curriculum and programs to make computing and computing education more accessible and appealing, with the specific goal of increasing the number of women and underrepresented minorities who study computing. Her work is funded by several grants from the National Science Foundation including a Faculty Early Career Development (CAREER) award and a CISE Pathways to Revitalized Undergraduate Computing Education (CPATH) award and a Computing Education for the 21st Century (CE21) award. In 2013 she received the A. Richard Newton Educator ABIE Award from the Anita Borg Institute for her contributions diversity in computer science education. Dr. Alvarado received her undergraduate degree in computer science from Dartmouth in 1998, and Masters and Ph.D. degrees in computer science from MIT in 2000 and 2004, respectively. She is a member of the AP Computer Science Principles development committee and the CRA's Education committee. She previously served on the College Board's commission to design the new Advanced Placement Computer Science Principles, as a co-chair of the NCWIT Academic Alliance and as general co-chair for the 2015 Grace Hopper Celebration of Women in Computing.

**TUESDAY, APRIL 24, 9:30AM-10:30AM**

### **BOF SESSION: SITE COORDINATION: WHAT'S VALUABLE? WHAT'S POSSIBLE?**

#### **LEADERS/SCRIBES**

**Jason O'Kane** (University of South Carolina) | **Daniel Katz** (UIUC) | **David Feil-Seifer** (University of Nevada Reno)  
**Evan Suma** (USC) | **Wes Uehara** (UCLA) | **Juana Moreno** (Louisiana State University) | **Cecilia Overdotter Alm** (RIT)  
**Rachel Burcin** (Carnegie Mellon University) | **Joshua Sunshine** (Carnegie Mellon University) | **Zachary Dodds** (Harvey Mudd College)

#### **OVERVIEW**

These Birds of a Feather (BOF) sessions will address an open-ended challenge for REU programs: how might individual REU Sites meaningfully coordinate, connect, or share their efforts and experiences? Certainly, all REU Sites already offer meaningful, lasting human connections within their Site experiences. This Birds-of-a-Feather session will offer five separate break-outs, organized by a possible theme through which Sites might consider coordinating. Each BOF theme will collect discussion ideas, which will be shared to our community post-meeting: the one or two most promising or striking will be shared out on site.

#### **BREAKOUT GROUPS**

**Connecting via Research Themes - By Topic:** Computing research at its core is about fostering topically-connected communities of researchers. How could REU Sites, together, tap and/or join those research communities?

**Connecting via in-person shared experiences - By Geography:** How could programs leverage geographic proximity to share those experiences among sites?

**Connecting via educational emphasis - By Academic Identity:** Some REU Sites highlight a distinctive facet of the undergraduate experience, could REU Sites share practices and experiences through these kinds of shared identities?

**Connecting via local community - By Local Engagement:** How could such REU Sites best take advantage of their surroundings - either on their own or including other REUs?

**Other connections/Overlap with the REU Solicitation - Other Themes:** This fifth session is for other coordination ideas and for sites where coordination seems especially daunting. We'll do some out-of-the-box thinking.

## AGENDA

**TUESDAY, APRIL 24, 11:00AM-12:00PM**

### **PANEL: RECRUITMENT, EVALUATION AND TRACKING**

#### **PANELISTS**

**Daniela Raicu** (DePaul University) | **Audrey Rorrer** (UNC Charlotte) | **Eliot Winer** (Iowa State)

#### **OVERVIEW**

This panel will discuss issues central to recruitment, assessment, and tracking, and inform the CISE REU PI community about the Evaluation Toolkit tools that support these issues, the CISE REU PI Resources website, and the Alumni Tracking Tool Pilot Program. Some specific topics and questions to be addressed include:

- **The Common Application and student recruitment:** What specific application data is collected, how it operates, what statistics have been generated since 2010? How are the applications shared across sites? What are the pros and cons of using the Common Application? How effective from the user perspective has the Common Application been on recruitment and strategies to increase diversity?

- **A la Carte Survey and evaluation metrics, tools, reporting:** What are the A la Carte Survey's key indicators and how were they developed? How was the survey data collected from various sites been used, what kind of statistics are generated, and what data packages/analysis are available to the PIs? What are the recent publications and findings from these site evaluations?

- **CISE REU PI Resources website:** How is it organized, how will be maintained over time? What kind of tips, advice, and resources it provides to run an effective site? How can PIs contribute to the website?

- **Alumni Tracking:** What is the Alumni Tracking Tool pilot, how it works, and what it captures? What are the pros and cons of using the Alumni Tracking Tool pilot, and how to work around it? What kind of longitudinal data and statistics have been individually collected by sites?

#### **RELEVANT LINKS**

**CISE REU PI Guide website:** <https://www.vrac.iastate.edu/cise-reu-pi-resources/>

**Alumni tracker:** <https://reu.uncc.edu/cise-reu-toolkit>

**TUESDAY, APRIL 24, 12:00PM-1:00PM**

### **PANEL: COMMUNICATING STUDENT RESEARCH**

#### **PANELISTS**

**Daniela Raicu** (DePaul University) | **Cecilia Dong** (New York Institute of Technology) | **Cindy Grimm** (Oregon State University)  
**Feng Li** (Indiana University-Purdue University Indianapolis) | **Douglas Thain** (University of Notre Dame)

#### **OVERVIEW**

The panel focuses on ways to communicate undergraduate student research effectively and provide examples for various communication methods used by the panelists at their own REU sites. Through discussions, the panel aims to brainstorm and identify a set of best practices to prepare REU students for communicating their research in a variety of settings and scenarios. Some specific topics and questions to be addressed include: 1) Provide exemplars for best highlights, papers, posters, TED talks, and research proposals for summer projects and NSF graduate fellowship applications, 2) How to prepare students to articulate their research to the layperson, 3) Provide examples of venues for communicating student research, and 4) Educate students on publication process in workshops, conferences, and journals.



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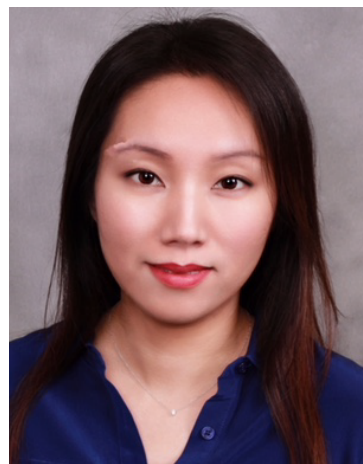
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