

BUILDING A SUCCESSFUL TEACHERS' WORKSHOP IN ASTRONOMY & ASTROPHYSICS



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Figure 1. The UCI Observatory



Figure 2. Night Sky Demo

Introduction

- Teachers' Workshops in Astronomy & Astrophysics are part of a larger Faculty-Led Outreach program entitled *Outreach in Astronomy & Astrophysics with the UCI Observatory* (PI = T. Smecker-Hane; see Figure 1.)
- Funded by an NSF FOCUS grant to UCI
- Workshops are 2-day long events held each summer
- Cost is \approx \$14,000 per workshop

The Teachers

- Attended by 20 K-12 teachers from local school districts (Compton, Newport/Mesa and Santa Ana)
- Each teacher is paid a \$200 stipend
- Pre-Workshop Surveys tell us:
 1. Most teachers declare a "strong" personal interest in learning more about astrophysics, but only half understand how to link it to their content standards.
 2. Most teachers disagree that they have resources available to incorporate astronomy into their lessons.
 3. Nearly all teachers "strongly" agree that their students are capable of doing simple experiments in class.

Teachers' Toolkit

Each teacher receives the following material:

- Astronomy Textbook & Planetarium Software (provided by a publisher free of charge)
- ASP's books entitled *Universe at Your Fingertips* and *More Universe at Your Fingertips*
- Planisphere
- Solar System slide set or HST Images CDRom
- Glossy photos & posters from STScl, etc.

Abstract

We discuss the *Teachers' Workshop in Astronomy & Astrophysics*, that we designed to aid K-12 grade teachers in incorporating astronomy and astrophysics into their curricula. Our workshop gives teachers both the content and instruction they need to accomplish this goal. We introduce many examples of creative hands-on activities and experiments they can do with their classes and instruction on how to build a coherent curriculum for their particular grade level. We also introduce teachers to CLEA, a suite of computer lab exercises that can be used effectively in high school physics classes. Teachers rate the workshop as highly necessary, very valuable, and very enjoyable.

Providing Instruction

Because only a small fraction (17%) of these teachers have taken a college astronomy course, an important component of the workshop are hour-long lectures filled with demonstrations on:

1. Basic Astronomy: motion of objects in the night sky, moon phases and the seasons
 - Motions in the Night Sky demo; see Fig. 2
2. The Solar System
3. Physics of Light
 - Spectroscopy demo; see Fig. 3
4. Hot Topics in Astrophysics
 - Searching for planets around other stars
 - Expansion of the Universe.

CLEA for High School Teachers

We introduce teachers to two of the Contemporary Laboratory Exercises in Astronomy (CLEA), developed by L. Marschall et al. at Gettysburg College with funding from the NSF, that are applicable for talented high school students. They also are used in our COSMOS Astronomy & Astrophysics program, a month-long summer program for talented high school students; see Fig 4.

- Astrometry of Asteroids
 - Emphasis: Geometry, Linear Motion, Parallax
- The Hubble Redshift-Distance Relationship
 - Emphasis: Basic Algebra, Data Collection & Experimentation, Expansion of the Universe



Figure 3. Spectroscopy Demo

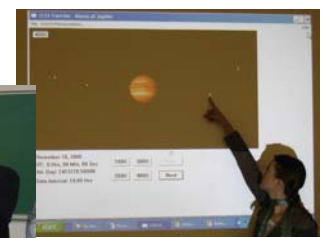


Figure 4. CLEA Demo

Hands-On Activities & Curriculum Development

- Provided by two books published by the Astronomical Society of the Pacific (ASP): *Universe at Your Fingertips* and *More Universe at Your Fingertips*
- Applicable for grades 3-12 although extendable to K-12
- Some of the examples that we cover:
 1. Modeling Moon Phases
 2. Scale Model Solar System
 3. Making a Sun Clock
 4. Investigating Types of Stars
 5. Astronomer's Toolkit
 6. Counting Galaxies in the Hubble Deep Field

Teachers' Post-Workshop Comments

Teachers' evaluations of the workshop are shown below on a scale of 1 through 5, with 5 being the highest:

- Pacing 4.3
- Informative 4.7
- Engaging 4.5
- Useful 4.3

Suggestions for improvement: demos of more hands-on activities, ideas for science fair projects

For more information: see us on the web at <http://www.physics.uci.edu/%7Eobservat/#e&o>.

Acknowledgements: Funding was provided by the National Science Foundation through FOCUS grant, EHR-0227202 (PI = Ronald Stern) to UCI. The views expressed here are those of the authors and do not reflect those of the National Science Foundation.