



*Going beyond standardized exams in  
graduate admissions: Enhancing  
diversity and predicting success*

*Lessons from the Fisk-Vanderbilt Bridge Program*



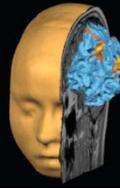
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## Fisk-Vanderbilt Master's-to-Ph.D. Bridge Program

physics and astronomy • biological sciences



Bernadette Cogswell, nuclear physics

*Nothing worthwhile is ever easy.  
We just help make it possible.*

*you can*  
Reach for the Ph.D.  
*tú puedes*

#### Who should apply

- Students with undergraduate majors in physics, biology, chemistry, computer science, math, and other science disciplines
- Students motivated to pursue the Ph.D., but who require additional course work, training, and/or research experience

#### How the program works

- Earn a master's degree at Fisk University, with full funding support.
- Along the way, receive valuable research experience with caring, dedicated mentors.
- Get fast-track admission to one of the participating Vanderbilt Ph.D. programs, with full funding support.

[www.vanderbilt.edu/gradschool/bridge](http://www.vanderbilt.edu/gradschool/bridge)  
[www.fisk.edu/bridge](http://www.fisk.edu/bridge)



biomedical sciences • materials science • imaging science



Matthew Richardson, astrophysics



Brittany Kanai, astrophysics



Michael Williams, astrophysics



*Nashville, Tennessee*

## Fisk-Vanderbilt Masters-to-PhD Bridge Program

*Get the preparation you need to earn a PhD*

1. Earn a Masters degree in physics, chemistry, or biology at Fisk, with full funding support.
2. Get valuable, paid research experience.
3. Receive preparation for the GRE.
4. Get fast-track admission to the Vanderbilt PhD program, with full funding support.
  - Physics & Astronomy
  - Biology and Biomedical sciences
  - Chemistry
  - Materials science and engineering

[www.fisk.edu/bridge](http://www.fisk.edu/bridge)  
[www.vanderbilt.edu/gradschool/bridge](http://www.vanderbilt.edu/gradschool/bridge)

# Where are the minorities in science?

- Top 10 producers of Black physics baccalaureates are all HBCUs.
- Just 20 HBCUs produce 55% of all Black physics baccalaureates.

## Universities that awarded the most physics bachelor's to African Americans.

Physics departments in these twenty universities awarded more than 55% of all physics bachelor's degrees earned by African Americans since 1998.

Alabama A&M University

Benedict College

Chicago State University

Delaware State University

Dillard University

Fisk University

Florida A&M University

Grambling University

Hampton University

Jackson State University

Lincoln University

Morehouse University

Morgan State University

Norfolk State University

North Carolina A&T State University

Southern University and A&M College

Spelman College

Tennessee State University

Tuskegee University

Xavier University

The physics departments on this list reported conferring 15 or more bachelor's degrees to African Americans between 1998 and 2007.

Source: AIP Statistical Research Center, Enrollment & Degrees Survey

# *Snapshot of program outcomes so far*

## ★ Since 2004:

- 67 Bridge students
- 61 Underrepresented minorities (all US citizens)
- 46% female
- Very high retention and persistence
  - 97% retention rate in STEM employment
  - 80% persistence to PhD (compare to 50% national average)



## ★ Since 2006:

- Fisk is top producer of Black MA degrees in physics, and top 10 producer of MA degrees in physics to US citizens

## ★ 2010:

- First Bridge PhD (now faculty at Alabama A&M)

## ★ 2012-13

- Seven PhDs graduate (all received postdoc/faculty offers prior to graduation: STScI, Arizona, DOE, DOD, Intel, CEA-Saclay)
- Vanderbilt is top producer of URM PhDs in astronomy, physics, materials science

## ★ 2014-

- Project 5-6 Bridge PhDs graduate per year

# *Summary of GRE scores*

## ★ Quantitative GRE:

- Mean = 619, Sigma = 114
- Min = 230 (1%-ile), Max = 800 (95%-ile)
- Student with lowest QGRE was one of three program dropouts. Two other dropouts had QGRE of 560 (37%-ile) and 620 (52%-ile).
- Students with 2<sup>nd</sup> thru 5<sup>th</sup> lowest QGRE (360-480; 9-23%-ile) completed PhD and are employed in STEM.
  - one completed PhD at Ivy League program and is now a postdoc
  - one earned NSF Graduate Research fellowship

## ★ Physics GRE:

- Min = 390 (1%-ile), Max = 700 (56%-ile)
- All students with 1-5%-ile scores completed PhD or in good standing

★ Summary: The only cut that would have eliminated more failures than successes would have been QGRE < 9%-ile. Physics GRE as low as 1%-ile not predictive of failure.

# *Bridge Program “Firsts”*

- ★ First Black woman to receive PhD in astronomy from Yale.
- ★ First Black woman to publish first-author astronomy paper in Nature.
- ★ First Sioux woman to earn advanced physics degree.
- ★ First Native Hawaiian woman to receive NSF graduate fellowship.
  
- ★ Fisk is top producer of African American master’s degrees in physics.
- ★ Vanderbilt is top producer of URM PhDs in astronomy, materials science, physics.

# *Identifying Students Who Will Succeed*

## **What roles are we looking for?**

- \* Commitment and academic potential
- \* Productive, creative, entrepreneurial researchers
- \* Effective teachers and mentors
- \* Transformational leadership

## **What qualities predict success?**

- \* Passion, “fire in the belly”
- \* Ability to succeed in relevant courses
- \* Ability in the laboratory
- \* Persistence in the face of hardship (the “P” in PhD)
- \* Entrepreneurial spirit

***Two most important elements in admissions:  
(1) relevant coursework, (2) grit***

**Use GRE only as part of determining best first-year course placements.**

## Applicant Interview Protocol

### College Experience:

- High points
  - Describe the high points of your college experience.
  - What went well for you? / What are you most proud of?
  - Describe a time when you have faced a difficult academic challenge or hurdle that you successfully navigated. What was the challenge and how did you handle it?
  - What are you most proud of accomplishing?
- Low points
  - Were there any personal or academic obstacles or challenges that had a significant impact on your college experience?
  - Describe the low points./What didn't go well and why?
  - What failures did you have (a time also to probe for issues with the transcript)? How did you handle them?
  - What mistakes did you make?
  - What would you do differently?

### Research Experience (in class, lab or other)

- Tell us about your most successful or interesting research experience, either in class, in the lab or at work?
- What was most challenging about it?
- How did you figure out what to do?
- What did you learn most from this experience?
- Who did you work with, and describe the working relationships.

***Stassun et al (2011, Am. Journ. Phys.)***

### Key Relationships

- Who are the faculty or other mentors who have been most important to you during college? Would you tell us about that relationship—how it developed, how you work together, why it is important?
- If we talked to your mentor, what do you think he/she would say you are really good at?
- What would you say you could have done better?

### Leadership/Service

- Have you had any experiences where you were playing a leadership or mentoring role for others?
- What did you do, and how did these experiences come about?

### Goals and Objectives

- Why science? What is compelling to you about this opportunity with the Bridge program?
- Where do you want to take your career? What do you want to do long term?
- What concerns do you have?
- What will be the biggest challenge for you?
- Is there anything else we should know?

***Stassun et al (2011, Am. Journ. Phys.)***

Attribute	Score		
	High	Medium	Low
Positive Self-Concept	Expresses confidence they can complete challenging goals, makes positive statements about abilities	Shows confidence and independence but may be unsure about adequacy or skills	Is unsure they can complete the program, exhibits low self-esteem
Realistic Self-Appraisal	Can clearly and realistically delineate strengths and weaknesses, works on self development	Has trouble identifying strengths and weakness but appreciates/seeks both positive and negative feedback	Over or understates abilities, does little to no self-assessment, does not appear to have learned from experiences
Preference for Long vs. Short Term Goals	Clearly communicates long-range goals beyond the PhD	Primary goal is PhD completion	Is vague about long-term goals, or goals are short term such as coursework
Support Person Availability	Can define a professional support network including mentors	Expresses support from one individual, or family or community	Expresses little or no support from family or institution for goals
Leadership/Community Involvement	Demonstrates involvement and leadership ability in either academics, family, community, religious group,	Demonstrates involvement in groups in academia or extramurals but has not shown leadership	Not involved in institutional or community group, no demonstrated leadership
Knowledge in a Field/Non-Traditional Learning	Has engaged in, and learned from, experiences outside the classroom, i.e. performed independent research, extramural activities, self-taught skills	Shows some evidence of non-traditional learning experience	Has not engaged in or indicated learning from experiences outside the classroom
Perserverance	Can describe a time they failed or encountered an obstacle and successfully coped.	Can identify a time they hit an obstacle but has trouble defining how they overcame the challenge.	Has little experience with failure/obstacles. Cannot provide an example or describe response

***Stassun et al (2011, Am. Journ. Phys.)***

**Appendix B. Candidate Evaluation Worksheet**  
Fisk-Vanderbilt Masters-to-PhD Bridge Program

<b>Candidate Name</b>	
<b>Interview Date</b>	
<b>Interviewer</b>	
<b>Interviewer</b>	

Candidate Assessment (Rate on scale of 1-4)

<b>Academic Preparation</b>	<b>Perseverance/ Fire-in-the-Belly</b>	<b>Relevant Research Exp.</b>	<b>Leadership/ Outreach Activities</b>	<b>Communication Skills/Presence</b>	<b>Overall</b>

EXPLANATION:

**Strengths**

**Weaknesses**

**Probe Further**

<b>Topics/Areas Probed</b>	<b>Additional Notes</b>

*Stassun et al (2011, Am. Journ. Phys.)*

# CAREERS

**EQUALITY** Lack of female academic leaders misrepresents faculty and students **p.473**

**RECESSION** Basic research increasingly targets societal outcomes **p.473**

**NATURE JOBS** For the latest career listings and advice [www.naturejobs.com](http://www.naturejobs.com)

VANDERBILT PHOTO/DANIEL DUBOIS



Vanderbilt University, Tennessee, is the leading US producer of minority graduates with PhDs in astronomy, physics and materials science.

HIGHER EDUCATION

## On the lookout for true grit

*With the right mix of persistence and support structures, scholars from minority groups can thrive as they pursue their PhDs.*

***Nature (2013, 504, 471)***

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