

Texas Observatory for Remote Research and Education (TORRE)

Problem Statement

Light pollution dramatically affects major cities like Houston, Texas, home to a rich and diverse urban community. Providing quality viewing experiences in light-polluted areas is a major challenge, particularly when attempting to involve underrepresented populations in astronomy and diversifying the workforce. Women and under-represented groups in metropolitan areas are geographically precluded from quality astronomical viewing experiences.

The U.S. Bureau of Labor Statistics' "2004-05 Career Guide to Industries and Occupational Outlook" handbook declares that "we must help alternative labor pools gain industry-defined skills and competencies and enhance the capacity of educational institutions in order to diversify astronomy and aerospace related disciplines." The U. S. Department of Labor "Workforce Report 2004" states that "other sectors of the economy depend on aerospace businesses and related disciplines, including astronomy, for technical skills and technologies that are critical elements of our security infrastructure and improve America's position in the global marketplace." The report identifies the greatest challenges for diversifying this specific workforce to include preparing for the demographic groups and recruiting young and diverse non-traditional labor pools. In order to broaden participation, efforts should be made in diverse communities with labor force needs in astronomy/aerospace-related fields. Houston, a center for the aerospace industry, is home to NASA's Johnson Space Center and the Rice University Department of Physics and Astronomy, making Houston an ideal community for such an effort.

According to the American Association of Community Colleges "National Profile of Community Colleges: Trends and Statistics 2002," over 50.5% of all minority undergraduates enroll in community colleges. However, less than three dozen of America's 1,157 community colleges have observatories. In order to increase the number of underrepresented groups in the field of astronomy, we must bring the facilities and programs to these populations. As the largest populations of underrepresented groups are found in metropolitan, light-polluted areas, overcoming light-pollution is a major challenge when attempting to involve women and underrepresented populations in the study of astronomy, producing a diversified workforce. Underrepresented and economically disadvantaged students, as well as female students with families, cannot make the financial or time commitment involved in traveling hundreds of miles for dark-sky observing.

Proposed Project

In the demographically-diverse urban community of Houston, we will provide remote observatory experiences at the university and community college level and beyond. We will also provide undergraduate and graduate level students with important research experience. We have crafted the Texas Observatory for Remote Research and Education program (TORRE) in order to broaden the participation of women and minorities in astronomy and draw them to the field.



Project Overview

Written by Juan Carlos Reina

TORRE will integrate the diverse expertise of faculty of two urban higher education institutions. Rice University faculty (Johns-Krull, Dufour, Hartigan) from the Physics and Astronomy Department will coordinate research and education efforts with graduate and undergraduate students. Houston Community College faculty (Reina and Boston) will provide expertise in astronomy, physics and synchronous and asynchronous delivery of instruction through the internet and television to remotely control the telescope and deliver the images and data to a network of computer labs and desktops at the two institutions and across the nation.

TORRE will refurbish a 30 in telescope and dome on Mount Locke at The University of Texas' McDonald Observatory, located 450 miles west of Austin, Texas, and install a remotely-operated 30" RCOS Ritchey-Chrétien telescope. This telescope will be outfitted with a science grade imaging system equipped with broadband UBVRI filters; narrowband Ha, O III, S II, S III, N II, and Ar III filters; and low resolution transmission gratings. This imager will be the primary science instrument on TORRE. In addition, the telescope will be equipped with a low resolution long slit spectrometer and lower grade CCD camera that will be used primarily for undergraduate education. Programs will be provided for Houston students in grades 9 through 12, community college students, university-level undergraduates and graduate students. The professional astronomical community at-large will be able to access the observatory via the internet regardless of geographic location. The number of professional astronomer nights will be approximately 100 per year once TORRE is operational, and this program will provide remote access to TORRE via computer. Research will be focused primarily on imaging studies (variable stars, extra-solar planet searches, jet variability, supernova studies, asteroid studies) but will also include efforts using low resolution spectroscopy. TORRE will offer a robust observing experience, enhancing research and education infrastructure by providing an observatory that can be remotely operated by a consortium of academic and professional astronomy institutions.

TORRE will increase participation by underrepresented groups including minorities, women, community colleges and individuals in geographic areas that have been historically unable to participate. The lead agency, William Marsh Rice University (Rice), with a well-established astronomy program, is well-qualified to undertake this effort. HCC, with enrollment comprised of 49.9% women, 76% under-represented groups and 68% economically disadvantaged students, and Rice, an institution that confers MST, MS, and Ph.D. degrees in astronomy and astrophysics, are qualified partners for this PREST grant opportunity.

Lead Organization Background

William Marsh Rice University, founded in 1912, provides an unsurpassed undergraduate education in science, engineering, the arts, humanities, and social sciences. Since 1962, Rice has been home to the nation's first Space Science Institute. As one of only 67 universities in the US that offers MST, MS, and Ph.D. degrees in astronomy and astrophysics, Rice has an accomplished track record in this field and is the ideal grant partner.

Rice University Demographics (2004-2005)	Caucasian	59%
Total Enrollment (Graduate/Undergrad)	Hispanic	9%

Project Overview

Written by Juan Carlos Reina

Female	43%	African American	5%
Male	57%	Asian/Pacific Islander	12%
		Other/Undisclosed	15%

Partner Organization Background

Houston Community College, located in Houston, Harris County, Texas, a designated Hispanic-Serving Institution (HSI), is a public two-year system of six community colleges under one system administration. Founded in 1971, over 1.3 million students have enrolled at HCC, an open admission institution that awards associate degrees and certificates in academic studies and workforce programs. HCC serves six school districts in all or part of several counties in the Houston Metropolitan Area. HCC is accredited by the Commission on Colleges of the Southern Association of College and Schools.

HCC Demographics	Fall 2006	Caucasian	23.4%
Total Enrollment (credit only)	39,226	Hispanic	27.5%
Female	49%	African American	25.1%
Male	50.1%	Asian/Pacific Islander	11.9%
Economically Disadvantaged	68%	Other/Undisclosed	12.1%

This link between a two-year institution, HCC, and a university, Rice, will successfully diversify the participating population of future astronomers. Rice will leverage HCC's student population comprised mainly of women (59%), underrepresented groups (76%) and economically disadvantaged students (72%). HCC will partner with Rice to provide a robust observing experience, complete scientifically meritorious research and reach students of all ages, utilizing and leveraging years of academic excellence and leadership in astronomy.