

## Supporting Data on UCO Education and Outreach Programs

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### Mount Hamilton Programs.

- **Statistics:** Number of people participating in tours of the 36-inch Great Lick Refractor telescope: FY 2011: 22,560; FY 2012: 24,149; FY 2013 to date: 14,128. Friday Night Summer Visitors' Program: 2,100 to 2,600 people per year. Saturday Night Star Parties: 150 – 200 people per year.
- **Metrics:** In the fall of 2010 a survey of visitors to the 36-inch Great Lick Refractor was completed by the Center for Science Education at UC Berkeley's Space Sciences Laboratory. The visitor survey included questions about overall enjoyment of the visit, favorite part of the visit, time spent in the visitor center, rating of exhibits in the visitor center, enjoyment of specific exhibit elements, awareness of various activities taking place at the Lick Observatory (including both public programs and research activities). Visitors were very positive about their visit, responding to the question "How much did you enjoy your visit today" with a rating of 9.6 out of 10. The tour of the Observatory and telescope was rated the favorite part of the visit by 60% of the respondents; another 14% rated the history of the Observatory most highly. The quality of exhibits in the Visitor Center was rated at 8 points out of 10. Visitors were well aware of the major research areas in which the Observatory engages. Half of the visitors spent an hour or more at the Visitor Center and its exhibits; another 40% spent 30 minutes to an hour.

### Center for Adaptive Optics Programs.

1) **Education Programs at UCSC:** As a spin-off after ten years of National Science Foundation funding for the Center for Adaptive Optics, UCSC's Institute of Scientist and Engineer Educators (ISEE) prepares science and engineering graduate students and postdoctoral researchers for their educational role as future faculty members. ISEE focuses on higher education and emphasizes educational practices that support diverse learners, and that create equitable learning environments, specifically with inquiry, diversity & equity, and assessment. Participants receive training on research-based teaching methods through workshops, then participate in a design team, and put their new teaching skills into practice in the classroom. PDP participants leave the program as well-trained, innovative, and reflective scientist-educators and engineer-educators. Since inception, approximately 160 graduate students at California institutions have been trained by ISEE. ISEE has received partial funding through UCOP systemwide support for the CfAO (\$50,000/yr from July 2009 through June 2012). The Astronomical Society of the Pacific has published a dedicated volume containing articles that document the Professional Development Program and its outcomes<sup>1</sup>. ISEE participants develop and teach innovative workshops for undergraduates. Each year ISEE participants provide workshops to about 200 undergraduates, of which about 2/3 are from groups underrepresented in science and engineering, and about 2/3 are community college students. One example of a workshop taught by ISEE participants is WEST (Workshops for Engineering and Science Transfers). To date more than 200 California community college students transferring to UCSC have been part of WEST. Institutional data are now available from the earliest cohorts in WEST, and indicate that the initial cohort of WEST students were 7% more likely to persist in a science or engineering major compared to non-WEST transfer students.

2) **New Collaboration with UC Berkeley's Center for Science Education:** In 2012 UCO began a long-term collaboration with UC Berkeley's Center for Science Education (CSE), with the goal of developing and funding education and public outreach programs related to Lick Observatory

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<sup>1</sup>"Learning from Inquiry in Practice," ASP Conference Series, Vol. 436, Lisa Hunter and Anne J. Metevier, eds. (2010 Astronomical Society of the Pacific).

activities. A Memorandum of Understanding states that CSE will evaluate the design and effectiveness of existing programs, and will collaborate with UCO in the development of new programs and funding through its extensive experience and expertise in science education and public outreach. Two areas are identified for initial thrusts: a Lick Observatory Teacher Workshop (LOTI), and a collaboration with San Jose's Tech Museum of Innovation to develop exhibits both at the museum and at Lick Observatory's Visitor Center. UCOP-supported Astronomer/Professor Claire Max is faculty liaison for this activity.

3) CfAO Summer Schools: The CfAO runs an annual week-long Summer School in adaptive optics at UCSC. Students attend lectures and discussions, and participate in hands-on laboratory activities with real optics and adaptive optics systems. Attendees from 2010 through 2012 averaged 62 per year, and represented 7 UC campuses, 51 other universities in the US and abroad, 7 US observatories, 9 foreign observatories from South Africa to Chile, and attendees from assorted national laboratories and industrial organizations. The Summer School is assessed via detailed questionnaires, and is consistently rated very highly. The Summer Schools were launched under NSF funding, continued under UCOP funding, and are now financially self-sufficient.

4) The Laboratory for Adaptive Optics (LAO): This state-of-the-art laboratory at UC Santa Cruz specializes in development of advanced adaptive optics systems and components. UCO also makes it available to visiting researchers, to attendees at the annual AO Summer School, and to graduate students in Professor Max's Astronomy 289 course in Adaptive Optics and its Applications. In 2010 through 2012 the LAO was used by 49 UC researchers and students, 48 from other US universities, 41 from non-US universities, 34 from US Observatories, 30 from non-US Observatories, and 4 from US national laboratories. The LAO was built with a grant from the Gordon and Betty Moore Foundation, under the auspices of UCO. Its infrastructure and base staffing are supported by UCOP funds.

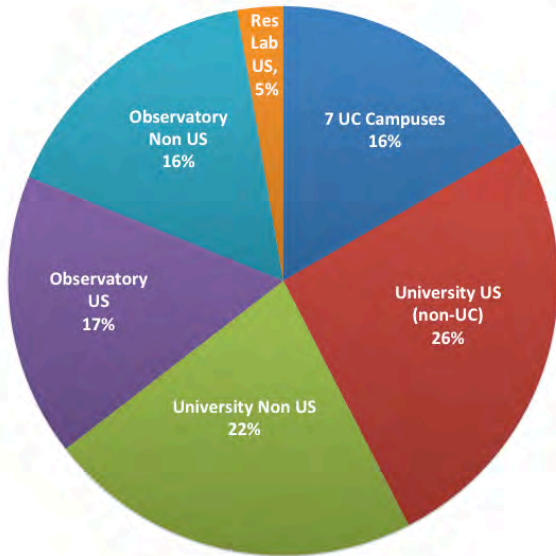
5) UC Santa Cruz Graduate Course in Adaptive Optics, Astro 289. Every other year, Professor Claire Max teaches a graduate level course in adaptive optics. Students from UCSC attend, but more notably external students also attend via live video-teleconferencing facilities from other UC campuses, other US universities, US and foreign observatories, and industrial organizations via UC Extension. To our knowledge this is the only current full-quarter course at the graduate level focusing on this new and exciting technology, which has cross-cutting relevance to astronomy, retinal imaging, and biological microscopy.

The varied nature of the clientele using CfAO facilities is illustrated below.

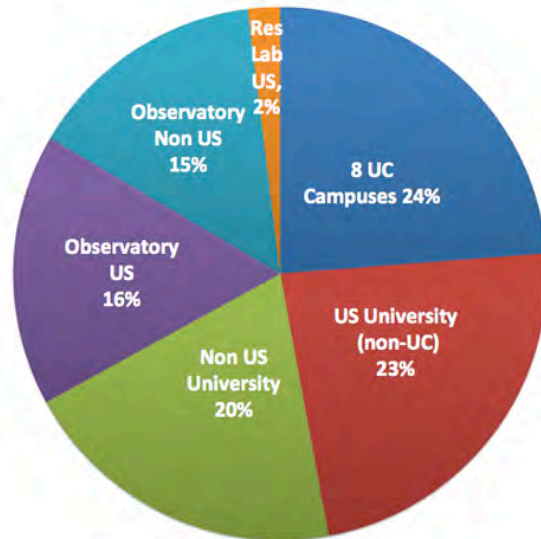
CfAO Summer Schools.

Users of Laboratory for Adaptive Optics

**Participants in AO Summer School, 2010-2012**



**Users of the Laboratory for Adaptive Optics, 2009-2013**



Participants in Graduate Course in Adaptive Optics

**Graduate Course in Adaptive Optics 2011 and 2013**

