

## SPECTRUM



*A report on underrepresented minorities in astronomy*

## In Memory of Dr. Beth A. Brown

by Keivan Stassun, Vanderbilt University

Many of us in the astronomical community were shocked and saddened by the sudden and untimely passing of Beth Brown on Sunday, October 5, 2008. Beth was an astrophysicist in the Astrophysics Science Division at NASA's Goddard Space Flight Center. Originally from Roanoke, Virginia, Beth is survived by her parents, Robert and Frances Brown, and a brother, Larry W. Brown.

The memorial ceremony, held at Metropolitan Baptist Church in Washington, DC, on October 9 was attended by well over 100 people. In addition to Beth's relatives, many representatives of the various professional and academic communities to which Beth was connected, and to which she meant



*(Continued on page 2)*

## A Partnership in Observational and Computational Astronomy

by Donald Walter, South Carolina State University

South Carolina State University (SCSU) recently received a five year, two million dollar award from the National Science Foundation (NSF) to enhance their astronomy program. SCSU partnered with Clemson University (CU) and the National Optical Astronomy Observatory (NOAO) to submit a proposal in the first round of competition under the NSF program "Partnerships in Astronomy and Astrophysics Research and Education (PAARE)". Their successful submission was entitled "A Partnership in Observational and Computational Astronomy (POCA)".

The objective of the NSF PAARE program is "...to enhance diversity in astronomy and astrophysics research and education by stimulating the development of formal, long-term, collaborative research and education partnerships between minority serving colleges and universities and the NSF Astronomical Sci-

*(Continued on page 3)*

### INSIDE THIS ISSUE:

In Memory of Dr. Beth A. Brown	1
A Partnership in Observational and Computational Astronomy	1
News You Can Use	4
NSF Report on the Role of HBCUs in Black S&E PhDs	6
Whatever Happened to Plans to Hire More Minority Professors?	8
Student Labor on LSST	10
Community Colleges Fuel Science Work Force	15

### HIGHLIGHTS:

- Learn about why community colleges and minority-serving universities are critical to recruit new, talented minds
- Discover successful programs at South Carolina State and LSST to increase minority participation
- Read about current events and issues relevant to minorities in astronomy
- See the status of university initiatives to hire more minority faculty — and why (or why not) they are succeeding

## In Memory of Dr. Beth A. Brown... (cont'd)

*(Continued from page 1)*

so much, were present. They included Beth's friends and colleagues from Howard University, the University of Michigan, Goddard, the National Society of Black Physicists (NSBP), and the American Astronomical Society.

Beth was fascinated by space growing up. A big fan of Star Trek and Star Wars, as a young girl she dreamed of someday becoming an astronaut. After graduating from high school as valedictorian, Beth studied physics and astronomy at Howard University. Beth also loved music and participated actively in the Howard Showtime Marching Band. During the summers she interned at Goddard. Later, she learned that her nearsightedness would hurt her chances of becoming an astronaut. Nevertheless her love for astronomy grew and she graduated *summa cum laude* from Howard.

Beth continued her education at the University of Michigan in Ann Arbor. She received a PhD in Astronomy in 1998, with a thesis entitled "X-ray Emission in Early-type Galaxies Surveyed by ROSAT" under the direction of Joel Bregman, which focused on establishing an X-ray luminosity versus optical luminosity relation for elliptical galaxies. She was the first African-American woman to obtain the doctorate in astronomy from the University of Michigan.

Upon completing her PhD, Beth joined NASA's Goddard Space Flight Center as a National Academy of Science/National Research Council (NAS/NRC) Post-Doctoral Research Associate, and joined the National Space Science Data Center (NSSDC) at Goddard in 2001 as a civil servant. In 2005, she moved over to the X-ray Astrophysics Laboratory, providing science support for the GSFC XMM Guest Observer Facility and continued science support and data acquisition for the NSSDC. In 2006, she was named an Astrophysics Fellow in the NASA Administrator's Fellowship Program (NAFP). While in that position, she worked as Visiting Assistant Professor at Howard University and enjoyed the opportunity to give back to her alma mater through teaching and helping to reinvigorate the astronomy program. She worked with the Howard faculty and students to develop a plan to refurbish the rooftop observatory; there are plans now to complete that refurbishment,

and the possibility of dedicating the facility in her honor is being discussed within the Howard community.

Beth cared deeply about outreach and she applied her talents actively toward communicating the excitement of NASA science to the community. While at Goddard, Beth appeared on local and national news outlets and spoke in the community explaining complex scientific data and celestial events. Beth participated in Goddard outreach programs, education/research programs, and numerous seminars. She was named one of the Women of NASA.

Beth's concern specifically for underrepresented minorities in astronomy was manifested in her involvement with the National Society of Black Physicists (NSBP), speaking at its annual conferences and mentoring students with whom she made a personal connection. Here, Beth's passions for astronomy, for outreach, and for community found confluence, and it was through NSBP that many of us knew her best.

This same confluence of interests had begun to manifest itself in her work at NASA as well. Shortly before her death, Beth had been appointed Assistant Director for Science Communications and Higher Education at Goddard. The last time I spoke with Beth, just a few days before she passed, she beamed with excitement about the position. She relished the challenges and opportunities that it represented and so looked forward to this new chapter in her astronomical career.

Beth was very active with the Metropolitan Baptist Church in Washington, DC, which she joined while an undergraduate at Howard. She served in the Ushers, Dance, Deaf, Singles, and

*College photo of Beth Brown*



*(Continued on page 18)*

## A Partnership in Astronomy at SCSU... (cont'd)

(Continued from page 1)

ences Division (AST)-supported facilities, projects or faculty members at research institutions including private observatories.” The mission of the SCSU POCA is to develop an effective, long-term partnership that combines the strengths of SCSU, CU and NOAO to increase the scientific and educational output of all the partners with special empha-

sis on enhancing diversity in the field of astronomy. A range of activities are supported under the POCA award including faculty and student research, undergraduate scholarships, graduate fellowships, planetarium programs and web-based activities.

SCSU is a Historically Black College/University (HBCU) located in Orangeburg, South Carolina, with an enrollment of approximately 4,300 including 3,800 undergraduates. The student body is 96% African-American and 59% female. The University has a number of undergraduate degree programs in the technical fields, but it has only one graduate program in the science, technology, engineering and mathematics (STEM) disciplines, an M.S. in Transportation.

The University has a physics B.S. degree program that is housed in the Department of Biological and Physical Sciences. It has recently experienced an explosive growth in physics, increasing from only three majors in 2005 to twenty-five majors in only three years. The physics degree offering includes not only the classical physics degree, but also options or concentrations in astronomy, health physics and medical physics. SCSU is one of only a handful of minority schools in the country with an astronomy option within its bachelor of science physics degree. Currently four of the twenty-five physics majors have selected the astronomy option and are supported under POCA. Two of the four had selected the astronomy option prior to PAARE, but the other two switched over to astronomy as a direct result of POCA, including one student who changed her major from nuclear engineering. Of the eight physics faculty members at SCSU, four are involved in POCA including three with Ph.Ds. in astronomy.

The POCA partners bring unique strengths to the program. The partnership with NOAO is a natural extension of past collaborations between the two organizations that have included faculty research, student internships and the presence of SCSU at Kitt Peak National Observatory (KPNO) as part of the consortium of schools that manages the 1.3 meter telescope, also known as the Robotically Controlled Telescope (RCT). POCA will fund REU internships for SCSU students at KPNO and Cerro Tololo Inter-American Observatory.

(Continued on page 19)

### SPECTRUM

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<http://www.aas.org/csma>

## News You Can Use

*Editor's Note: 'News You Can Use' is a new column that will highlight relevant current and upcoming events. If you would like to contribute stories to 'News You Can Use', send articles and ideas to the Editor: [lopez@astro.ucsc.edu](mailto:lopez@astro.ucsc.edu).*

### **NASA Awards \$35 Million in Education Research Grants to Minority Universities**

NASA's Office of Education is awarding research grants totaling nearly \$35 million to seven minority institutions.

The goal of NASA's Minority University Research and Education Program is to establish significant, multi-disciplinary scientific, engineering and commercial research centers at the host universities that contribute substantially to NASA programs. The awards will help to achieve a broad based, competitive aerospace research and technology development capability among the nation's Historically Black Colleges and Universities and Other Minority Universities.

The grants also will help increase participation by faculty and students of selected colleges and universities in the research programs of NASA's mission directorates, and increase the number of underrepresented minorities who obtain advanced degrees in NASA-related fields. Each university will receive up to \$1 million per year for a maximum of five years based on performance and availability of funds. NASA's Office of Education intends to issue a cooperative agreement notice for the University Research Center project in the coming fiscal year.

The university organizations selected to receive awards are:

—NASA University Research Center SPACE Center, California State University, Los Angeles

—WaterSCAPES: Science of Coupled Aquatic Processes in Ecosystems from Space, Florida International University, Miami

—Howard University Beltsville Center for Climate System Observation, Howard University, Washington

—Center of Excellence in Systems Engineering for Space Exploration Technologies, Morgan State University, Baltimore

—The Center for Radiation Engineering and Science for Space Exploration, Prairie View A and M Uni-

versity, Prairie View, Texas

—Center for Bio-Nanotechnology and Environmental Research, Texas Southern University, Houston

—Center for Advanced Nanoscale Materials II, University of Puerto Rico, Rio Piedras Campus, San Juan

For more information about the awards, visit: <http://mured.nasaprs.com>

### **Mexican Senate Approves Creation of Mexican Space Agency**

The Mexican senate voted unanimously on November 4, 2008, to approve the creation of an official Mexican Space Agency, AEXA (Agencia Espacial Mexicana). Mexican-American NASA astronaut Jose Gonzalez Moreno was one of the primary proponents behind AEXA's inception; he testified before the Senate promoting the importance of Mexican competitiveness in space-related technology and research. Upon approval by the Mexican president, construction on the first space center (of ten planned to be built) will begin as early as March 2009 on the Yucatan peninsula. Mexico becomes the 43rd nation to have a space agency.

### **Affirmative Action Ballot Measure Results**

In the recent election, two states -- Nebraska and Colorado -- voted whether to ban affirmative action in college admissions and in hiring practices. With 58 percent of the vote, Nebraska became the fourth state to ban race- and gender-based preferences. California, Michigan, and Washington have passed similar initiatives in previous elections. Meanwhile, Colorado became the first state to uphold affirmative action when put to voters: a similar ballot measure there was rejected with just over a 1% margin. Analysts seem to attribute Colorado's support of affirmative action to the large grass-roots volunteer effort to elect Barack Obama (see the NY

*(Continued on page 5)*

*(Continued from page 4)*

Times article from November 8:  
<http://www.nytimes.com/2008/11/08/us/politics/08affirm.html>)

The implications of the results are still uncertain. The University of Nebraska campuses state that undergraduate admissions will be unaffected, while some graduate programs may need to adjust their procedures. Generally, measures banning affirmative action are expected to appear on other states' ballots in coming years; campaigns have already begun in Arizona and Missouri for the 2010 election.

### **University of California and Mexico Partner to Build Telescope**

Astronomers met in Puebla, Mexico, this past August to discuss the plans and science behind the Synoptic All-Sky Infrared Survey Telescope (SASIR), a 6.5-meter telescope to be located in San Pedro Mártir, Baja California. University of California and Mexico (specifically Instituto de Astronomía at UNAM and the Instituto Nacional de Astrofísica, Óptica y Electrónica) have partnered together in this effort to survey the entire sky in yJHK bands at unprecedented depths.

The SASIR collaboration aims to build the scientific, industrial, and social ties between California and Mexico. The program will promote graduate and postdoctoral research between institutions, and public outreach activities are planned to generate interest in the community and at the K-12 level. Generally, it is hoped that SASIR will catalyze greater development and research in astronomy throughout Latin America.

To learn more about SASIR, see their webpage: <http://www.sasir.org>

### **Astronomy at the Upcoming NSBP/NSHP Conference**

The annual joint meeting of the National Societies of Black and Hispanic Physicists will be held February 11-15, 2009, in Nashville, TN.

Astronomy and astrophysics sessions will be held all day Saturday, February 14 there, and an astronomy networking dinner for students and

faculty is planned for Friday, February 13. Additionally, the AAS will be giving a prize to the best astronomy poster presented, and the winner will receive free membership and registration to one of the annual AAS meetings.

As with all NSBP/NSHP meetings, all costs for student attendance are covered (including travel, lodging, and food). Thus, the conference is a great opportunity to meet, support, and recruit students from diverse backgrounds for summer research and graduate programs. All are welcome and encouraged to attend, and the deadline for abstract submission is January 16.

More information about the meeting is available at <http://www.nsbp.org/conference/>

Instructions for applying for financial support to attend the meeting are at

<http://www.nsbp.org/conference/studenttravel>

If you would like to attend the meeting as an exhibitor/recruiter for your institution, see <http://www.nsbp.org/conference/exhibitors/>

### **New Mailing List for Minorities in Astronomy**

The AAS Committee on the Status of Minorities in Astronomy (CSMA) has started a new electronic mailing list called `aas_panchromatic`. The CSMA created this list as a response to the discussion at the Austin AAS that indicated a growing need for advocacy and support for minorities in astronomy at all levels in their careers. This list is intended to be a resource for astronomy students and professionals of under-represented groups. Its primary purpose is to facilitate networking and mentorship. Additionally, `aas_panchromatic` is used to inform the community of relevant events and issues. The list is not intended for open forum political discussions or for distribution of job advertisements.

Instructions for subscribing to the `aas_panchromatic` list are given at the URL: [http://www.physics.rutgers.edu/~ajbaker/aas\\_panchromatic.html](http://www.physics.rutgers.edu/~ajbaker/aas_panchromatic.html)

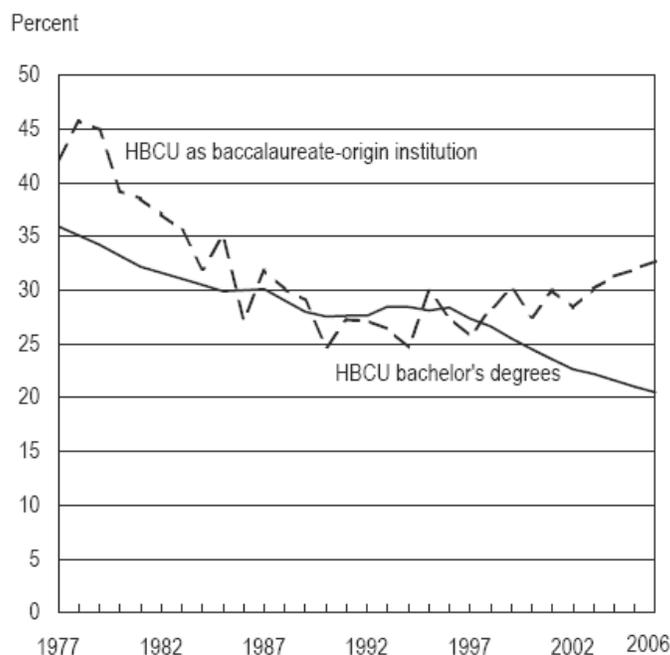
## Role of Historically-Black Colleges & Universities as Baccalaureate-Origin Institutions of Black Science & Engineering Doctorates

By Joan Burrelli and Alan Rapoport, National Science Foundation

In a February 2008 article in the Washington Post, the presidents of four Maryland historically black institutions raised the issue of the role and relevance of historically black institutions in enhancing education opportunities for African Americans (Avery et al. 2008). This InfoBrief partially addresses this issue by examining the role of historically black colleges and universities (HBCUs) as baccalaureate-origin institutions of black science and engineering (S&E)<sup>1</sup> doctorate recipients. It examines trends primarily during the past two decades and compares HBCUs to non-HBCU institutions, to different Carnegie types of institutions<sup>2</sup>, and to a select group of baccalaureate colleges—the Oberlin 50 (minus Hampton University which is an HBCU).<sup>3</sup> The InfoBrief also examines differences between public and private institutions. The analysis focuses on two types of output variables: the absolute number of doctorates and the institutional yield—the number of S&E doctorates in a given year per thousand bachelor's degrees awarded in all fields 9 years (the median time from bachelor's-to-doctorate receipt for S&E doctorates) prior to that year.

In the late 1970s over 40% of black S&E doctorate recipients received their baccalaureate degrees from HBCUs. This percentage fell to 25% in the first part of the 1990s before increasing to about 33% in 2006. During the same period (1977–2006), the share of blacks receiving bachelor's degrees from HBCUs fell from 36% to 21% (Figure 1).

FIGURE 1. Black S&E doctorate recipients with HBCU baccalaureate degrees and black bachelor's degrees conferred by HBCU institutions: 1977-2006



NOTES: Includes only U.S. citizens and permanent residents. Bachelor's degree data by race not available for 1978, 1980, 1982-1984, 1986, 1988, and 1999.

SOURCES: National Science Foundation, Division of Science Resources Statistics, Survey of Earned Doctorates, 1977-2006 and National Center for Education Statistics, IPEDs Completions Survey, 1977-2006.

1. In this report, science and engineering includes health fields.
2. The 2005 version of the Carnegie Foundation for the Advancement of Teaching's Basic Classification scheme for colleges and universities categorizes academic institutions on the basis of highest degree conferred, level of degree production, and research activity. Doctorate-granting universities are institutions that award at least 20 doctoral degrees per year. These institutions have three subgroups: very high research activity, high research activity, and doctoral/research universities, based on level of research activity. Master's colleges and universities are institutions that award at least 50 master's degrees and fewer than 20 doctoral degrees per year. Baccalaureate colleges are institutions that award fewer than 50 master's degrees or 20 doctoral degrees per year and at which baccalaureate degrees are at least 10% of all undergraduate degrees. See <http://www.carnegiefoundation.org/classifications/> for more information on the Carnegie classification scheme.
3. The Oberlin 50 is a group of 50 small, private baccalaureate schools that was studied in the mid-1980s and was found at that time to contribute greatly to the production of future S&E doctorates. Hampton University is also an HBCU and is therefore eliminated from the group to obtain the Oberlin 49. The Oberlin 50 institutions are: Albion College, Alma College, Amherst College, Antioch University, Barnard College, Bates College, Beloit College, Bowdoin College, Bryn Mawr College, Bucknell University, Carleton College, Colgate University, Colorado College, Davidson College, Denison University, DePauw University, Earlham College, Franklin and Marshall College, Grinnell College, Hamilton College, Hampton University, Harvey Mudd College, Haverford College, College of the Holy Cross, Hope College, Kalamazoo College, Kenyon College, Lafayette College, Macalester College, Manhattan College, Middlebury College, Mount Holyoke College, Oberlin College, Occidental College, Ohio Wesleyan University, Pomona College, Reed College, Smith College, St. Olaf College, Swarthmore College, Trinity College (CT), Union College (NY), Vassar College, Wabash College, Wellesley College, Wesleyan University, Wheaton College (IL), Whitman College, Williams College, and College of Wooster. Two of these institutions (Hampton University and Manhattan College) are now Carnegie master's-granting institutions.

**TABLE 1.** Black S&E doctorate recipients, by selected classes of baccalaureate institutions: 1986-2006

Year	U.S. non-HBCU institutions											
	All institutions	HBCU	All non-HBCU	Research Universities	Other doctorate granting	Master's colleges and universities	Baccalaureate Colleges	Other/Unclassified Carnegie Group	Oberlin 49	Foreign Institutions	Unknown Baccalaureate Institutions	
1986	356	89	234	91	51	52	35	5	19	23	10	
1987	350	99	221	93	47	48	32	1	18	28	2	
1988	389	103	239	106	48	57	26	2	12	45	2	
1989	396	104	257	114	42	56	42	3	22	32	3	
1990	405	85	267	120	51	64	29	3	16	46	7	
1991	503	119	325	139	79	69	34	4	17	45	14	
1992	442	109	292	138	53	72	29	0	11	33	8	
1993	526	121	340	140	75	77	42	6	20	54	11	
1994	544	120	362	160	71	79	49	3	27	53	9	
1995	610	165	390	176	72	83	53	6	26	40	15	
1996	620	151	395	170	81	92	50	2	27	57	17	
1997	688	145	420	189	102	76	52	1	25	50	53	
1998	708	175	445	206	87	90	53	9	31	44	44	
1999	773	207	475	218	95	104	52	6	19	57	34	
2000	784	192	504	246	104	90	60	4	32	54	34	
2001	767	204	480	234	105	85	47	9	27	60	23	
2002	761	196	501	225	100	102	67	7	38	51	13	
2003	742	195	454	215	84	86	55	14	32	58	35	
2004	857	242	527	236	108	112	60	11	25	60	28	
2005	828	239	512	230	122	96	56	8	23	51	26	
2006	866	254	525	240	117	96	61	11	29	67	20	

NOTES: Includes only U.S. citizens and permanent residents. Research universities are the Carnegie group “doctorate-granting universities, very high research activity.” Other doctorate-granting institutions include the two other Carnegie categories of doctorate-granting institutions—high research activity and doctoral/research universities. HBCUs are excluded from each of the Carnegie groups presented in the table. The Oberlin 49 schools are not excluded from the baccalaureate colleges category.

(Continued from page 6)

### Baccalaureate-Origin Institutions of Black S&E Doctorate Recipients

Black S&E doctorate recipients from U.S. universities complete their undergraduate education at a wide variety of types of institutions in the United States. A small proportion of blacks earning S&E doctorates from U.S. universities had undergraduate degrees from foreign institutions, 8% in 2006 (Table 1). An additional 2% did not provide information about their baccalaureate institutions in 2006. Of those with known U.S. baccalaureate institutions, in 2006 a third earned their bachelor's degrees from an HBCU institution and the remainder earned their bachelor's degrees from non-HBCU institutions. The percentage of S&E doctorate recipients earning their bachelor's degrees from HBCUs ranged between 24% and 33% from 1986 to 2006. Among those earning their baccalaureate degrees at known U.S. institutions in 2006 slightly less than one-third (31%) earned their bachelor's degrees from a non-HBCU research university. The remainder earned their bachelor's degrees from non-HBCU other doctorate-granting institutions (15%), master's-granting

institutions (12%), or baccalaureate colleges (8%). The baccalaureate origin of 4% was an Oberlin 49 institution.

### Baccalaureate-Origin Institutions of Black S&E Doctorate Recipients Normalized for Bachelor's Degrees Awarded

Although only one-quarter to one-third of black S&E doctorate recipients received their bachelor's degrees from HBCUs from 1986 to 2006, when normalized by the number of bachelor's degrees awarded, HBCUs as a group yielded about as many future S&E doctorates per thousand bachelor's awarded as non-HBCU institutions during this period. The trends for both groups were similar (Figure 2).

### Baccalaureate-Origin Institutions of Black S&E Doctorate Recipients Normalized for Black Bachelor's Degrees Awarded

When normalized by the number of bachelor's degrees awarded, the baccalaureate colleges as a group yield more future S&E doctorates than other types of institutions, except research universities. Figure 3 shows that for 9 of the 14 years shown,

(Continued on page 12)

## **Whatever Happened to All Those Plans to Hire More Minority Professors?**

**Results often fall short of ambitions, but nobody's giving up.**

*By Ben Gose, Chronicle of Higher Education*

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## Student Labor on LSST: Summer 2008 REU and FaST Programs

By Suzanne Jacoby and Anna Spitz, LSST Corporation, [www.lsst.org](http://www.lsst.org)

Even years before first-light, LSST is able to provide opportunities to undergraduate students looking for scientific and engineering research experience. This summer LSST researchers mentored several students in the National Science Foundation's (NSF) Research Experience for Undergraduates (REU) program and through NSF supplemental funding to the LSST Design & Development award to support Faculty and Student Teams (FaST) at 3 LSST-affiliated institutions.

The FaST Program, a cooperative effort of the Department of Energy's (DOE) Office of Science and NSF, supports teams of one faculty member and two to three undergraduate students from institutions with limited research facilities and those serving underrepresented populations in science, engineering and technology (women and minorities). FaST teams typically experience hands-on research opportunities in DOE national laboratories during the summer working with scientists and engineers. This year education leads and researchers at Brookhaven National Laboratory (BNL), Stanford Linear Accelerator Center (SLAC), and the University of Washington (UW) submitted a collaborative proposal to the NSF through LSSTC. These funds allowed the expansion of FaST at BNL and SLAC and the extension of the existing UW Pre-Map Program through the summer. Our eventual goal is to increase the diversity of participants in LSST and to expand the FaST model to all other interested LSST-affiliated institutions in coming years.

At UW, Florida Institute of Technology faculty mentor Hakeem Oluseyi and students Muhammad Furqan and Chris Culliton worked with astronomer Andrew Becker to simulate the sensitivity of LSST to astrophysical variability using a light curve simulation tool.

The team plans to continue working to-



*Chris Culliton, Dr. Andrew Becker, Dr. Hakeem Oluseyi, Muhammad Furqan at the University of Washington program summer 2008.*

gether on this analysis, extending it to other types of variability once the software is in place. Culliton expressed interest in applying to UW for graduate school. Dr. Oluseyi asked Dr. Becker to serve as an external member of student Furqan's graduate work.

Two students from Southern University at Baton Rouge, Zephra Bell and Mark Bryant, and faculty member, Ray H. O'Neal, Jr., from Florida Agricultural and Mechanical University worked with mentor Paul O'Connor at BNL to analyze the optical characteristics of the charge-coupled device for the LSST camera.

A FaST team has been selected to work at SLAC next summer; the timing of the award made it impossible to get things going this year.

Taylor Chonis, a senior in the Physics and Astronomy Department at the University of Nebraska-Lincoln worked with LSST System Engineer Chuck Claver and Jacques Sebag in the Kitt Peak National Observatory (KPNO)/National Optical Astronomy Observatory (NOAO) REU Program to investigate characteristics of El Peñón, future site of the LSST.

*(Continued on page 11)*



Ray O'Neal, Mark Bryant and Zephra Bell at BNL. Photo courtesy of Brookhaven National Laboratory.

(Continued from page 10)

The project included a trip to Cerro Tololo for observations on the 0.9-meter telescope to calibrate for LSST.

Taylor's interest in the engineering side of astronomy and physics fit well with the work of his mentors. "I always say that if I were to choose another major instead of physics, it would be engineering. This project was a good mix of the two fields and has reassured me that the two fields are often one in the same, especially for someone who works in instrumentation." After graduating in December, Taylor will start working at University of Texas-Austin on the Hobby Eberly Telescope Dark Energy Experiment (HEDEX) and plans to apply to graduate school in astrophysics or engineering for fall 2009.

Students will present their work at the January 2009 meeting of the American Astronomical Society in Long Beach:

- Taylor Chonis, Chuck Claver, Jacques Sebag, University of Nebraska — Lincoln, LSST/NOAO: *Site Characterization of El Peñón: Site of the Large Synoptic Survey Telescope.*



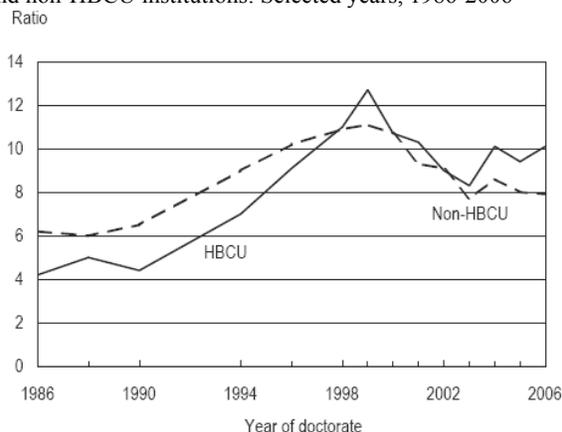
Taylor Chonis taking a break from his work on LSST to visit the Grand Canyon and enjoy the southwest. "Tucson v. Nebraska... well, there's not as much corn in Tucson!"

- Hakeem Oluseyi, Chris Culliton, Muhammad Furquan, Andrew Becker, Florida Institute of Technology, University of Washington: *LSST Lightcurve Simulation to Quantify Variability Sensitivity.*

For more information about education opportunities with LSST, please contact Suzanne Jacoby, (sjacoby@lsst.org) LSST Manager for Education and Public Outreach.

## The Role of HBCUs in Black S&E Doctorates... (cont'd)

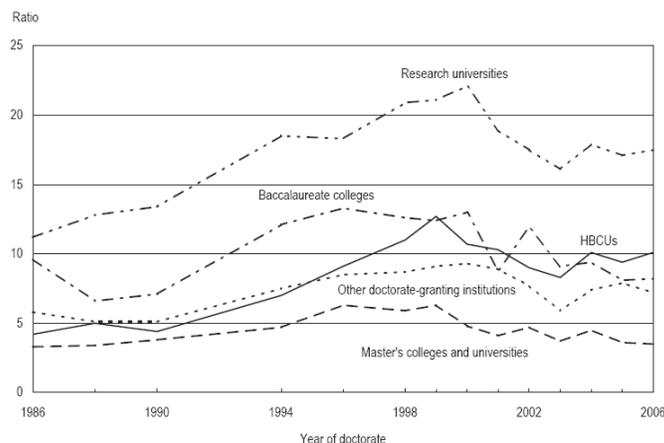
**FIGURE 2.** Black S&E doctorate recipients per thousand black bachelor's degrees awarded in all fields 9 years earlier, by HBCU and non-HBCU institutions: Selected years, 1986-2006



*(Continued from page 7)*

baccalaureate colleges also yielded more future black S&E doctorates than other types of institutions, except research universities. Between 1986 and 1998, both the non-HBCU research universities and the non-HBCU baccalaureate colleges yielded more future black S&E doctorates than the HBCUs. However, between 1999 and 2006, HBCUs and non-HBCU baccalaureate colleges yielded similar numbers of future black S&E doctorates. During this latter period the HBCUs yielded more black S&E doctorates than either non-HBCU other doctorate-granting or non-HBCU master's institutions (Figure 3). The yield ratios of all of these types of institutions generally increased between 1986 and the late 1990s, reaching their peak in 1999 or 2000, and have generally declined

**FIGURE 3.** Black S&E doctorate recipients per thousand black bachelor's degrees awarded in all fields 9 years earlier, by selected Carnegie group and HBCU status: Selected years, 1986-2006

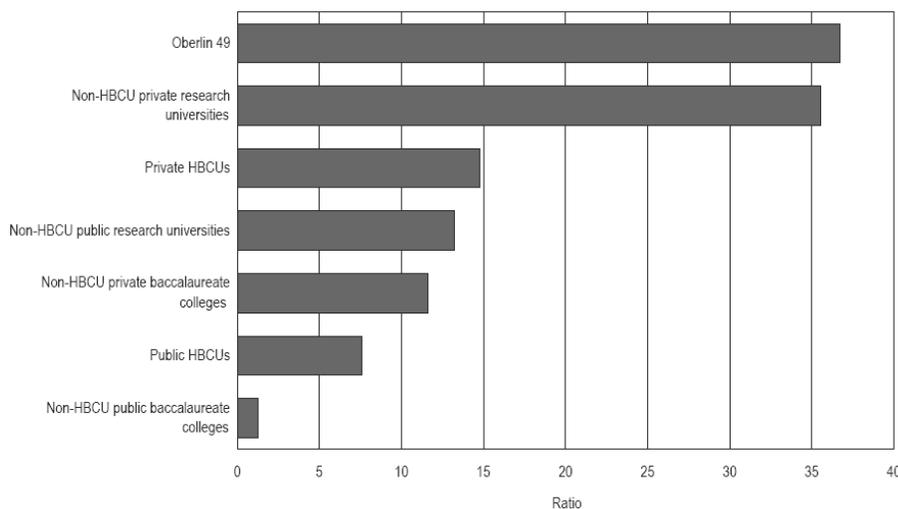


since then.

Comparing public and private institutions, private schools, whether non-HBCU research universities, non-HBCU baccalaureate colleges, or HBCUs, out-perform comparable public schools in the proportion of their black bachelor's degree recipients becoming future S&E doctorate recipients (Figure 4). The number of 2006 black S&E doctorate recipients per thousand black bachelor's degrees awarded in all fields 9 years earlier is highest among private non-HBCU research universities and the Oberlin 49 baccalaureate colleges. Private HBCUs as a group have a yield similar to all private non-HBCU baccalaureate colleges and public non-HBCU research universities (Figure 4).

*(Continued on page 13)*

**FIGURE 4.** Black S&E doctorate recipients in 2006 per thousand black bachelor's degrees awarded in all fields in 1997, by selected Carnegie group, HBCU status, and institutional control



(Continued from page 12)

### Top Schools From Which Black S&E Doctorate Recipients Receive Bachelor's Degrees

Among known U.S. baccalaureate-origin institutions of 1997–2006 black S&E doctorate recipients, the top 8 and 20 of the top 50 were HBCUs. Another 26 were non-HBCU research universities (Table 2). The top 5 baccalaureate-origin institu-

tions of 1997–2006 black S&E doctorate recipients were: Howard University, Spelman College, Hampton University, Florida A&M University, and Morehouse College.

However, after normalizing for the number of bachelor's degrees awarded 9 years earlier, only 5 of the top 50 baccalaureate origin institutions of 1997–2006 black S&E doctorate recipients were HBCUs, with only Spelman College in the top 25.

(Continued on page 14)

**TABLE 2.** Top 50 baccalaureate origin institutions of 1997-2006 black S&E doctorate recipients, by institutional control, 2005 Carnegie classification, and HBCU status

Rank	Academic Institution	Institutional control	2006 Carnegie classification	HBCU	1997-2006 black S&E Doctorate recipients
—	All baccalaureate-origin institutions	—	—	—	7,754
—	Foreign institutions	—	—	—	552
—	Unknown institutions	—	—	—	310
1	Howard University	Private	Other doctorate granting	Yes	224
2	Spelman College	Private	Baccalaureate colleges	Yes	150
3	Hampton University	Private	Master's colleges & universities	Yes	135
4	Florida Agricultural and Mechanical University	Public	Other doctorate granting	Yes	100
5	Morehouse College	Private	Baccalaureate colleges	Yes	99
6	North Carolina A&T State University	Public	Other doctorate granting	Yes	89
7	Southern University A&M College at Baton Rouge	Public	Master's colleges and universities	Yes	88
8	Xavier University of Louisiana	Private	Master's colleges and universities	Yes	79
9	Harvard University	Private	Research universities	No	79
10	University of Maryland at College Park	Public	Research universities	No	72
11	Tuskegee University	Private	Baccalaureate colleges	Yes	71
12	Morgan State University	Public	Other doctorate granting	Yes	64
13	University of California Berkeley	Public	Research universities	No	64
14	Jackson State University	Public	Other doctorate granting	Yes	63
15	University of Virginia, main campus	Public	Research universities	No	63
16	University of Michigan at Ann Arbor	Public	Research universities	No	62
17	Massachusetts Institute of Technology	Private	Research universities	No	58
18	University of North Carolina at Chapel Hill	Public	Research universities	No	54
19	North Carolina State University at Raleigh	Public	Research universities	No	51
20	Brown University	Private	Research universities	No	50
21	Stanford University	Private	Research universities	No	50
22	Yale University	Private	Research universities	No	48
23	Princeton University	Private	Research universities	No	47
24	Cornell University, all campuses	Public/Private	Research universities	No	46
25	University of Illinois at Urbana-Champaign	Public	Research universities	No	45
26	Clark Atlanta University	Private	Other doctorate granting	Yes	43
27	Prairie View A&M University	Public	Master's colleges and universities	Yes	43
28	University of California Los Angeles	Public	Research universities	No	43
29	University of Pennsylvania	Private	Research universities	No	43
30	Alabama Agricultural and Mechanical University	Public	Master's colleges and universities	Yes	41
31	Rutgers University New Brunswick	Public	Research universities	No	41
32	Tougaloo College	Private	Baccalaureate colleges	Yes	41
33	University of South Carolina at Columbia	Public	Research universities	No	41
34	CUNY City College	Public	Master's colleges and universities	No	40
35	Norfolk State University	Public	Master's colleges and universities	Yes	40
36	North Carolina Central University	Public	Master's colleges and universities	Yes	40
37	Wayne State University	Public	Research universities	No	38
38	Fisk University	Private	Baccalaureate colleges	Yes	37
39	Temple University	Public	Other doctorate granting	No	37
40	Florida State University	Public	Research universities	No	36
41	Michigan State University	Public	Research universities	No	35
42	Tennessee State University	Public	Other doctorate granting	Yes	35
43	Duke University	Private	Research universities	No	34
44	Grambling State University	Public	Master's colleges and universities	Yes	34
45	University of Texas at Austin	Public	Research universities	No	34
46	CUNY Hunter College	Public	Master's colleges and universities	No	33
47	Columbia University in the City of New York	Private	Research universities	No	32
48	Georgia Institute of Technology, main campus	Public	Research universities	No	32
49	Pennsylvania State University, main campus	Public	Research universities	No	32
50	University of Maryland Baltimore County	Public	Other doctorate granting	No	32

## The Role of HBCUs in Black S&E Doctorates... (cont'd)

(Continued from page 13)

Thirty-two were research universities and 8 were Oberlin 49 colleges (Table 3). The top 5 baccalaureate origin institutions in terms of number of black S&E doctorates per thousand bachelor's degrees awarded in all fields 9 years earlier were: Massachusetts Institute of Technology, Swarthmore College, Princeton University, Harvard University, and Amherst College.

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**TABLE 3.** Top 50 baccalaureate origin institutions of 1997–2006 black S&E doctorate recipients, by black S&E doctorate recipients per thousand black bachelor's degrees awarded in all fields 9 years earlier, institutional control, 2005 Carnegie classification, HBCU status, and Oberlin 49 status

Rank	Academic Institution	Institutional control	2006 Carnegie classification	HBCU	Oberlin	97-06 S&E PhDs	97-06 S&E PhDs per 1000 bachelors awarded 9 years earlier
1	Massachusetts Institute of Technology	Private	Research universities	No	No	58	112.6
2	Swarthmore College	Private	Baccalaureate colleges	No	Yes	17	85.9
3	Princeton University	Private	Research universities	No	No	47	70.7
4	Harvard University	Private	Research universities	No	No	73	64.2
5	Amherst College	Private	Baccalaureate colleges	No	Yes	15	55.6
6	Brown University	Private	Research universities	No	No	50	54.0
7	Yale University	Private	Research universities	No	No	48	52.9
8	Wellesley College	Private	Baccalaureate colleges	No	Yes	18	52.3
9	Carnegie Mellon University	Private	Research universities	No	No	14	50.4
10	University of Chicago	Private	Research universities	No	No	14	49.8
11	Oberlin College	Private	Baccalaureate colleges	No	Yes	22	48.7
12	Vanderbilt University	Private	Research universities	No	No	21	47.3
13	University of California Santa Cruz	Public	Research universities	No	No	19	45.6
14	Colgate University	Private	Baccalaureate colleges	No	Yes	11	44.4
15	Spelman College	Private	Baccalaureate colleges	Yes	No	150	41.8
16	Stanford University	Private	Research universities	No	No	50	41.2
17	Vassar College	Private	Baccalaureate colleges	No	Yes	16	41.0
18	Columbia University in the City of New York	Private	Research universities	No	No	32	39.5
19	Case Western Reserve University	Private	Research universities	No	No	13	39.4
20	Wesleyan University	Private	Baccalaureate colleges	No	Yes	20	38.9
21	Rice University	Private	Research universities	No	No	11	38.3
22	University of Pennsylvania	Private	Research universities	No	No	43	38.1
23	Johns Hopkins University	Private	Research universities	No	No	15	37.5
24	Duke University	Private	Research universities	No	No	34	36.8
25	Williams College	Private	Baccalaureate colleges	No	Yes	12	35.9
26	Tougaloo College	Private	Baccalaureate colleges	Yes	No	41	35.9
27	Wake Forest University	Private	Other doctorate granting	No	No	15	35.8
28	Cornell University, all campuses	Public/private	Research universities	No	No	46	34.4
29	University of California Irvine	Public	Research universities	No	No	21	33.8
30	Tulane University	Private	Research universities	No	No	25	33.7
31	George Washington University	Private	Other doctorate granting	No	No	19	30.8
32	College of William and Mary	Public	Research universities	No	No	19	30.5
33	Fisk University	Private	Baccalaureate colleges	Yes	No	37	30.0
34	Dartmouth College	Private	Research universities	No	No	17	29.7
35	Washington University	Private	Research universities	No	No	19	28.4
36	Emory University	Private	Research universities	No	No	25	27.1
37	Andrews University	Private	Other doctorate granting	No	No	14	26.5
38	Iowa State University	Public	Research universities	No	No	17	25.2
39	University of California Riverside	Public	Research universities	No	No	12	25.1
40	Georgia Institute of Technology, main campus	Public	Research universities	No	No	32	24.7
41	Miami University, all campuses	Public	Other doctorate granting	No	No	14	24.4
42	Morehouse College	Private	Baccalaureate colleges	Yes	No	99	24.4
43	University of Michigan at Ann Arbor	Public	Research universities	No	No	62	24.3
44	Xavier University at Louisiana	Private	Other doctorate granting	Yes	No	79	24.1
45	University of California Berkeley	Public	Research universities	No	No	64	24.0
46	University of California Davis	Public	Research universities	No	No	26	24.0
47	University of Virginia, main campus	Public	Research universities	No	No	63	23.9
48	University of Wisconsin Madison	Public	Research universities	No	No	17	22.6
49	University of Miami	Private	Research universities	No	No	24	22.1
50	University of Maryland Baltimore County	Public	Other doctorate granting	No	No	32	21.6

## Community Colleges Fuel Science Work Force

By Siri Carpenter, Reprinted by permission from Science Careers

When he graduated from high school, Roberto Tinoco didn't really know what his options were for further education. Tinoco, whose family emigrated from Mexico to California when he was a child, had a 1-year-old daughter to support. "I was a young dad. I had all these responsibilities at home, and a lot of people told me that maybe I should give up school so that I could support my family," Tinoco remembers. So he found a job as a check-cashing teller. The business's owner had once been a minority-mentoring coordinator at the University of California (UC), Davis, and she believed Tinoco had potential. "She helped me realize that I still had to take care of my education and that there are opportunities out there for me," Tinoco says.

With his boss's encouragement, Tinoco enrolled as a biology major at Mt. San Antonio College, a 2-year school in Walnut, California. After 2 years of studying hard, getting laboratory experience, and working full-time, he applied to six UC campuses and was accepted by all of them. "I was amazed at the level of recruitment these universities have at community colleges," he says. He chose UC Irvine, persuaded largely by a minority scholarship offered through the university's NSF-funded California Alliance for Minority Participation (CAMP) program. Now a third-year Ph.D. student in viral immunology at UC San Diego, Tinoco advises students following a similar path to "stay focused on obtaining your goal and surround yourself with people who care about helping you in your education."

Tinoco's success in moving from a 2-year college to the scientific mainstream reflects both his exceptional tenacity and his good fortune in meeting the right people. But he is no fluke. "There is a huge pool of talent to tap at the community colleges," concludes Shiva Singh, program director of NIH's Bridge to the Future, an initiative aimed at

increasing minority participation in bioscience. Students at the nation's 1200 community colleges account for almost half of all U.S. undergraduates, and more than a third of them are black, Hispanic, American Indian, or Asian/Pacific Islander--minority groups underrepresented in science. "If we can provide community college students with the proper guidance and mentoring to take the right courses, in the right sequence, they can be competitive at the university level," says Singh.

*"For aspiring researchers, community colleges are an attractive way to begin one's scientific training."*

### Forging partnerships

According to a study by the U.S. National Science Foundation (NSF), 48% of people who received a bachelor's or master's degree in science or engineering in 2004 or 2005 had attended a 2-year college at some point. Most underrepresented minority students begin their journey in higher education at community colleges, and minority Ph.D. holders across all fields are more likely than whites to have begun their careers at a community college. Mexican Americans are espe-

*(Continued on page 16)*



Roberto Tinoco, his wife Erika, and their daughter Anika

## Community Colleges Fuel Science Work Force... (cont'd)

*(Continued from page 15)*

cially likely to start at a community college: 23% of Mexican Americans with doctoral degrees began their postsecondary careers at a community college.

"I've been a faculty member for over 32 years, and students who came out of the community colleges are among the best scientific talent that I have known in my professional career," says Juanita Barrena, a professor of biological sciences at California State University, Sacramento, and principal investigator for her university's Bridges to the Baccalaureate grant, an arm of the U.S. National Institutes of Health's (NIH's) Bridges to the Future initiative. "Were it not for the community colleges," Barrena says, "those students would not now have completed their Ph.D.s or even be ready to apply to Ph.D. programs. Those students would have been lost to the scientific enterprise."

Data are elusive on how well community colleges do at shepherding interested students into research careers. No one systematically tracks the nation's community college students after they transfer to 4-year schools or measures how many go on to get advanced degrees. Numerous federal agencies that historically have focused their minority recruitment and retention efforts on universities, including NSF, NIH, and the Department of Education, are now implementing or expanding programs to fortify science education at community colleges, to facilitate 2-year students' transfer to universities, and to encourage those students to continue toward advanced degrees.

"American higher education is recognizing that community colleges are critical partners in fueling the scientific enterprise, not merely way stations until students get to the 4-year institutions," says education policy analyst Jamie Merisotis, president and CEO of the Lumina Foundation for Education in Indianapolis, Indiana. Merisotis is regarded as a leading expert on education policy, including issues of access to higher education for underrepresented minorities.

NIH's 10-year-old Bridges to the Baccalaureate Program, for example, spends \$8 million a year to support partnerships between 2-year and 4-year institutions, providing money for institutional coordination, facilities, tutoring, peer mentoring, seminar series and workshops, and summer research opportunities for community college students. (Its companion,

dubbed Bridges to the Doctorate, takes over from there. Both programs are cosponsored by NIH's National Institute of General Medical Sciences and the National Center on Minority Health and Health Disparities.)

Early research opportunities are critical, many science educators believe: A 2007 study found that undergraduates who participate in laboratory research are significantly more likely to pursue advanced degrees in science and engineering than those who don't get hands-on research experience. In addition to building technical and critical-thinking skills, a laboratory berth broadens students' understanding of what science is and provides a "passport" to the scientific community, says Kika Friend, who directs the CAMP program at UC Irvine. For community college students, working in a research lab means that "instead of flipping burgers to make ends meet, you become part of the culture of research," Friend says. "To have a faculty member take interest in what you're doing, to be given the key to the lab, and to be part of a team reinforce that sense that you can do it."

### A promising path

For aspiring researchers, community colleges are an attractive way to begin one's scientific training for many reasons. On average, community college tuition and fees are 38% of those at 4-year institutions. Local community colleges often are preferable for students with family or job obligations. And compared with research universities, community colleges offer smaller classes on average--especially in the big survey courses that dominate the first 2 years of a college education--and provide more opportunities for individual attention from professors. Stephen Summers, chair of the physical sciences department at Seminole Community College near Orlando, Florida, says that science classes there are capped at 24 students. "That intimate classroom environment is more conducive to students' success than are university lecture halls that seat maybe 450 students," he says.

In addition, 30% of students who enroll at community colleges require remedial instruction, especially in math and English. Remedial courses

*(Continued on page 17)*

*(Continued from page 16)*

are becoming scarce at universities but remain one of community colleges' strengths, Summers says.

Community colleges are also equipped to provide English language training for immigrant and refugee students, so they are a good starting point for strong students with weak skills in spoken and written English. That was a critical component for Veder Garcia, whose family moved to the United States from El Salvador when he was a teenager. When he finished high school, Garcia says, "my English was not good enough to obtain an acceptable score in the exams, such as the SAT, required for applying for admissions at a 4-year institution." During a 2.5-year stint at Montgomery College in Rockville, Maryland, Garcia's English skills flourished, and he completed the general science courses necessary to transfer to the University of Maryland, College Park. Now a graduate student in plant and microbial biology at UC Berkeley, Garcia believes that the teaching and mentoring he received while in community college was essential to launching his scientific career.

Still, would-be scientists who start out at a community college have some barriers to climb. In addition to the educational deficiencies that frequently frustrate students' progress, students sometimes have difficulty finding out what credits will transfer to a university. Community colleges also tend to have less funding per student than universities do, so the quality of academic offerings sometimes suffers. Finally, opportunities to participate in hands-on research are scarce at community colleges, so students looking for lab experience typically have to look elsewhere.

Given these obstacles, it's not surprising that, although about half of all enrollees enter community college intending to transfer to a 4-year institution, only about 25% actually do--a gap that programs such as NIH's Bridges to the Baccalaureate and NSF's Louis Stokes Alliance for Minority Participation aim to remedy.

Students who make it that far must clear more hurdles after they enter a university. Many transfer students work full-time while attending school, before and after they transfer. And even students who received solid mentoring at a community college, and who are academically well prepared,

may find the faster pace of university life unnerving. "We have a saying in Spanish," says Friend. "Until you're in the bull ring, you don't realize the magnitude of being a bullfighter.' "

On the other hand, students coming from community colleges are often better prepared to fight the bull. They're often older, more mature, and more committed to their education than students who enter the university right out of high school, says Derek Dunn-Rankin, faculty director for California's statewide CAMP program and a professor of mechanical and aerospace engineering at UC Irvine. He notes that transfer students tend to have higher graduating grade point averages than their "native" counterparts. "The community college is a selective filter," he says. "The students who are dedicated enough to get through a community college experience while juggling a job, a family--all of the things that kept them out of a 4-year college to begin with--are special people."

*Siri Carpenter is a freelance science writer in Madison, Wisconsin.*

*The full article can be seen at this URL:*

[http://sciencecareers.sciencemag.org/career\\_development/previous\\_issues/articles/2008\\_04\\_11/career\\_a0800056](http://sciencecareers.sciencemag.org/career_development/previous_issues/articles/2008_04_11/career_a0800056)

## In Memory of Dr. Beth A. Brown... (cont'd)

*(Continued from page 2)*

Young Adult ministries. She sang in the Women's Choir and was active in bible studies.

I think most of us who were fortunate to know Beth well would characterize her as a deeply spiritual person, even if we were not part of her community of faith. That spirit was evident in her warm smile, in her gracious manner, and in her humility and empathy. But most of all it was evident in her hugs, warm embraces that lasted and left you feeling loved and cared for.

Beth loved her friends. She and I were regularly in touch over the years, and almost always it was she who called. I loved those spontaneous phone calls. Beth's warmth was palpable even across the distance, and talking with her always left me feeling good about things. Sometimes we'd talk science, sometimes politics, sometimes about our work in diversity and mentoring. Oftentimes those conversations would touch upon the intersections of science and faith, another confluence in Beth's life. Beth liked to say that words have power and these words in particular—"For to whom much is given, much is required"—which she recited often to me, were among her favorites. Beth believed that her life had been richly blessed—with family and friends, with vocation and calling, with opportunity after opportunity—and she believed that these blessings in turn compelled her to give back to the communities to which she belonged.

Beth will be missed. In the days following the tragic news of Beth's untimely death, friends and colleagues from around the country spoke up in the hope that we might come together to develop a fitting and lasting memorial for our friend. Because so much of Beth's passion for education and mentoring of minority scientists was focused through NSBP, we are working to create a Beth Brown Memorial Fund administered by NSBP.

It is not known at this time what form the memorial will take. Certainly, given Beth's passion for science, learning, and outreach, a scholarship or other program that would encourage the next generation of scientists and explorers would be appropriate. Ultimately, of course, we will develop the details of the memorial in close consultation with Beth's family. Even as we seek now to lay the



foundation for Beth's memorial, we respect the need of the family for time and space to grieve.

While we work out the logistics of setting up a formal tax-deductible Memorial Fund, we are taking pledges of donations as well as ideas for the memorial. Please send pledges and ideas to any one of the individuals listed below, and we will be in contact as soon as the details have been worked out.

In fond remembrance of Beth,

Keivan Stassun ([keivan.stassun@vanderbilt.edu](mailto:keivan.stassun@vanderbilt.edu))  
 Marcel Agueros ([marcel@astro.columbia.edu](mailto:marcel@astro.columbia.edu))  
 Kelly Holley-Bockelmann ([k.holley@vanderbilt.edu](mailto:k.holley@vanderbilt.edu))  
 David Leisawitz ([David.T.Leisawitz@nasa.gov](mailto:David.T.Leisawitz@nasa.gov))  
 Chanda Prescod-Weinstein  
 ([chandadeepti@gmail.com](mailto:chandadeepti@gmail.com))  
 Louis Strolger ([louis.strolger@wku.edu](mailto:louis.strolger@wku.edu))

An online feature of Beth Brown's biography is available at this web address:

<http://www.nasa.gov/audience/foreducators/postsecondary/features/sharing-the-stars.html>

## A Partnership in Astronomy at SCSU... (cont'd)



*SCSU PAARE students (left to right) Patrick Durant, Graham Davis and Joshua Davis, prepare a telescope for an evening observing session.*

*(Continued from page 3)*

Researchers at NOAO will serve as mentors to SCSU faculty to conduct the most in-depth study to date of RV Tauri stars. These stars are luminous, supergiant variables with periods of pulsation that are sometimes predictable and sometimes not. The light curves of these stars have a primary period of variability in the range of 30-150 days but some also show a superimposed secondary variation with periods of hundreds to thousands of days. The evolutionary status of these objects is uncertain and an adequate explanation of the changes in their spectra and light curves is lacking.

We will use our high signal-to-noise, archival coude spectra and the large AAVSO photometric database as a starting point. We will then add new spectra from the coude-feed telescope taken simultaneously or contemporaneously with new UBVRI photometry from other telescopes at KPNO. Our modeling of the light curves will derive a mathematical description of the curve shapes for such parameters as luminosity and color, as a function of phase and period which in turn may allow us to better understand the underlying physical processes in the stars.

CU is one of three research institutions in South Carolina and has a total enrollment of around 17,000 students, approximately 3,800 of whom are

in the graduate program. CU's physics and astronomy department includes nearly 100 undergraduate majors and over 50 graduate students, several of whom are African-American. The astronomy area includes six faculty working with eighteen graduate students and typically eight undergraduate researchers. POCA will fund graduate fellowships for under-represented minorities in CU's astronomy graduate program. POCA will address retention in graduate school by funding an experienced graduate student to mentor the new POCA students during their first year in the program.

CU and SCSU are only 175 miles apart, which will facilitate faculty and student exchanges in both directions. Geographic proximity is a strong reason for partnering an undergraduate school with a Ph.D. granting institution. Parsad and Gray (2005) studied interstate migration of recipients of bachelors and masters degrees in science and engineering. Their work shows that, nationally, slightly more than 51% of all white and black, non-Hispanic students, pursuing a graduate degree, remain in the same state in which they receive their bachelors degree, while for Hispanic students the number is 61%.

Collaborative research between SCSU and CU will include optical follow-up to gamma ray bursts using the RCT and SARA. Additionally, we will collaborate in the study of primordial lithium abundance in halo stars using the RCT for photometry, the echelle spectrograph on the KPNO 4 meter telescope and possibly the HIRES spectrograph on the Keck 10 meter telescope.

*(Continued on page 20)*



*SCSU PAARE student Patrick Durant examines high dispersion, coude spectra of RV Tauri Stars.*

## A Partnership in Astronomy at SCSU... (cont'd)



*The SCSU POCA project sponsors an evening observing session on campus.*

*(Continued from page 19)*

NOAO and CU astronomers are working with SCSU faculty and students to increase their involvement in hands-on astronomical research through the use of the facilities at KPNO including the coude-feed telescope, the 4 meter telescope, SARA, the 0.9 WIYN and the RCT. POCA emphasizes the use of small telescopes as a good way for students to get research experience and is in keeping with the recent recommendations of the NSF AST Senior Review Committee.

POCA has initiated a three-tier program of undergraduate research that progressively develops student skills and builds their confidence. Students will spend their first REU experience in residence at SCSU, typically after their freshman or sophomore year. Here they will work closely with the SCSU faculty to build their research skills that will enable them to participate in national REU programs. Approximately six students per summer will attend this Tier 1 REU. Those slots that are not filled by SCSU students will be open to underrepresented minorities from other institutions.

Tier 2 of the POCA REU experience will

include a second summer internship, this time at NOAO or CU. Students can participate at this level only if they have prior research experience such as the Tier 1 internship. The Tier 3 summer experience will occur after their junior or senior year. In this case, the student will apply for a national REU through the normal process. The first two summers of experience are intended to make the POCA student competitive for these other programs.

Our past experience (Walter, et. al., 2007, 2005) has shown that undergraduate interest in astronomy drops precipitously after a summer internship unless there are

follow-on activities during the academic year. Students who receive astronomy scholarships under POCA are required to attend weekly sessions throughout the academic year. These include skill building sessions such as abstract writing, journal club readings, public observing sessions and a very popular “meet an astronomer” series that is conducted via videoconference when face-to-face visits are not possible.

Recruitment and retention strategies include participation in national meetings such as a graduate school recruitment booth at the Joint Annual Conference of the National Society of Black Physicists and the National Society of Hispanic Physicists. At SCSU, the PAARE project is partnering with other programs at the University by sending faculty and student teams to high schools as well as pooling scholarship money and summer internships. Specifically, POCA is partnering with the NSF Alliance for Minority Participation and the NSF Historically Black Colleges and Universities Undergraduate Program (HBCU-UP) as well as NASA’s Space Grant Program.

POCA also includes a significant educa-

*(Continued on page 21)*

(Continued from page 20)

tional and outreach component. SCSU has a museum and planetarium facility on campus that serves more than 25,000 visitors per year including thousands of school children. The project will fund planetarium programs and interactive displays in the museum including the operation of a 3.2 meter radio telescope on the roof of the building. The control room for the telescope is a glass booth visible to museum patrons.

Web-based activities and inquiry-based astronomy labs will be developed under POCA. JAVA versions of software and web-based resources will be created to analyze the Large Scale Structure of the Universe using data sets from the Sloan Digital Sky Survey. Dissemination of these products will serve as a legacy to PAARE and a resource for the community at large.

SCSU has been slowly building its astronomy program for more than a decade. Fifteen years ago, the school had a limited involvement in the field. The University had a planetarium, was a member of the South Carolina Space Grant Consortium, housed the NASA Educator Resource Center and had several physics faculty interested in space science, but no astronomers. In 1994, the first Ph.D. astronomer was hired. A series of grants from NASA and NSF over the next decade and a half allowed the department to develop coursework and a curriculum that culminated in the astronomy option as part of the physics degree program. Two more Ph.D. astronomers were hired and an aggressive recruiting program offering competitive scholarships resulted in a major increase in the number of physics majors. The University became a part of the RCT consortium, with access the 1.3 meter telescope at Kitt Peak. Very recently SCSU signed a consortium agreement with the College of Charleston and the University of the Virgin Islands that allows for use of the observatory located in the Virgin Islands.

The formal partnership of NOAO, CU and SCSU under PAARE utilizes the strengths of the three institutions to support a comprehensive program that enhances research, supports educational and outreach activities and most importantly begins the process of increasing the number of underrepre-

sented minorities in astronomy by filling the student pipeline from high school to graduate school. While a five year program is too short to see students complete the track from high school to Ph.D., PAARE will build the foundation of a sustainable partnership that will last beyond the award period and make the journey possible.

*Donald Walter is a professor of physics at South Carolina State University.*

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## **Whatever Happened to Hiring Minority Profs?... (cont'd)**

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