

Bridging the Gap

A unique collaboration helps pave the way for minority students to successfully transition from master's program to Ph.D.

BY KEIVAN GUADALUPE STASSUN AND ARNOLD BURGER

Native Americans together with Hispanic- and African-Americans comprise more than 25 percent of the U.S. population, yet they represent only 3 percent of all astronomy and astrophysics Ph.D.s earned. This translates, on average, to about four minority students earning a Ph.D. each year. Put another way, each of the roughly 50 astronomy and astrophysics Ph.D. programs in the United States awards a doctorate to a minority candidate once every 13 years. This pattern of underrepresentation has remained largely unchanged for the last 30 years.

In 1999, at an NSF-sponsored summit on Promoting National Minority Leadership in Science and Engineering, Richard Tapia, director of the Center for Excellence and Equity in Education, observed that to truly broaden minority participation requires that we identify and support nontraditional students, or “diamonds-in-the-rough,” who are certainly capable, but have not been properly developed or evaluated.

Their potential can take a number of forms, depending on circumstances and the characteristics of the student. For instance, one student's undergraduate transcript might show a low GPA, which, on closer inspection, shows a slow start with an upward trajectory. Another may have an excellent GPA, but is missing critical upper-level courses that were not offered at his or her undergraduate institution.

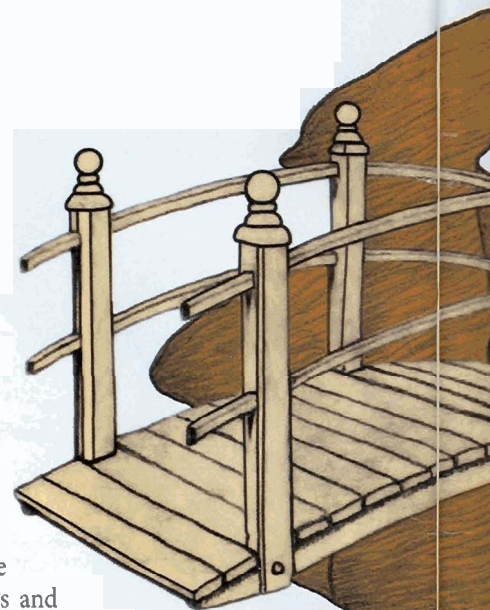
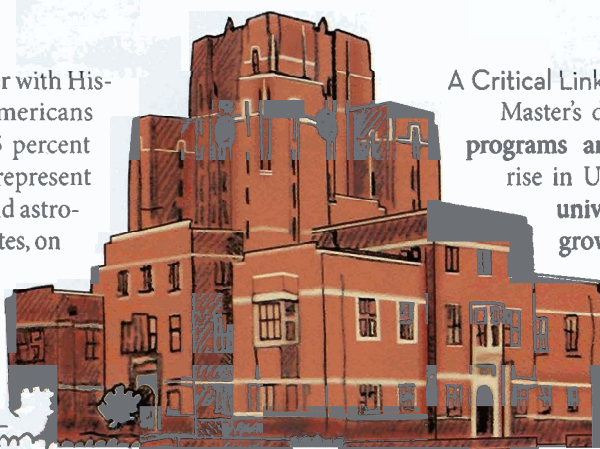
Recruiting and developing students who don't meet traditional criteria for graduate school is analogous to the “farm” league in baseball. Rather than build a team by recruiting only immediate “starters,” the aim is to identify unproven talent and provide the resources and training needed for that talent to blossom and to perform at a high level—the major leagues.

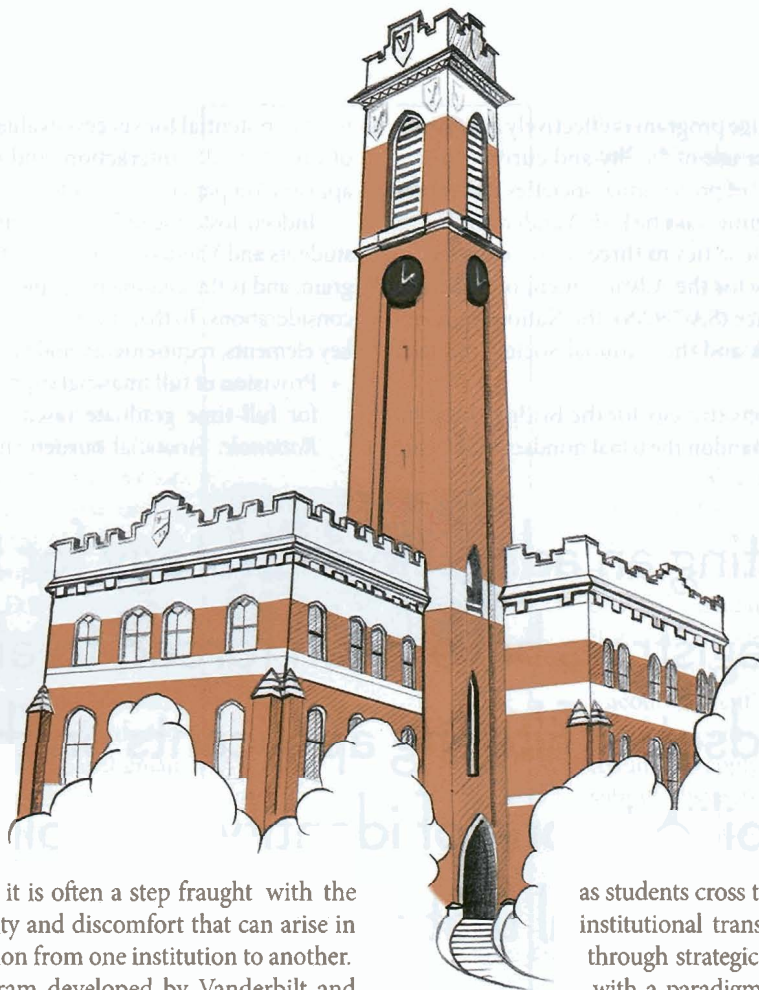
A Critical Link

Master's degree programs are on the rise in U.S. colleges and universities. Much of this growth can be attributed to increasing enrollment by traditionally underrepresented groups. Between 1990 and 2000, the total number of master's

degree recipients increased by 42 percent. During this same time period, the number of women earning master's degrees increased by 56 percent; African-Americans increased by 132 percent; Native American Indians, by 101 percent; and Hispanics, by 146 percent.

A 2006 study conducted by S.E. Lange of the University of Washington provides valuable insight into the role of the master's degree as underrepresented minority students proceed to the doctorate in STEM disciplines. Data from the Survey of Earned Doctorates (SED) were used to examine institutional pathways to the Ph.D., and transitions from master's to doctoral programs by race and gender. According to Lange's study, White/Asian science students are more likely to forgo earning the master's degree en route to the doctorate altogether. For underrepresented minorities, however, pursuit of the master's degree can often be a critical interim step along the path to the doctorate. Unfor-





Unfortunately, it is often a step fraught with the uncertainty and discomfort that can arise in the transition from one institution to another.

A program developed by Vanderbilt and Fisk Universities has taken careful consideration of cultural, logistical, and academic influences and modeled a new approach. Opportunities for students at Fisk, a historically black college located 1.5 miles from Vanderbilt, to earn graduate-level degrees in a physical science discipline tops out at a master's. The Fisk-Vanderbilt Masters-to-Ph.D. Bridge program (see www.physics.vanderbilt.edu/bridge) is designed for students who need (or want) additional coursework or research experience before beginning Ph.D.-level work.

The Bridge program is, in effect, predicated on the premise that the underrepresentation of minorities in the space sciences is one of the major challenges facing the United States' science, technology, engineering, and mathematics (STEM) workforce and that minority-serving institutions are a critical link in the higher education pipeline for underrepresented minority students.

The Fisk-Vanderbilt Masters-to-Ph.D. Bridge program was developed to (a) leverage the market forces that are driving underrepresented students in STEM fields to increasingly pursue a master's degree en route to the Ph.D., and (b) provide a path to the Ph.D. that includes deliberate mentorship

as students cross the critical junctures that attend institutional transitions. Students are identified through strategic, faculty-led recruiting coupled with a paradigm shift in admissions decisions:

Scout out talent early while it is still rough, provide the resources and training to allow that talent to blossom and mature without lowering standards or expectations, and in so doing sustain the future vitality of the program. Overall, program outcomes have been extremely positive.

Admission begins with application to the Fisk M.A. program in physics, which includes undergraduate transcripts, letters of recommendation, a personal statement, and general GRE scores. Once admission to the Fisk M.A. program has been formally decided by the Fisk faculty following Fisk's standard admissions procedures, admission to the Bridge program is determined by the Bridge program steering committee, consisting of three faculty members each from Fisk and Vanderbilt.

The primary recruitment vehicle of the Bridge program is faculty emissaries at minority-serving institutions and at national meetings of professional societies of underrepresented students. Both print and online advertising materials are broadly distributed and made highly visible through personal connections with minority-serving institutions and professional societies of minority scientists. However, reliance is primarily placed on research faculty to personally visit nearby institutions and to participate in national conferences. The recruiting function is too important to be relegated only to nonacademic staff; it is faculty—faculty who are positioned to convey the excitement of their research, who have discretionary authority to offer opportunities in their labs, and who are able to communicate their commitment to student success—who make the most effective recruiters.

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A key way by which the Bridge program is effectively advertised to minority students is to make use of faculty and current Bridge students attending the meetings of professional societies that represent minority scientists and engineers. The Fisk-Vanderbilt Bridge program has developed very close ties to three of these organizations in particular: The Society for the Advancement of Chicanos and Native Americans in Science (SACNAS), the National Society of Hispanic Physicists (NSHP), and the National Society of Black Physicists (NSBP).

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his/her potential for success evaluated holistically and on the basis of direct faculty interaction, and not simply on how the student appears "on paper."

Indeed, fostering individual mentoring relationships between Fisk students and Vanderbilt faculty is at the very heart of the Bridge program, and is the guiding principle for all other programmatic design considerations. To that end, the Bridge program includes the following key elements, requirements, and benefits:

Provision of full financial support in an amount that is standard for full-time graduate research assistants at Fisk University.

Rationale: Financial burden should not be an impediment to

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Officially speaking, admission to the Bridge program does not constitute admission to the Vanderbilt Ph.D. program, nor does it carry with it a formal promise of admission to Vanderbilt in the future. The seeming appearance of a "back door" into the Ph.D. program and subsequent guarantee of admission at the outset might encourage passivity both in the students admitted and in the faculty mentors responsible for preparing them.

But this does not mean that the program makes no promises. On the contrary, Bridge students are guaranteed support and mentorship in a number of concrete forms. More importantly, Bridge students receive an explicit commitment that they will receive the personalized attention, guidance, and one-on-one mentoring relationships that allow students to develop—and to demonstrate—their full scientific talent and potential. The program has adopted the view that failures in student retention are programmatic failures. Of course, the proof is not in promises made but in real student outcomes.

The vehicle by which successful transitions to the Vanderbilt Ph.D. program are realized is through carefully orchestrated student-faculty mentoring relationships. Faculty mentors not only provide key guidance on course selection and research topics, they also become the student's most important advocates in the Ph.D. admissions process. The fact is that a student who is well known to the faculty of the admitting department is more likely to have

full participation and satisfactory progress. Funding is provided through a combination of institutional support (e.g. tuition waivers) and extramural support, as appropriate, for a maximum of two years leading to the conferral of the M.A. degree. Core funding partners to date have included NSF and NASA, in combination with institutional funds from Vanderbilt in the form of dedicated "bridging fellowships" for Bridge students in their first year at Vanderbilt after completing the Fisk program.

- Assignment of both a primary Fisk adviser and a secondary Vanderbilt adviser. *Rationale:* Joint mentoring is the best way to track student progress and to ensure student readiness for Ph.D.-level work. For students who are certain of the area of research interest, every attempt is made to match the secondary adviser to that interest.
- Scheduling of at least two meetings per year with the Bridge program steering committee to review progress and receive guidance, in addition to the day-to-day interactions with primary and secondary advisers. *Rationale:* Keeping key personnel, particularly the directors/liaisons of the participating Ph.D. programs, abreast of student progress helps to keep each Bridge student on the Ph.D. program's "radar screen" and helps Ph.D. program directors in planning the needs of each year's incoming Ph.D. class.
- Participation in supervised research, at Fisk or Vanderbilt (or both), during at least the second academic year of the program, and participation in supervised research at Vanderbilt (or at a

Vanderbilt-affiliated research site) during at least each summer of the program. *Rationale:* Demonstrating research promise, skill, and maturity in the lab of a potential Ph.D. adviser is the single most effective way for students to develop relationships with faculty who can serve as recommenders and advocates.

Requirement of at least B grades in all graduate courses, with at least one of these courses being a core Ph.D. course taken at Vanderbilt. *Rationale:* Demonstrating competency in a core Ph.D. course is essential to demonstrating promise for Ph.D. study. Together with a judicious selection of courses taken in fulfillment of the MA degree at Fisk, many Bridge students complete most of the course requirements for the Ph.D. by the time they apply to the Vanderbilt Ph.D. program.

- Provision of: cross-registration privileges for Vanderbilt courses through a memorandum of understanding between the two universities; Vanderbilt parking permit; Vanderbilt photo ID card, email account, and library access. *Rationale:* These privileges and benefits support the programmatic goals and elements listed above, and specifically enable course attendance and research participation. In addition, these services provide Bridge students with a sense of welcoming and belonging at the institution that they strive to call their home, and thus serve a critical retention function as well.

In addition to providing Bridge students with the one-on-one mentoring, coursework, and research experiences that form the program's core, a variety of ancillary programmatic elements have been implemented to form a scaffold of support that helps to ensure student retention and satisfactory progress. These include:

- Annual program orientation and kickoff. A mandatory, all-hands meeting each fall serves to welcome and initiate new Bridge students with a celebratory and community-building event.
- Social support structure. We have helped the students organize an informal social group (the "Bridge Club") with student officers who serve as a conduit for program information between faculty and students. An electronic calendar system keeps students reminded of departmental events (colloquia, journal clubs, etc.) and of important deadlines (e.g., course registration). The club includes senior Bridge students as well as Vanderbilt graduate student mentors who can share their experiences and provide access to social networks at Vanderbilt.
- GRE preparation study sessions and tutoring. The subject GRE is but one component of



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the whole system of assessments by which Bridge students are holistically evaluated for admission to the Vanderbilt Ph.D. program. Nonetheless, it is a formal requirement, and we want to help students perform to the maximum of their ability. Early identification of course difficulties and proactive intervention are essential to bolstering success in the critical core graduate courses that form an essential component of student retention. The courses that Bridge students enroll in and the progress they make are monitored as part of the advising process. Instructors promptly notify Bridge coordinators at the first signs of concern. One-on-one tutoring is provided, as needed, by advanced graduate students, and course-load adjustments are made mid-stream if it is determined that remedial instruction is required before reenrolling in the course.

Encouragement in fellowship applications and conference participation. All Bridge students are required to apply for national fellowships and to submit abstracts to national conferences. This provides critical skills in grants development, communication, and professional networking.

Since its inception in 2004, the Fisk-Vanderbilt Masters-to-Ph.D. Bridge program has attracted a total of 18 underrepresented students. Of these, 16 have either already transitioned to the Vanderbilt Ph.D. program of their choice or are making satisfactory progress toward that goal, a retention rate to date of approximately 90 percent. These initial outcomes reinforce the efficacy of the approach and suggest that the program may well serve as a model for other programs built on active partnerships with minority-serving institutions.

To be sure, the Fisk-Vanderbilt Bridge program is not for all students, nor is it intended to be. Students with strong undergraduate backgrounds will usually want to enter a Ph.D. program directly, and will not seek nor require this type of bridging opportunity. In these cases, the Bridge program can play an important recruiting role, conveying as it does a serious commitment to student success. Indeed, in the time since partnering with Fisk to develop the Bridge program, Vanderbilt University has witnessed a significant increase in the number of strong minority students applying—and gaining admission—directly to the Ph.D. program. Δ

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