STABLE ISOTOPE ASTROBIOLOGY AT HISPANIC SERVING INSTITUTIONS: SI SE PUEDE!

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Abstract: A "crawl-walk-run" strategy has been used to create a strong, sustainable program in stable isotope geochemistry with an emphasis on astrobiology. The "crawl" stage was supported by California Space Grant, the "walk" stage was supported by the McNair Scholar Program, and the "run" stage was funded by the NASA ABI-MIRS (Astrobiology Institute-Minority Institute Research Sabbatical) Program. The result of this work was the creation of a vibrant stable isotope geochemistry program addressing the record of early life on Earth, the graduation of many exceptional students, several student-faculty publications, and the placement of two of these students in graduate school.

Crawl Stage: California Space Grant funded a project in 2007-8 to examine terrestrial analog stable isotope astrobiological indicators. In this work, three of our best students were selected to participate. Each student was awarded a modest stipend, and provided with modest research funds. These students meet weekly to discuss reading assignments in an astrobiology text book. They also developed an outline for a research project in astrobiology and obtained preliminary field data. The projects were 1) investigation of nitrogen stable isotope values of minerals from diverse geological settings, and their potential to record the presence of life. 2) Determination of C and H stable isotope values for stichtite, and the significance of these values as a record of methane in subduction zones. 3) Investigation of halophile Archea living in pink salt crystals of Searles Dry Lake, California.

Walk Stage: Each student participant applied for the award of a competitive McNair Summer Scholar Research Grant (summer 2008). Two, who are the co-authors of this paper, were successful. These students used their summer research funds and time to develop their "crawl-stage" project into a full-fledged research project with potential for a publishable result. In addition, these senior students served as mentors for younger students who voluntarily participated in the research in hopes of developing their own astrobiology project in the future for their senior thesis. The results of these projects included: 1) Determination that nitrogen stable isotope values of nitrate minerals provide a very reliable indicator of past biological activity. 2) Stichtite (Cr-Mg Carbonate Hydroxide) has C and H stable isotope values consistent with biogenic methane.

Run Stage: In this final stage, the lead author, and advisor for the student participants, was awarded an ABI-MIRS Research Sabbatical for 2009. This program permitted the awardee a chance to travel to the University of Hawaii Astrobiology Institute for two months to use advanced isotope instrumentation (isotope ion probe). The original student participants were now graduate students in our program and the data from this sabbatical became the basis for their theses. In December 2009, these students returned to the University of Hawaii Astrobiology Institute for an additional week of instrument time to complete their Master's theses. In addition to the ability to use instrumentation not otherwise available, the students and their advisor were able to participate as members of a large astrobiology group and build a significant partnership for future collaborative work. The ABI-MIRS Research Sabbatical, especially the follow-up funding for the students, was a program that had the single most significant impact of any program in which the lead author has participated.

Conclusions: The framework has been set in place for a three-component, sustainable experiential learning program in stable isotope astrobiology at a Hispanic Serving Institution. Future work will focus on providing support for student participation through a combination of NASA Minority Programs and traditional competitive programs. The ultimate goal is that the program will be funded entirely through traditional funding opportunities; an achievement that will not be possible without the initial support of NASA for smaller minority serving institutions.