

Program



Connecting Science Education Theory and Practice

*A Workshop for Graduate Students, Postdoctoral Researchers, and Educators of the
Center for Adaptive Optics*

March 16 – 21, 2005

Royal Lahaina Resort

Maui, Hawaii



This workshop was developed and sponsored by:

Center for Adaptive Optics

Exploratorium

UC Santa Cruz Education Department

Maui Economic Development Board

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National Science Foundation

Science and Technology Center

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MAUI ECONOMIC DEVELOPMENT BOARD, INC.



Agenda at a Glance

Wednesday, March 16

3:30 – 4:00	Registration
4:00 – 5:30	Opening Session and Introductions
5:30 – 7:00	Poster Session
7:00	Dinner

Thursday, March 17

7:30 – 8:00	Continental Breakfast
8:00 – 3:00	Group 1: Tour of Haleakala Observatories Group 2: Training and Preparation for Returning Participants
6:00 – 7:00	Dinner
7:00 – 7:30	Intro to Inquiry
7:30 – 8:30	Design Gallery

Friday, March 18

7:30 – 8:00	Continental Breakfast
8:00 – 11:15	Three Kinds of Hands-on Activity
11:15 – 12:30	Seven Principles Discussion
12:30 – 1:30	Lunch
1:30 – 3:00	Bus to Maui Beach Hotel
3:30 – 8:00	High Tech Maui Industry Education Exchange and Dinner

Saturday, March 19

8:00 – 8:30	Continental Breakfast
8:30 – 2:00	Inquiry Experience (Box Lunch)
2:00 – 7:00	Break
7:00	Dinner

Sunday, March 20

8:00 – 8:30	Continental Breakfast
8:30 – 11:30	Inquiry Continued
11:30 – 12:30	Lunch
12:30 – 2:00	Inquiry Discussion
2:00 – 2:30	Break
2:30 – 4:00	Past Inquiry Designs
4:00 – 5:00	Concurrent Sessions
6:00 – 7:00	Dinner
7:00 – 8:00	Design Gallery II

Monday, March 21

8:00 – 8:30	Continental Breakfast
8:30 – 2:00	Inquiry Design (Working Lunch)
2:00 – 3:30	Final Comments and Survey
7:00	Celebration Dinner

Detailed Agenda

*Blue sessions have been designed for returning PDW participants. For some roles, attendance is required at particular sessions. In other cases there is flexibility and choice. If you have any questions, please talk to any of the workshop staff.

Day 1

Wednesday, March 16, 2005

10:00 – 12:00 Inquiry Facilitator Preparation

Barry Kluger-Bell

Oahu/Molokai

***Who Should Attend:** The Inquiry Co-Facilitators – Kathy Cooksey, Mike McElwain & Shelley Wright

1:00 – 3:00 CTP Group Meeting

Lisa Hunter

Oahu/Molokai

***Who Should Attend:** CTP Working Group

3:30 – 4:00 Registration

Hotel Lobby

4:00 – 5:00 Opening Session

Welcome and Introduction to Workshop

Lisa Hunter, Associate Director, Education and Human Resources, CfAO

Morris Aizenman, Senior Science Associate, Directorate for Mathematical & Physical Sciences, National Science Foundation

Oahu/Molokai

5:00 – 5:30 Participant Introductions

Lisa Hunter

Oahu/Molokai

5:30 – 7:00 Poster Session*

Lower Alii

** Posters can be setup in Lower Alii anytime after 3 PM on March 16. Please remove your poster by 5 PM on March 17.**

7:00 **Dinner**
Alii Terrace

Day 2
Thursday, March 17, 2005

7:30 – 8:00 **Continental Breakfast**
Hale Pillani

8:00 – 3:00 **Group 1: Tour of Haleakala Observatories**
Meet in the hotel lobby at 8 AM. BRING WARM CLOTHES,
CLOSED TOED SHOES AND YOUR PHOTO ID!

Group 2: Training and Preparation of Returning Participants

8:00 – 8:30 **Returning Participants: Overview of Roles**
Lisa Hunter
Hale Pillani

8:30 – 3:00 **Facilitator Preparation**
Barry Kluger-Bell
Oahu/Molokai

8:30 – 11:30 **Design Leader Preparation**
Lisa Hunter and Candice Brown
Hale Pillani

11:30 – 12:30 **Box Lunch**

2:00 – 3:00 **CTP Meeting**
Lisa Hunter
Hale Pillani

3:00 – 4:00 **Inquiry Shadower Preparation**
Lynne Raschke
Oahu/Molokai

3:00 – 5:00 **Preparing Design Posters and Gallery**
Lisa Hunter
Hale Pillani

- 6:00 – 7:00 Dinner**
Alii Terrace
- 7:00 – 7:15 Introduction to the Exploratorium and Inquiry**
Barry Kluger-Bell
Hale Pillani
- 7:15 – 7:30 Research on the PDW**
Doris Ash
Hale Pillani
- 7:30 – 8:30 Design Gallery 1**
Informal 3-minute presentations on:
- Past designs that can be used as is, modified for a new audience, or are in need of refinement
 - Venues that need inquiry designs
 - New designs (presented by Design Team Leaders) that teams can help develop
- Lisa Hunter*
Hale Pillani

Day 3
Friday, March 18, 2005

- 7:30 – 8:00 Continental Breakfast**
Hale Pillani
- 8:00 – 11:15 Three Kinds of Hands-on Learning**
Candice Brown and Barry Kluger-Bell
Hale Pillani and Alii Terrace
- 11:15 – 12:30 Seven Principles Discussion**
Participants will discuss their experience in the Three Kinds of Hands-on Learning activity and how it relates to learning principles. Prior reading required.
CTP Group
Hale Pillani and Alii Terrace
- 12:30 – 1:30 Lunch**
Tiki Grill

1:30 – 2:30 Bus to Maui Beach Hotel for HTMIEE

Meet in the Lobby

3:30 – 8:00 High Tech Maui Industry Education Exchange

Lisa Hunter

Maui Beach Hotel

Day 4

Saturday, March 19, 2005

8:00 – 8:30 Continental Breakfast

Hale Pillani

8:30 – 2:00 Inquiry Experience (Box Lunch)

Participants explore a range of puzzling optics phenomena, develop questions, form a team for further investigation of their chosen question, and begin investigations.

Candice Brown and Barry Kluger-Bell

Oahu/Molokai

2:00 – 7:00 Break

7:00 Dinner

Alii Terrace

Day 5

Sunday, March 20, 2005

8:00 – 8:30 Continental Breakfast

Hale Piilani

8:30 – 11:30 Inquiry Experience (continued)

Participants finish their investigations and share results.

Candice Brown and Barry Kluger-Bell

Oahu/Molokai

11:30 – 12:30 Lunch

Tiki Grill

12:30 – 2:00 Inquiry Discussion

Oahu/Molokai

2:00 – 2:30 Break

2:30 – 4:00 Past Inquiry Designs

Introduction, *Lisa Hunter*

Vision Science Inquiry Designs: *Jason Porter & Lana Nagy*

COSMOS Astronomy Projects: *Scott Seagroves & Patrik Jonsson*

Analyzing and Reporting Data: *Lynne Raschke*

Oahu/Molokai

4:00 – 5:00 Concurrent Sessions:

A. Shadower Debrief

Lynne Raschke

Hale Piilani

B. Facilitator Debrief

Barry Kluger-Bell and Candice Brown

Oahu/Molokai

Break if you do not need to attend Session A or B.

6:00 – 7:00 Dinner

Alii Terrace

7:00 – 8:00 Design Gallery 2

Design Teams generate and then present their work plans.

Hale Piilani

Day 6

Monday, March 21, 2005

8:00 – 8:30 Continental Breakfast

Hale Piilani

8:30 – 8:45 Introduction to the Design Session

Lisa Hunter

- 8:45 - 1:00** **Design Team Work** (Box Lunch)
Hale Piilani
- 1:00 – 2:00** **Design Gallery 3**
Report on Design Team Progress and Next Steps
Hale Piilani
- 2:00 – 2:15** **Final Comments**
Hale Piilani
- 2:15 – 2:45** **Survey**
Hale Piilani
- 2:45 – 3:30** **Debrief and Feedback Sessions**
Hale Piilani
- 3:30 – 7:00** **Break**
- 7:00** **Celebration Dinner**
Ocean Front Lawn

Workshop Team

Lisa Hunter, Center for Adaptive Optics, University of California, Santa Cruz CfAO Professional Development Workshop Director

Lisa Hunter is the Director of Education and Human Resources at the Center for Adaptive Optics (CfAO), where she develops and leads programs aimed at students from the high school to graduate and postdoctoral levels. Her work focuses on engaging scientists and engineers in educational efforts that increase access to science and engineering, such as inquiry-based teaching approaches, mentoring, and partnership building. She has designed residential science programs, internship programs, workshops, and a range of other educational activities.

Doris Ash, University of California, Santa Cruz

I am an Assistant Professor at University of California Santa Cruz in science education. My main research focus is on museum learning, specifically attempting to understand the thematic content of family conversations about life science topics, as well as the inquiry skills used in advancing scientific sense-making.

The aim of all my museum research is to understand how social groups make sense of science in informal contexts. With the help of an NSF career grant (REC # 0133662), and an AERA/IES grant I am conducting a five-year research project with English and Spanish-speaking families (many of whom are bilingual). The aim is to understand scientific sense-making but with a second aim of determining how museum learning can serve as a pathway to increasing advancement in formal science settings, especially for those typically excluded from science and mathematics. This work is consistent with UCSC'S philosophy of equal access to science learning for all students. To that end I have forged strong formal collaborative links over the past year with two informal learning institutions, the Monterey Bay Aquarium and the Seymour Marine Discovery Center.

Before joining the Faculty at UCSC, I was a Science Educator with the Institute for Inquiry (IFI) at the Exploratorium (1995-2000). My work at the Exploratorium focused primarily on inquiry and professional development design for local and national science education reform efforts. Before that I was a teacher for many years, primarily as a science specialist in a K-8 school. In keeping with the same theoretical frame that emphasizes intertwining science inquiry and literacy.

Candice Brown, Center for Informal Learning and Schools (CILS)

Candice is the Director of the Center for Informal Learning and Schools (CILS) at Santa Cruz. As Director, she co-teaches science education courses for the Science Fellows program and she coordinates Center activities for doctoral students in education, psychology, and in the sciences. She has a Ph.D. in Education Psychology with an emphasis in Teaching and Learning/Science Education from the University of California,

Santa Barbara. Her research focused on middle school students from diverse backgrounds learning about science and how to do science in a long-term weather research project. She has worked on curriculum development, led professional development workshops, designed traveling education exhibits, and taught science methods and theory courses in the Division of Education at University of California, Davis. She founded the Farallones Marine Sanctuary Association, a nonprofit that helps protect ocean resources through outreach and education. Most recently, she spent the last few years as a science educator working for the Institute for Inquiry (IFI) at the Exploratorium doing professional development design and helping other informal science institution with professional development.

Patrik Jonsson, University of California, Santa Cruz

Patrik Jonsson is a postdoc in astronomy at UCSC, where he also went to graduate school, studying interstellar dust. He's been involved in CfAO education activities since the center started, and is one of the few "fifth-year returnees" at the Professional Development Workshop. Previously, he has worked as an instructor for COSMOS and has helped design and facilitate numerous inquiry experiences, including at a previous workshop. This year, he is helping staff the Workshop, mostly working with the connection between educational theory and teaching practice.

Barry Kluger-Bell, Exploratorium

Barry Kluger-Bell is Assistant Director for Science at the Exploratorium Institute for Inquiry in San Francisco. He holds an A.B. in Physics and Mathematics from the University of California at Berkeley, and a Ph.D. in physics from the University of Colorado. Dr. Kluger-Bell has worked as a research physicist, college level physics teacher, science teacher-educator, and as director of the Bay Area Science Project. At the Exploratorium, he has served as science resource teacher, developed curriculum materials, worked with elementary teachers and children in their classrooms, developed and led inquiry education workshops for teachers, university graduate students and faculty, and professional developers. He is author of *The Exploratorium Guide to Scale and Structure*. He has served as an advisor for video projects by WGBH, Boston and Annenberg/CPB in Washington.

Jason Porter, University of Rochester

Jason Porter is a post-doctoral fellow working under the advisement of Dr. David R. Williams in the Center for Visual Science at the University of Rochester. He received his B.S., M.S., and Ph.D. in optics from The Institute of Optics at the University of Rochester. Jason's thesis research focused on the design of clinical diagnostic systems for vision and on improving, designing and enhancing methods to correct the aberrations of the human eye using laser refractive surgery, contact lenses and adaptive optics. Currently, he is developing an adaptive optics scanning laser ophthalmoscope for high-resolution retinal imaging experiments in human patients with color vision deficiencies and cone/rod dystrophies, as well as in animal models of retinitis pigmentosa and glaucoma. Jason is

also the lead editor for the first book that will provide information on how to design, build and implement adaptive optics systems for vision science applications. As a member of CfAO, Jason has designed, organized, and facilitated numerous CfAO Educational activities. He continues to be the lead vision science instructor in the 'Stars, Sight and Science' program, and has assisted in the design and instruction of the Professional Development Workshop. He has designed and facilitated inquiry activities at the Rochester Saturday Open Lab while also mentoring undergraduates in the CfAO's Mainland Internship Program.

Lynne Raschke, University of California, Santa Cruz

Lynne is a PhD candidate in the Astronomy and Astrophysics department at UC - Santa Cruz. Her dissertation is a study of gas and dust morphology and kinematics at the centers of nearby galaxies. She has observed extensively with the laser guide star adaptive optics system at Lick Observatory. Lynne has been actively involved in the CfAO's EHR activities since the summer of 2000. She has attended the Professional Development Workshop every year since its inception in 2001 and has held various roles at the PDW over the past 4 years including discussion leader, shadower and facilitator. Lynne co-developed and co-taught the first CfAO Short Course in 2002 and continued to teach and develop curriculum for the Mainland Short Course in 2003 and 2004. Lynne also has participated in the CfAO's "Stars, Sight and Science" (COSMOS) program: she was a project leader in 2001 and co-lead instructor in 2002 and 2003. In her work with the Mainland Short Course and "Stars, Sight and Science", Lynne has helped develop two full inquiry activities as well as several other innovative activities for teaching topics related to optics and astronomy. Lynne has also taken the CfAO-sponsored graduate-level education course, Education 286, "Teaching Science for Scientists". Lynne is very interested in improving college-level introductory science courses and increasing diversity in science. She hopes to find a career that allows her to pursue these interests as well as astronomy research.

Scott Seagroves, University of California, Santa Cruz

Scott Seagroves received a BS (physics) and a BA (philosophy) from the U. of North Carolina at Chapel Hill and is now a PhD candidate in astronomy/astrophysics at UC Santa Cruz. His research has been in "statistical astrophysics" on such topics as the redshift distribution of gamma-ray bursts, the detection of transiting extrasolar planets by amateur astronomers, and the velocity distribution of pulsars. He has experience designing projects/curriculum, facilitating inquiries, and teaching, in such venues as COSMOS / "Stars, Sight, and Science", Maui Community College, and the CfAO Professional Development Workshop. This year he has helped plan/staff the PDW as a member of the "Connecting Theory and Practice Working Group". He is a Science Fellow of the NSF Center for Informal Learning and Schools (CILS). He is interested in education, outreach, policy, science literacy, and in particular issues involving groups that are underrepresented in science.

Speakers

Morris Aizenman, Senior Science Associate, Directorate for Mathematical & Physical Sciences, National Science Foundation

Dr. Morris L. Aizenman is the Senior Science Associate in the Office of the Assistant Director for the Mathematical and Physical Sciences Directorate of the National Science Foundation. His responsibilities include NSF oversight of the Center for Adaptive Optics. Dr. Aizenman received his doctorate in Astronomy and Astrophysics from the University of Chicago and a bachelor's degree in Honors Physics from the University of Alberta. Dr. Aizenman joined the National Science Foundation as a Program Director in the Division of Astronomical Sciences. He has been Section Head, Deputy Division Director, and Executive Officer within that Division. Prior to joining NSF he held positions at the University of Colorado, the University of Montreal, and the University of Liege in Belgium.

Jeanne Unemori Skog, President & CEO, Maui Economic Development Board

Jeanne Unemori Skog serves as the President and Chief Executive Officer for Maui Economic Development Board, Inc. (MEDB) and is a member of the Economic Development Alliance of Hawaii (EDAH). At MEDB, she administers the organization's \$2 million annual budget, and directs a highly qualified and technically skilled 14-member staff, reporting directly to the MEDB Board of Directors. Ms. Skog works to identify and address issues supporting development of an appropriate and sustainable economic climate in Hawaii and in Maui County, in the areas of infrastructure, education and workforce. Particular attention has been given to attracting high tech business, and facilitating the growth and diversification of Hawaii-based industries which engage in the sustainable development of Hawaii's agricultural, energy, environmental, and technological resources.

Leslie R. Wilkins, Vice President and Program Director, Women in Technology Project

Ms. Wilkins serves as Vice President of the Maui Economic Development Board, Inc. (MEDB). She joined MEDB in October 1999 to direct its Women in Technology Program—The Women in Tech project is funded through a grant from the U.S. Department of Labor and is the first workforce development project of its kind to encourage women and girls into science, technology, engineering and math careers.

Session Co-Leaders

Returning participants who are involved in leading sessions.

Design Team Leaders

Amy Anderson, University of California, Davis
Sarah Anderson, W. M. Keck Observatory/CfAO
Sarah Martell, University of California, Santa Cruz
Anne Metevier, University of California, Santa Cruz
Marshall Perrin, University of California, Berkeley
Amy Ritter, University of California, Santa Cruz
Sally Robinson, University of California, Santa Cruz
Jerome Shaw, University of California, Santa Cruz

Inquiry Co-Facilitators

Kathy Cooksey, University of California, Santa Cruz
Michael McElwain, University of California, Los Angeles
Shelley Wright, University of California, Los Angeles

Inquiry Shadower Leader

Lynne Raschke, University of California, Santa Cruz

Inquiry Shadowers

Mark Ammons, University of California, Santa Cruz
Mark Hoffman, Maui Community College
Sarah Martell, University of California, Santa Cruz
Lana Nagy, University of Rochester

Connecting Theory and Practice (CTP) Working Group

Patrik Jonsson, University of California, Santa Cruz
Jason Porter, University of Rochester
Lynne Raschke, University of California, Santa Cruz
Scott Seagroves, University of California, Santa Cruz

PDW Event Manager

Hilary O'Bryan, Center for Adaptive Optics, University of California, Santa Cruz

CfAO Education Coordinator

Malika Moutawakkil Bell, Center for Adaptive Optics, University of California, Santa Cruz