

Enhancing Diversity in Astronomy: Minority-Serving Institutions and REU Programs

Strategies and Recommended Actions

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A white paper from the AAS Committee on the Status of Minorities in Astronomy

In response to its charge from the AAS Council, the Committee on the Status of Minorities in Astronomy (CSMA) has been working to identify promising strategies for enhancing the participation of under-represented minorities in the astronomy profession. At the January 2003 Meeting (Seattle), the CSMA organized a Special Session highlighting the important role of Minority-Serving Institutions (MSIs) and Research Experiences for Undergraduates (REU) programs. The goal of the session was to assemble a panel of MSI faculty, REU directors, and AAS members to identify specific strategies, and then for the CSMA to synthesize these suggestions into a set of recommended actions. This report is the result.

The report begins with an executive-style summary, including specific recommendations and action items, and is followed by a thorough summary of the session.

1. EXECUTIVE SUMMARY

Minority-serving institutions (MSIs) are major producers of minority undergraduates in physics. Tapping the undergraduate talent at these institutions may be key to enhancing diversity at the higher levels of the astronomy profession. The loss of these students at the undergraduate/graduate transition represents a significant “leak” in the pipeline of minority talent into astronomy.

Key strategies:

- Establish relationships with MSIs. This requires efforts that are deliberate, aggressive, and ongoing. Continuity is key to building successful partnerships. Visitation programs need to be sustained efforts; “one-shot” recruiting is generally not effective.
- Work with MSIs to develop programs that “grow talent from within,” in which students first participate in research at their home institution, with thoughtful and nurturing transitions to mentors at other institutions.
- Create, and take advantage of, informal networks to open pathways from MSIs into astronomy graduate programs. Implicit here is that relationship-building requires cooperation both logistical and personal; building trust with MSI faculty is central to building successful partnerships with those institutions.
- Address the perceived disconnect between the educational atmosphere present at many MSIs and that which characterizes many of our graduate programs. MSI faculty are working to develop dynamic undergraduate programs that respond to student needs, that incorporate current pedagogical methods, and that inculcate an appreciation for teaching as part of the profession. These values should be extended to the graduate level to allow for a more seamless “handoff” of students from one program to the next, and to address the issue of minority retention at the graduate level. MSI faculty often do not trust that their students will be “taken care of” in

graduate programs at majority institutions, and many students believe the teaching activity is undervalued.

- Increase the visibility of a diversity of astronomers at the K-12 level to “put a face” on the profession, and to communicate opportunity and inclusiveness. This emphasizes the value of “having diversity to get diversity.”

Four specific action items emerged for the AAS itself. The AAS should:

- Develop a small grants program to support minority recruiting efforts by AAS-affiliated institutions and individuals.
- Partner with professional societies of minorities in physics, such as the National Society of Black Physicists and National Society of Hispanic Physicists.
- Encourage reform of graduate education in astronomy to (1) impedance-match with reforms taking place at the undergraduate level in MSIs, and to (2) place additional value on teaching, including increased training of graduate students in teaching.
- Advocate via policy and direct activities to support the infrastructure needs at MSIs. These institutions support a broad base of students; they should develop the same kinds of opportunities normally attributed to R-1 schools.

2. SESSION SUMMARY

Participants:

- Panelists
 - Jim Falco, Dean of Math & Sciences, Heritage College
 - Elia Eschenazi, Professor of Physics, Xavier University of Louisiana
 - Bob Benjamin, REU Director, University of Wisconsin–Madison
 - Kathy Eastwood, Director of Special Programs, NSF Astronomy Division
- CSMA members Chick Woodward and Keivan Stassun (Chair)
- Approximately 100 AAS members in the audience, including AAS President and other Council members

2.1 INTRODUCTION: CONTEXT AND MOTIVATION FOR THE SESSION

*Keivan Stassun,
Department of Physics & Astronomy,
Vanderbilt University*

The under-representation of minorities in astronomy is an order-of-magnitude problem. Black-, Hispanic-, and Native-Americans together comprise approximately 25% of the U.S. population, while these same groups comprise about 2-3% of

all astronomy PhD's earned. In terms of raw numbers, this translates into an average minority PhD production rate of about 2 individuals per year, and this pattern of underrepresentation has remained unchanged for at least 25 years. Furthermore, the representation of these groups at the faculty level is similar, and when only the top-tier institutions are considered the representation of minority faculty decreases even further (to approximately 0.5%).¹

With these sobering statistics in mind, the question immediately arises: How can we improve the recruitment and retention of minorities in astronomy?

Minority-Serving Institutions (MSIs) are important breeding grounds of minority talent in higher education generally and in the sciences specifically. MSIs include Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs), and Tribal Colleges and Universities (TCUs). Examples include Fisk University (Nashville, TN), University of Texas at El Paso, and the Tohono O'odham Community College (Tucson, AZ).² MSIs are typically small, public and private, four-year institutions, but the nation's community (two-year) colleges are also important gateways for minorities in higher education; roughly 50% of all minorities enter higher education through community colleges.

Roughly 25% of all baccalaureate degrees earned by African-Americans, and roughly 40% of all science/engineering baccalaureate degrees earned by them, are earned at HBCUs. The top ten producers of Black physics undergraduates are all HBCUs (see June 2002 and January 2003 issues of SPECTRUM for these and other statistics). As an example, Xavier University of Louisiana every year produces more African-American students with baccalaureate degrees in physics than all of the Big Ten schools combined.

As one of its first major initiatives, the CSMA is working to forge partnerships between the AAS and the institutions that are primarily producing the minority undergraduate talent in physics. Our aim is to create smooth pathways for these students into astronomy—into our summer undergraduate research (REU) opportunities, into our graduate programs, and ultimately into the profession.

As a first step, we have convened this panel of representatives from minority-serving institutions and REU programs. Our purpose is to introduce AAS members to these representatives, and to solicit from them their perspectives on strategies for successfully connecting the pool of minority talent at minority-serving institutions to the network of opportunities that the AAS, through its members, has to offer.

2.2 PRESENTATIONS BY PANELISTS

Jim Falco, Dean of Math & Sciences, Heritage College

Heritage College is an Hispanic-Serving Institution (HSI) on the Yakima Indian reservation, about 150 miles from Se-

attle. It serves some 1400 students, primarily Hispanic and Native American, from mostly poor, rural areas in Washington. Financial need is a major factor for most of these students; 95% receive financial aid, and the school suffers from an attrition rate of 80% due primarily to financial reasons.

Dr. Falco presented a number of recommendations for AAS members. These include:

- The need for interaction between professional scientists and minority students at the K-12 level.
- Many of the students at Heritage and at other MSIs are "location-bound," meaning that they tend not to venture far from home. This stresses the importance of local outreach efforts; connections need to be made by PhD-granting institutions and local MSIs. Moreover, through these local connections, these students would benefit from exposure to opportunities at other, perhaps more distant, institutions.
- At Heritage, as at many MSIs, astronomy is the most popular introductory science course, but students know little about the profession. This presents an important opportunity for education/outreach efforts.
- Students would benefit from greater exposure to online and other resources for learning about opportunities in astronomy.

Dr. Falco also described various efforts for helping students at Heritage make the transition into graduate school. He discussed the relative successes with each of the approaches:

- "Hard handoff": In this approach, students are introduced to colleagues in graduate programs at nearby institutions (University of Washington, Washington State University, University of Idaho) during their senior year. This approach, involving a transition over a relatively short period of time, has been the least successful of the approaches tried.
- "Extended handoff": In this approach, an articulation agreement is made between Heritage and a nearby graduate program in which the student stays at Heritage and earns a Masters degree, then "transfers" to the partner school for the PhD. This has proven to be a successful strategy, with a 70-80% success rate. At present, this approach is limited by the availability of faculty at Heritage qualified to provide Masters level offerings that are suitable for connecting to PhD programs.
- As a further extension of the above approach, in some cases students from Heritage participate in summer internships during the junior year with faculty at nearby institutions. In addition, some of these faculty have worked with Heritage faculty to "team teach" Masters level courses at Heritage. While this has been attempted in only a few instances, this way of extending the hand-off downward to the junior year is promising.

Finally, Dr. Falco discussed a number of policy issues:

- MSIs, as small colleges, often have difficulty getting funding to make the capital investments needed to teach science. Sciences is one of the most costly teaching proposition because of the need for equipment, special-

¹These statistics from the AIP the National Society of Black Physicists. See the January 2002, June 2002, and January 2003 issues of SPECTRUM.

²For comprehensive lists of HBCUs, HSIs and TCUs, visit the CSMA website: www.vanderbilt.edu/csma

ized faculty, etc. There is a strong need to support infrastructure at these schools by federal investments (e.g. NASA) and through lobbying.

- AAS is in a strong position to urge government, research universities, and national labs to provide release time for professionals to interact with students at the K-16 level.

*Elia Eschenazi, Professor of Physics,
Xavier University of Louisiana*

Dr. Eschenazi described various factors key to Xavier's success in preparing large numbers of minority physics students:

- Clear purpose of mission: All science departments are involved in determining obstacles to student success and making necessary programmatic adjustments. This should not be viewed as an approach uniquely suited to HBCUs; this should be done everywhere. Faculty at Xavier take their role as *educators* as their *raison d'être*, working actively to identify obstacles to learning, and then make any reforms necessary to bring all students to a "standard" level of achievement. This does not imply a lowering of expectations.
- In physics, all introductory-level courses have been reformed to be non-lecture-based. All courses are now designed around physics education research into collaborative learning.
- These approaches result in much more positive student attitudes toward physics (science generally). Faculty are in a stronger position to identify and address student misconceptions, and the highly "interactive" environment gives students a sense of "ownership" over the process of learning.
- A fundamental component in the Xavier physics program is an aggressive effort to involve all students in undergraduate research experiences. Xavier is one of six NSF-funded Model Institutions of Excellence (MIE), which provides infrastructure and other support for undergraduate research.

Dr. Eschenazi presented statistics of the physics program's enrollment of physics majors over the past 15 years to emphasize the demonstrable effects that (a) reforms in the curriculum, and (b) the inclusion of a mandatory research experience, have had on recruitment and retention of physics majors. The statistics he presented showed two distinct jumps in enrollment in the major. The first noticeable jump in the enrollment numbers occurs in 1991, just after the reform to a collaborative-based curriculum. The second jump occurs around 1997, just after the introduction of the NSF-funded undergraduate research component.

Dr. Eschenazi closed with remarks that, in his words, were intended to provoke. A concern among the Xavier physics faculty is the apparent mismatch between their own efforts—efforts that aggressively and deliberately help students achieve—and the graduate programs where they seek to send their students—which they often perceive as being both more passive (in terms of support) and more hostile (e.g. competitive). The Xavier faculty work hard to continually develop a nurturing, attentive environment, and are uncomfortable recommending to their students those graduate

programs that they do not know to be similarly nurturing, similarly proactive to the educational and professional development needs of the students. After all of the effort that the Xavier faculty invest in the success of their students, they will not abandon those students by sending them on to environments that are, by comparison, neglectful. That neglect can come in a number of forms, including: an indifferent attitude on the part of faculty toward student progress; a static curriculum that does not reflect changing standards of teaching and learning; the lack of deliberate professional preparation for a future in academe (e.g. training in teaching). In Dr. Eschenazi's view, this issue is integrally connected to Dr. Falco's discussion of the "handoff": To effect a more seamless transition requires greater synergy between the undergraduate and graduate programs, perhaps through joint planning.

*Bob Benjamin, Research Scientist and REU Director,
University of Wisconsin–Madison*

Dr. Benjamin directs the NSF-funded Research Experiences for Undergraduates (REU) program in astrophysics at the University of Wisconsin. This program has been very successful in recruiting students from MSIs. Its first cohort included 33% minorities, its second cohort 40%. These minority students were recruited from such MSIs as Alabama A&M (an HBCU), Ventura Community College (a two-year HSI), Hampton College (an HBCU), Universidad Metropolitana (an HSI in Puerto Rico), and others. Dr. Benjamin shared his insights into how and why the Wisconsin REU program has been so successful in engaging minority students.

Perhaps the most important key to the success of the Wisconsin program is individual faculty making one-on-one contacts with students. Dr. Benjamin stressed that the most effective recruiting occurs when faculty, those who will actually mentor students in research projects, are involved in recruiting students. While program directors and other program representatives certainly play an important role in recruiting, getting individual faculty mentors involved as ambassadors is critical for developing lasting partnerships between institutions. This can go a long way toward addressing the issues of trust raised by Dr. Eschenazi. Impersonal, one-shot visits will fail. When Wisconsin faculty visit schools like Alabama A&M and Universidad Metropolitana, they take the time to meet with faculty and students individually. This communicates respect and a desire to establish a long-term relationship. These faculty are also empowered to do more than just give a talk and leave literature behind; they can invite individual students to apply, and then follow up in a proactive and personal way, engaging the support of faculty at the target school. Aggressive follow-up is key.

In addition to recruiting at individual schools, professional meetings of minorities in physics can be effective venues as well. For example, the National Society of Black Physicists (NSBP) and the National Society of Hispanic Physicists (NSHP) host annual meetings that include student presenters from the MSIs that these organizations represent. These can be particularly fruitful venues because the students involved have already self-selected on the basis of an interest

in physics and astronomy, and indeed often attend these meetings specifically seeking summer research or graduate-school opportunities.

Dr. Benjamin emphasized that it is often imperative to dispel student misconceptions about the nature of REU programs. In particular, he has found that many students from MSIs do not fully appreciate that these programs actually pay money; oftentimes students assume that they must pay out-of-pocket to participate.

Finally, Dr. Benjamin pointed out that, while not every recruiting attempt will result in a successful contact, perseverance pays off. If visiting a particular school does not yield any good student prospects one time, that should be taken as a sign that additional contact is needed. One of the key lessons learned at Wisconsin is that most of the recruiting effort goes into getting the first student from a particular school. Assuming s/he has a positive experience, that student then becomes a natural ambassador, making recruiting of future students from their home institution much easier.

*Kathy Eastwood, Program Director,
Education and Special Programs, NSF AST Division*

Dr. Eastwood shared a number of insights from the vantage point of the NSF, and as an administrator with oversight of the national REU programs in astronomy. Dr. Eastwood emphasized that REU programs may be the best tool we have for getting more minorities into astronomy. However, she reported that historically the astronomy REU programs have been largely unsuccessful in this regard.

This poor track record has not been due to lack of effort on the part of individuals at some programs. For example, Dr. Eastwood related the story efforts made by the director of the NOAO REU program to visit HBCUs and other MSIs; these visits yielded zero applicants to the NOAO program.

More recently, the astronomy REU directors have started working together to engage this issue, with the goal of drawing on common experience to make headway on recruiting more minorities into REU. Dr. Eastwood reported insights and suggestions from the most recent national REU directors meeting, which we summarize here³:

- Recruiting minorities for REU is difficult. Just visiting a campus is not enough. MSIs are often courted, and have become skeptical of the large number of people passing in and out of their campuses. The goal is to build up a continued, personal relationship with a department. Recognize that this requires a lot of work, and takes a lot of time.
- A visit to a MSI should include not only giving a seminar, but talking to both students and faculty. Another useful time to visit is during undergraduate research conferences. Visiting a department once a year is probably not enough; one annual visit to give a talk combined with one annual visit to a local undergraduate research conference might be an effective combination.
- The existing Louis Stokes Alliances for Minority Participation are an excellent starting place. This NSF pro-

gram has already built partnerships among academic institutions with the goal of strengthening the preparation of, and increasing the number of, minority students who successfully complete baccalaureate degrees in science and math. The leadership structure in these partnerships is already in place, and thus it would be relatively easy to set up visits for several schools within a LSAMP partnership. The program director for LSAMP is Dr. A. James Hicks; the program description is at www.ehr.nsf.gov/EHR/HRD/amp.asp, and a list of partnerships is at www.ehr.nsf.gov/EHR/HRD/hrddir.asp#LSAMP.

Dr. Eastwood suggested that each REU site director should choose a small set of schools geographically close together, preferably geographically close to the site. Ideally, these schools will also hold joint undergraduate research conferences, which again makes the AMP consortia excellent targets. Funding for these recruiting visits could be made in the form of supplements to existing grants, and written into the budgets of future grants.

Finally, Dr. Eastwood suggested that the AAS should develop a small grants program to support minority recruiting efforts by AAS members.

2.3 QUESTION & ANSWER, COMMENTS FROM THE AUDIENCE

Rolf Danner (JPL) reflected on the importance in our profession of “informal networks” between individuals. He suggested that the AAS is in a good position to help such informal networks develop between individuals at MSIs and those in astronomy REU and graduate programs. He commented that those who are recruiting minority students need to think about this issue of networking, and suggested that one should ask the following questions: Who will I hand this student off to? How will a long-term relationship be maintained (with the student, with their mentors, with their home institution)?

Prompted by a question from Alan Whiting (REU director, CTIO) about the difficulty of getting participants for the CTIO program, the panelists reiterated that one should expect a relatively large investment of effort up front to recruit the first cohort of participants. It’s often difficult to get the first students to respond, but once there’s good word of mouth, the relationship grows.

Dr. Don Walter, who heads a NASA-funded minority outreach program at South Carolina State University, commented on the importance of working with students early to develop the abilities necessary for them to participate in things like REU. In the SCSU program, students who are not yet “REU-ready” are given “pre-REU” training (e.g. basic skills in observing, image processing, presentation, etc) to help make them more competitive for REU programs. He also echoed the concern expressed by the panelists about wanting to know that his students will be “taken care of,” and the value in developing faculty-level relationships of trust and mutual commitment.

³Dr. Eastwood credits Dr. Roosevelt Johnson, director of the NSF Human Resource Development division, with a number of these suggestions.

Finally, Katy Pilachowski (AAS President, director of REU program at Indiana University) pointed out that many university campuses have resources available for helping with minority/diversity-related issues, recruiting, etc, and

that tapping these resources has proved very useful at Indiana. She also pointed out that new programs such as the NSF GK-12 program provide excellent opportunities for building outreach connections at the K-12 level.