

2005 CfAO Professional Development Workshop

“Connecting Science Education Theory and Practice”

Introduction

Lisa Hunter

Associate Director, Education & Human Resources
(EHR)

Center for Adaptive Optics

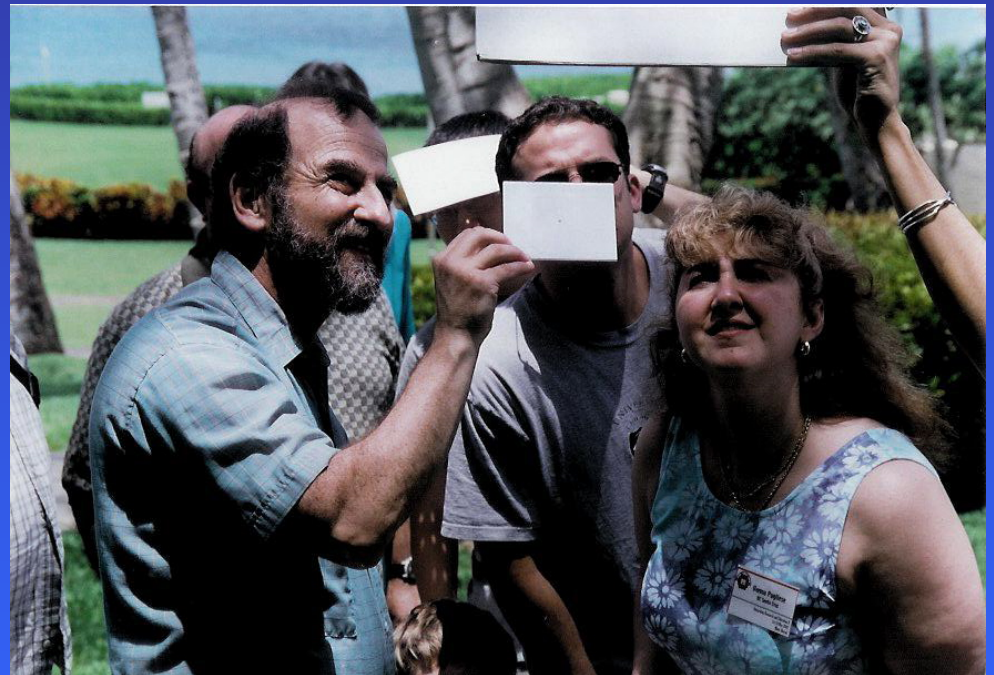
March 16, 2005



Hmmm...6 days focused on “inquiry” on Maui



- Why inquiry?
- Why Maui?
- Why does the CfAO spend so much time, money and effort on this?
- What’s going to happen this week?



Overview of this presentation



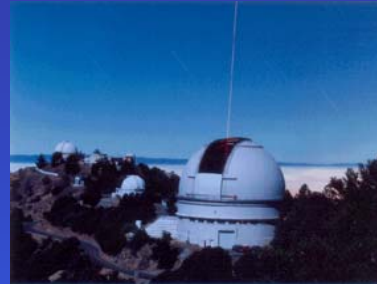
- **Center for Adaptive Optics**
 - **Comments from Morris Aizenman**
- **Inquiry**
- **CfAO connections to Hawaii**
- **Overview of the workshop: what we do and how we do it**
- **Participant introductions**

Center for Adaptive Optics



- NSF Science and Technology Center.
1 of 5 funded in 1999, at \$4million/yr
for 10 years (2009)
- Headquarters at UC Santa Cruz
– Director: Claire Max
- 11 university nodes
– Over 40 partner institutions
- Integrates research and education into
four major themes
- Funded to make new discoveries in
research and education - innovation in
an interdisciplinary environment
- NSF Technical Coordinator:
Morris Aizenman

ASTRONOMY



EDUCATION

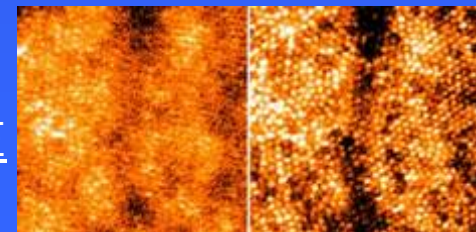


ADVANCED TECHNOLOGY



Without AO

With AO



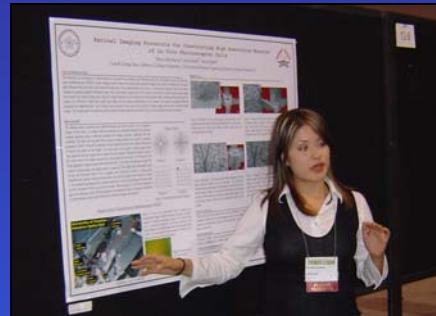
VISION SCIENCE

Images of single cells in the living human retina

CfAO Education & Human Resources



Stars, Sight and Science
(high school)



Internships
(college)



Short Courses
(college)



Hawaii Partnerships
(college)



**Professional Development
Workshop**
(grad & postdoc)



Education 286
(grad student)

EHR Program



BROADEN PARTICIPATION

PEOPLE:

Advance students
in CfAO fields

TOOLS:

Innovations within
established models

“Teaching Labs”

Workshop



Ed 286

Grad
students



Postdocs



Immersion Program

Internships

Recruitment &
Retention

Scientist
educators:

- Tools
- Resources
- Skills
- Community



High school
students

College
students

The CfAO EHR Staff Team



Lisa Hunter, Malika Moutawakkil-Bell, Hilary O'Bryan



Sarah Anderson

Overview of this presentation



- Center for Adaptive Optics
 - Comments from Morris Aizenman
- **Inquiry**
- CfAO connections to Hawaii
- Overview of the workshop: what we do and how we do it
- Participant introductions

Inquiry: Processes of Science



- **Generating research questions (engineering: identifying problem)**
- **Studying research reports**
- **Designing studies**
 - **Planning procedures**
 - **Controlling variables**
 - **Making observations**
 - **(engineering add: constraints, testing, debugging)**
- **Explaining results**
 - **Transforming observations**
 - **Finding flaws**
 - **Making generalizations**
 - **Communicating**
- **Developing theories**
 - **Developing theoretical explanations or mechanisms**
 - **Coordinating results from multiple studies**

Inquiry Teaching and Learning



- Teaching methods that teach not only the content, but the processes of science (i.e. scientific inquiry)
- The PDW community uses the word “inquiry” as a shorthand for an activity that is designed and taught using inquiry-based approaches:
“We designed a new vision science inquiry”



Mirrors "real" science



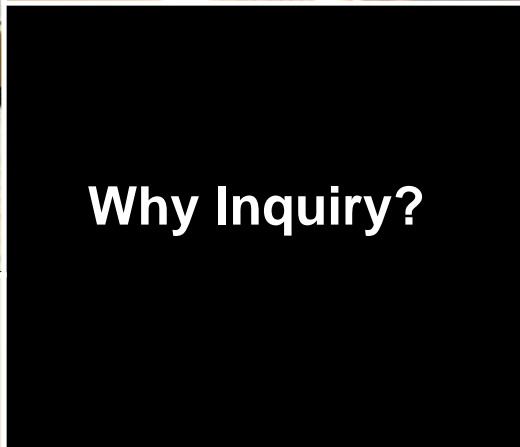
At the heart of CfAO's community of practice



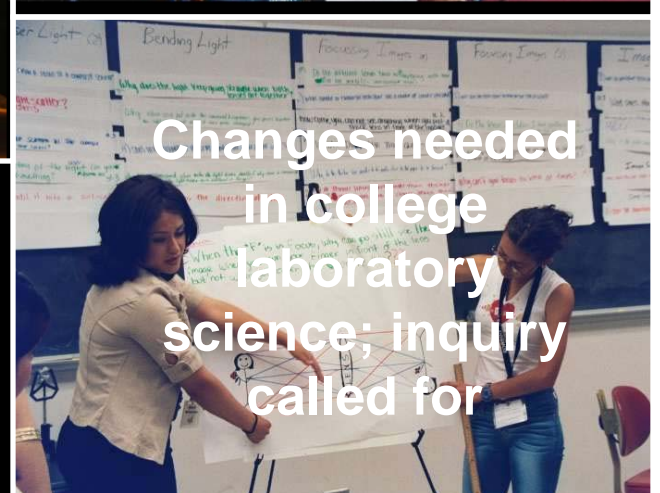
Research grants: Federal funding agencies (e.g. NSF broader impacts criterion)



Aligns with theory on how people learn



Why Inquiry?



Changes needed in college laboratory science; inquiry called for



Students learn content and process skills



Diversity: supports multiple ways of learning & builds confidence



Called for in national reform efforts (e.g. National Science Standards)



What students say:

"The inquiry project gave me a sense of power over what I wanted to know, and it made me want to know more. It's empowering"



Overview of this presentation



- Center for Adaptive Optics
 - Comments from Morris Aizenman
- Inquiry
- **CfAO connections to Hawaii**
- Overview of the workshop: what we do and how we do it
- Participant introductions

Why Maui?



- Mauna Kea (Big Island) and Haleakala (Maui) are extremely important resources for the astronomical community
- The CfAO has a strong commitment to the Hawaiian community
- At the HTMIEE you will hear about science and technology on Maui, and our partnership activities



It's a great place to be!

Overview of this presentation



- Center for Adaptive Optics
 - Comments from Morris Aizenman
- Inquiry
- CfAO connections to Hawaii
- **Overview of the workshop: what we do and how we do it**
- Participant introductions

PDW Staff



- **Doris Ash**
 - **Asst. Professor, Education Department, UC Santa Cruz**
- **Barry Kluger-Bell**
 - **Asst. Director for Science, Institute for Inquiry, Exploratorium**
- **Candice Brown**
 - **Director, Center for Informal Learning and Schools (CILS), UC Santa Cruz**
- **Lisa Hunter**
 - **Assoc. Director, Education and Human Resources, Center for Adaptive Optics, UC Santa Cruz**

PDW: Interwoven Strands



- Personal experience in inquiry
- Theory and research: how it connects to teaching practice
- Design
- Facilitation (returning participants)
- Community



What happens at the workshop



- Day 1 (now): Context, introductions, and poster (community)
- Day 2:
 - Haleakala (community)
 - Preparation for returning roles (facilitation & design)
 - Design Gallery 1 (design)
- Day 3:
 - Comparing hands-on approaches (theory)
 - Seven principles discussion (theory)
 - High Tech Maui Industry Education Exchange (community)

What happens at the workshop (cont)



- Day 4:
 - Personal experience in inquiry
 - Afternoon off; evening social?
- Day 5:
 - Personal experience in inquiry
 - Reflection on inquiry (inquiry & theory)
 - Past design panel (design & theory)
 - Design Gallery 2 (design)
- Day 6:
 - Design teams work on designs (design)
 - Celebration (community)

What we hope you will get at this workshop



- **Increasing capacity for inquiry teaching and learning**
 - **Setting goals, including inquiry skills**
 - **Specific tools and strategies**
 - **Experience designing activities that match goals and connect to theory**
 - **Facilitation (for returning participants)**
- **Enhancements in your general teaching skills: knowledgeable and reflective**
- **An increasing awareness of educational research and theory on how people learn, and how it connects to practice**
- **You become part of the education, as well as science/engineering community, within the CfAO**

The PDW cycle



2005 workshop roles for returning participants



- Inquiry facilitators: Shelley, Mike, and Kathy
- Inquiry shadowers: Mark H., Mark A., Sarah M.
- Shadowers Preparation: Lynne
- Design team leaders: Sarah M., Mark A., Marshall, Sally, Amy R., Anne, Amy A., Sarah A., Jerome
- CTP Group: Jason, Patrik, Scott Seagroves, Lynne



2005 PDW Special Staff



- **Patrik Jonsson, Postdoc, Astronomy Department, UC Santa Cruz**
- **Jason Porter, Postdoc, Institute of Optics, University of Rochester**
- **Lynne Raschke, Graduate Student, Astronomy Department, UC Santa Cruz**
- **Scott Seagroves, Graduate Student, Astronomy Department, UC Santa Cruz**

Who are you?



Poster Session



- After introductions we will move over to Hale/Alii for poster session
- 1 minute summary from each presenter
- 60 minute poster session
- Posters will be up until tomorrow

Participant Introductions



1. Pair up with somebody you don't know

- **Name**
- **Affiliation**
- **Position**
- **Why you are here - what you hope to gain**
 - **Returning: what you have gained in the past**
- **Something about yourself that is outside of work (e.g. sports, music, hobbies, etc.)**

2. Introduce your partner (30 seconds)