

AC 2007-2832: THE DYNAMICS OF ESTABLISHING AND SUSTAINING A NATIONAL MINORITY ENGINEERING PROGRAMS ADVISORY BOARD

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Angelitha L. Daniel graduated from the University of Pittsburgh with a Bachelor of Science Degree in Materials Science and Engineering. After graduation, she was hired as the Coordinator of Minority Recruitment for PECAP, Pitt's Engineering Career Access Program (formerly known as the IMPACT Program) from July 1998 until June 2003. Ms. Daniel currently works as the

Assistant Director of Minority Engineering Programs at North Carolina State University in Raleigh. She is responsible for the planning and implementation of programs that assist the college in recruiting, retaining, and graduating underrepresented students.

Dynamics of Establishing and Sustaining a National Minority Engineering Programs Advisory Board

Abstract

For nearly 12 years, our Minority Engineering Programs Office has sustained a national board of industry representatives who serve on our National Minority Engineering Programs Advisory Board. These representatives are from companies who actively recruit our undergraduate and graduate students to fill internships and co-operative education. They also hire our graduates as new full-time employees. Specific companies targeted for inclusion on our MEP advisory board are those who work tirelessly to diversify their company's engineering workforce. The board members have demonstrated a willingness to maintain an on-going relationship with us by, among other things, allowing our MEP office to help facilitate company on-campus exposure and hiring, and by regularly providing financial support programs administered by our office.

This paper describes our strategy for recruiting members to our National Board, frequency and rationale for twice a year board meetings, priority MEP student-centered services provided to members of our board, and challenges associated with sustaining these relationships as corporate recruiting personnel change within these companies at a fairly regular rate. An additional attribute associated with our success is having our student chapter presidents of the National Society of Black Engineers, the American Indian Science and Engineering Society, and the Society of Hispanic Professional Engineers, maintain permanent membership on this national advisory board. A portion of the paper explains how this inclusion provides added value to industry representatives who are active board participants. This paper includes specific information on three companies who have served continuously on our board, and which have provided continuous support to our programs.

Background on Our National Minority Engineering Programs Advisory Board

Our Director of Minority Engineering Programs was hired in 1995 with the specific charge to increase recruiting, enrollment, graduation and overall success of under-represented minority engineering students. The director moved quickly to establish a permanent advisory board of corporate representatives who routinely recruit our engineering students, and who are demonstrating a commitment to diversity in the work place. Invitations went out to over two dozen companies, with a small fraction responding. Working with a dozen companies, the director decided to hold advisory board meetings twice annually: In the fall in conjunction with the university-wide Minority Career Fair, and in the spring in conjunction with the College of Engineering Career Fair. Rationale for these two meeting times was that the companies targeted for inclusion on the National Minority Engineering Programs Advisory Board are likely to have a recruiting presence on campus at these two career fairs, and even if the preferred company administrator could not attend, she/he could send one of the company recruiting representatives to our meeting. At the first board meeting, members in attendance confirmed the logic and frequency for our meetings. Since they have a keen interest in direct access to our minority engineering students, we agreed to add to the board student presidents of our National Society of Black Engineers (NSBE), Society of Hispanic Professional Engineers (SHPE), and American Indian Science and Engineering Society (AISES) chapters. With leaders of NSBE, SHPE and

AISES at these meetings, company representatives could interact directly with these organizations on accessing meeting schedules, corporate visits, other identified needs.

From 1996 through 2002, the majority of our national MEP board consisted of companies different from its current composition. Near the end of this period, the declining economy and corporate turn resulted in an MEP board that was national in name only. Most regular attendees were from a few companies located here in North Carolina, plus student chapter presidents of NSBE, AISES and SHPE. In 2003, shortly after hiring a new assistant director of minority engineering programs, we move to reconstitute the board to a true national level, and invited companies to join who were either not on the board previously, or who were members in name only since they had not actively participated in annual meeting. Table I represents a list of companies invited to join our expanded, reconstituted National MEP board. The few companies who continued to be involved remained as well.

The following national and international companies are current, active members of our National Minority Engineering Programs Advisory Board. This list represents the few companies who were members of our degraded board, plus those invited in Table I who accepted the invitation to join, or re-activate their membership. Three companies, The Southern Company, Phillip Morris, and Progress Energy, attended our spring 2007 meeting as observers to see if they wanted to become formal board members. All three decided they do, and have been invited to join.

AISES, Student Chapter	NSBE, Student Chapter
Boeing Corporation	PBS&J
Cisco Systems	Progress Energy
Duke Energy Corporation	Redhat, Inc.
DuPont Company	SAS Institute, Inc.
Eastman Chemical Company	Southern Company
EMC Corporation	Shell Corporation
ExxonMobil Corporation	SHPE, Student Chapter
General Electric Corporation	NC Department of
Hewlett-Packard Company	Transportation
Intel Corporation	The Procter & Gamble Company
International Paper	Time Warner Cable, Inc.
Microsoft Corporation	NC Math & Science Education
Milliken & Company	Network
Nortel Networks	Underwriters Laboratories, Inc.
Northrop Grumman	Caterpillar

In addition to formal board affiliations and interactions described in this paper, several companies also host our students who attend a high school to college Summer Transition Program (STP). STP is a six weeks recruiting programs for our newly admitted minority engineering freshmen. In addition to taking their first college courses during our second summer academic session, STP participants also get a heavy orientation to the engineering profession. The Friday industry visits are part of that orientation. Company hosts plan presentations for our students, and insure when possible, that a diverse set of company employees are involved. These companies are within five hours drive of our campus, and each has hosted groups of students for

our Friday industry visits. Table II is a detailing of visits to several companies, including the number of students visiting each.

Table I: Companies Invited to Join Our Reconstituted National MEP Advisory Board
(I = International; N=National)

COMPANY NAME	COMPANY SIZE	COMPANY BUSINESS	ENGINEERING DISCIPLINES
Alcatel (I)	56,000	Telecommunications	CE, CPE, CS, EE
Bayer (I)	113,000	Chemical & Health Care (Pharmaceuticals)	BME, CHE, MSE
Cisco Systems (I)	34,000	Networking Hardware	CE, CPE, CS, EE
Dupont (I)	55,000	Chemical	CHE, MSE
Eaton Corporation (I)	56,000	Machinery and Tool Manufacturer	AE, EE, IE, ME
General Electric (I)	310,000+	Power Generation, Financial Services, and Medical Imaging	AE, CHE, EE, ME, MSE, TE
IBM (I)	329,000	Manufacturers/Sells Computers Services, Hardware, and Software	EE, CPE, CS, MSE
International Paper (I)	83,000	Paper, Packaging, and Forest Products	IE, ME
Konica Minolta (I)	34,710	Photo Imaging and Industrial Products	CHE, CPE, EE, IE, ME
Milliken & Company (I)	10,000+	Textile and Chemical Manufacturer	TE, IE, ME, EE
Nortel Networks (I)	34,150	Optical, Wireless, and Voice Technologies	EE, CPE, CS
NC Department of Trans. (N)	14,000+	Highway Development, Construction, and Maintenance	CE
PBS&J (I)	3,700+	Multidisciplinary Consulting: Engineering and Architecture	CE
Procter & Gamble (I)	98,000	Fabric, Home, Beauty, Baby, Family, and Health Care Products, Snacks & Beverages	CHE, MSE
Progress Energy (N)	11,000+	Power Generation	EE, CE, CPE, ME, NE
Red Hat, Inc. (I)	740	Linux Software and Open Source Technology	EE, CPE, CS
SAS Institute (I)	10,000	Business Software	EE, CPE, CS
Square D (Schneider Electric) (I)	84,866	Electrical Power Distribution, Industrial Control, Automation Products	EE, CPE, CS
Time Warner Cable, Inc. (N)	30,000	Fiber Optic Technology: Digital Cable and Phone, High Speed Online Service	EE, CPE, CS
Underwriters Laboratories, Inc. (I)	5,722+	Product Safety Certification, Quality System Regulation Services	EE, ME, MSE, TE

While the majority of these are international companies, our proximity to the North Carolina Research Triangle Park is a tremendous plus, since these companies have a national presence in that Park. Note that there are some companies listed in Table II that are not formal members of our National MEP Board. These companies support us in this narrow activity, but are not involved in other ways that warrant formal board membership.

Table II. Companies Supporting or Summer Transition Program Friday Visits

	2000	2001	2002	2003	2004	TOTAL
Alcatel	21	0	0	0	0	21
Bayer	0	27	0	0	0	27
Cisco Systems	22	27	0	0	57	106
Dupont	21	0	0	0	28	49
Eaton Corporation	22	0	27	0	0	49
General Electric	0	27	0	0	0	27
IBM	21	27	27	0	0	75
International Paper	0	27	0	41	29	97
Kenan Institute	0	27	27	0	28	82
Konica Minolta	21	0	0	0	0	21
NC Dept of Trans.	0	0	27	41	0	68
Nortel Networks	22	0	0	0	0	22
Procter & Gamble	21	27	27	0	24	99
Progress Energy	0	27	0	0	0	27
SAS Institute	22	27	26	41	28	144
Time Warner Cable	N/A	N/A	N/A	N/A	23	23
Underwriters Labs	22	27	0	0	29	78
TOTAL	215	270	161	123	246	1015
Number of Fridays Visited	5	3	3	3	5	

After providing summary information on our Minority Engineering Programs (MEP) and board goals, the remainder of this paper provides additional information on three of the companies who have been long-standing board members and supporters: Milliken & Company, Northrop Grumman Corporation, and SAS, Inc.

MEP Mission and Goals

The mission of our Minority Engineering Programs is to develop and maintain programs that assist in the recruitment, retention, mentoring, placement, and graduation of top quality, under-represented (African-American, Native-American, and Hispanic) students within our College of Engineering.

Programs goals, as approved by our National Minority Engineering Advisory Board, are to:

- Increase under-represented minority enrollment to 20 percent within the College of Engineering;
- Achieve persistence and graduation rates of under-represented minority students comparable to the general engineering student body;
- Become #1 among major colleges in awarding African-American undergraduate engineering degrees;
- Achieve engineering student population diversity that reflects both in-state and out-of-state student ratios; and
- Double the enrollment and graduation rate of Native American engineering students.

The purpose of our National Minority Engineering Programs Advisory Board is to:

- Be a support body that provides advice on engineering and corporate programs, employment needs & trends;
- Participate as is reasonable in MEP programs and activities,;
- Support program needs related to minority engineering student success; and
- Help facilitate professional development and hiring of a diverse pool of our engineering students.

Industry Interaction with our MEP office and students include:

- Hosting student orientation visits;
- Giving annual presentations and conducting mock interviews in our minority student focused course: E145 –Academic and Professional Preparation of Engineers II;
- Participating in periodic information and career development sessions with student chapters of AISES, NSBE and SHPE;
- Hosting engineering student events at national conferences;
- Sponsoring individual students for internships, co-operative education, undergraduate research; and
- Co-authoring papers that document unique and interesting industry/university collaborations.

Motivation for Selecting the Following Companies as Focus of This Paper

These three companies were selected because of the diversity of their business, national and international presence, close proximity to NC State University, and their strong, sustained support of our MEP. Also these were three of the companies that remained active even after our national board deteriorated to one mostly of State of North Carolina members. Finally, these three representatives suggested we work together on this paper.

Milliken & Company

Located in Spartanburg, SC, Milliken is one of the largest privately held textile and chemical manufacturers in the world. Milliken is widely acknowledged as an international leader in research, innovation, technology, and customer service. The company strategy is focused on combining textile and chemical technologies in unique ways to serve a vast array of markets. Milliken is widely recognized for its commitment to innovation and technology. Milliken has been the recipient of the Malcolm Baldrige National Quality Award, the European Quality Award, the Responsible Care Leadership Award, and numerous others. Milliken's dedication to research and its increasing investment in new product development, modern manufacturing, and new markets ensure a strong, successful future.

Milliken's fabrics keep soldiers and youngsters warm, astronauts safe, and major league baseball players comfortable. Their carpets and table linens are found in many of the world's finest hotels and restaurants around the world. Their fabrics are found in cars, sailboats, tennis balls, and printer ribbons. Chemicals developed by Milliken give crayons and markers their color and automobile dashboards their durability. Also, Milliken chemicals are used in transparent aspirin bottles and food storage containers. Milliken's strong financial position allows investments in hiring, and retaining the best people through continuing education, career opportunities, and secure long term employment.

Milliken is committed to a work environment with a diverse workforce. Forty percent of its associates are minorities and 38% are women. Milliken & Company has for many years focused its recruiting efforts at targeted colleges and universities. They work closely with career placement offices on these campuses and participate in career fairs, on-campus interviews, and other relevant college relations activities.

Milliken has found that being a member of our MEP board has been a tremendous benefit in helping meet their recruiting goals on an annual basis. Our Minority Engineering Program has helped Milliken get closer to the students in order to identify new leaders that will fit Milliken's culture and passion for excellence. Company representatives spend time in the classroom, support student group activities, and work with faculty to provide students with real world experience on challenging engineering and business-related projects that will result in full time employment after graduation.

During our 2006 Summer Transition Program, our MEP office worked with Milliken and sent a group of approximately 60 students, counselors and staff to the Milliken headquarters in Spartanburg, SC. This marked the first time in STP's history that our students have traveled this

far for a Friday orientation visit. Normally, we use Friday afternoons for these visits, and split our attendees into two separate groups. Until the Milliken visit, all companies identified in Table II were easily accessible for Friday afternoon visits. We choose Milliken as our first day-long visit because of company interest (the chartered the bus for our round-trip visit), their success at attracting our undergraduate and graduate students for internships, co-ops and new hires, their commitment to diversity, and the fact that NC State University College of Engineering is one of their key executive recruiting locations.

Milliken recruits the following Engineering disciplines: Chemical Engineering, Mechanical Engineering, Electrical Engineering, Industrial Engineering, and Textile Engineering. Milliken hires approximately 100 new engineers, 125 summer interns, and 25 co-op students into the company every year. Milliken hires the very best into its Summer Challenge program and recruits our interns and co-ops into full-time positions.

Northrop Grumman Corporation

Northrop Grumman Corporation is a \$30 billion global defense and technology company whose 120,000 employees provide innovative systems, products, and solutions in information and services, electronics, aerospace and shipbuilding to government and commercial customers worldwide and is divided into four business areas and eight sectors.

Four Main Business Areas are: Information and Services, Electronics, Aerospace and Ships.

Their Information Technology sector delivers full life-cycle solutions that meet mission, enterprise and infrastructure needs in information systems and services; strategic security; engineering and science; training and simulation; base and range operations; and enterprise IT solutions and products. Their Mission Systems sector is a leading global integrator of complex, mission-enabling systems and services. The sector's technology leadership spans command, control and intelligence systems; missile systems and technical and management services. Their Technical Services sector provides life-cycle solutions and a foundation for long-term technical services. Key areas of focus include support services for Northrop Grumman Original Equipment Manufacturer products, non-platform service opportunities, and third-party product support opportunities.

Their Electronic Systems sector is a world leading provider of airborne radar, navigation systems, electronic countermeasures, precision weapons, airspace management systems, space systems, marine and naval systems, communications systems, and government systems.

Their Aerospace sector at Newport News, Virginia, is the nation's sole designer, builder and refueler of nuclear-powered aircraft carriers and one of only two companies capable of designing and building nuclear-powered submarines. The sector also provides services for a wide array of naval and commercial vessels.

Northrop Grumman's Ship Systems sector is one of the nation's leading full service systems companies for the design, engineering, construction, and life cycle support of major surface ships for the U.S. Navy, U.S. Coast Guard and international navies, and for commercial vessels of all types.

Northrop Grumman Corporate Policy and View on Diversity

Over the past few years, Northrop Grumman has experienced dramatic changes. Just as their product portfolio has grown and diversified, so have the people who work for NG. NG's more than 120,000 employees worldwide make up a talented and diverse team. Their goal is to continue to support and nurture a professionally diverse workforce that mirrors the communities in which we reside.

Each employee plays a role in supporting workforce diversity by attracting, developing, and retaining a wide spectrum of individuals who are passionate about the work they do and are eager to share their perspectives and talents. By embracing the advantages of diversity, Northrop Grumman will be even better equipped to meet the business challenges of the future.

Northrop Grumman participates across the country building inter-city houses in support of programs like Habitat for Humanity. In addition, Northrop Grumman is a National Sponsor of events such as; NSBE, SHPE, AISES, and SWE conferences with several winners in the past two years on National Society of Black Engineers of the Year Awards. Since student chapter presidents of NSBE, AISES and SHPE, are members of our National MEP Board, NG has easy and continuing access to further its interaction with these organizations.

Diversity Through Recruitment

Northrop Grumman is proud of its continued efforts to increase number of diversity candidates and employees in our organization through strong support of Minority Engineering Programs such as the one at our university. At the Baltimore site alone, they have hired over 500 new graduate engineers for our nationally recognized "Best Manufacturing Practices" Engineering & Manufacturing New Graduate Professional Development Rotation Program. Within that program, NG is extremely proud that the company female population over the period of time is 30 % and the total of minorities and females approaches 50%. In addition NG has a growing New Graduate Leadership Training Program run out of our Baltimore facility that has also been recognized as "Best Manufacturing Practices" where 52% of the almost 250 participants in the last three years are women and minorities.

Northrop Grumman is the second largest employer for Engineers graduating from the NC State University College of Engineering over the past four years, having hired in excess of 75 new graduate engineers for the Baltimore location alone. NG has a very strong relationship with the engineering co-op program and our Newport News Shipbuilding Sector and have increased company concentration at N.C. State through participation by other sites and sectors within the corporation.

One recent minority engineering hire from our College, Shantel Samuel, BS Computer Engineering 2003, received the NSBE Black Engineer of The Year Award for most promising Engineer and Scientists for 2006. Shantel has supported our Minority Engineering recruitment by attending several Minority Career Fairs and presenting at NSBE, SHPE, and AISES student group meetings in the past three years in addition to conducting on-campus interviews making outstanding recommendations for potential hires.

SAS, Inc.

The mission of SAS is to empower organizations around the world with superior software, solutions and services that give them THE POWER TO KNOW[®]. SAS wants to be the most valued competitive weapon in business decision making.

Incorporated in 1976, SAS is the world's largest privately held software company with 10,000 employees in more than 400 offices spanning the globe.

SAS is the leader in business intelligence software and services. Customers at 40,000 sites use SAS software to improve performance through insight into vast amounts of data, resulting in faster, more accurate business decisions; more profitable relationships with customers and suppliers; compliance with governmental regulations; research breakthroughs; and better products. Only SAS offers leading data integration, intelligence storage, advanced analytics and traditional business intelligence applications within a comprehensive enterprise intelligence platform.

SAS Work/Life

With enviable low employee turnover that has been consistently and significantly below the industry average, SAS reaps the rewards of employee loyalty and the benefit of the most talented minds in the software business. Programs and facilities at its Cary, N.C., world headquarters include two on-site childcare centers, elder care information and referral program, an employee health care center, wellness programs, a 58,000 square foot recreation and fitness center, and many other work-life programs.

The company's work-life programs and unique corporate culture continue to receive accolades. For eight consecutive years, the company has been listed in the top 20 of *FORTUNE's* "100 Best Companies to Work for in America" and was inducted into the list's "Hall of Fame" in 2005. In addition, SAS has been listed by *Working Mother* as one of the 100 Best Companies for Working Mothers 13 times. SAS' corporate culture has been featured in a segment titled "The Royal Treatment" on CBS' *60 Minutes* and more recently was featured as the Best Place to Work on the *Oprah* show.

Advantages to Being an Active Member of our National Minority Engineering Programs Advisory Board

A key advantage is the excellent opportunity to network with competitors and share ideas and recruitment successes. Close and continuing contact with the Offices of the Dean of Engineering and Minority Engineering Program are also strong incentives. The existence of NSBE, AISES, and SHPE presidents on the board has been extremely critical to corporate access to these student populations. Also, board members are given priority access to our freshmen minority engineering students in two courses administered by the MEP office. This access allows board members to build early relationships with these scholars via course presentations on resume writing, personal and professional development, interviewing skills development and the conduct

of mock interviews. Other advantages include a) Link between Dean's office and engineering academic departments; b) A great feeling of making a difference in the development of future engineers and meeting company diversity goals; c) Personal growth and development through better understandings of diversity issues; and d) Teaming with staff, students, and corporations on local events/sponsorships

Challenges in Minority Engineering Student Recruitment

Challenges include the following:

- Increased Minority Hiring goals from the federal government
- Continued reduction in students pursuing engineering degrees
- Not enough diversity candidates attending engineering programs or institutions
- Not enough infrastructure to support growth and development of diversity engineers so they can be successful studying engineering (more money to football coach's salary than to minority engineering programs learning)
- Gaining access to students with so many things on their plate already
- Need to grow the diversity student organizations faster
- Need to coordinate and embrace diversity groups across campus instead of the stove pipes that currently exist

Challenges to Sustaining an Effective National Minority Engineering Programs Advisory Board

The current director has served in this capacity continuously since 1995. As indicated earlier, he was the primary catalyst to reviving and continuing to sustain the significant relationship enjoyed by our board members. He also has detail knowledge of impediments to continued success of this, or similar boards. The most significant challenge has to do with continuity, both at the university and with individual corporate representatives.

Since arriving in 1995, the current director has hired, trained, or worked with three assistant MEP directors. The number of programs and activities managed by our office, demands placed on office support staff for recruiting, mentoring, summer bridge programs, teaching, and advising, coupled with one's desire for additional education or a more balanced life, have combined to retard the rate at which progress is made. Interim periods of not having an assistant for up to one year while national searches occurred for replacements, have necessitated a reduction of the time the director has been able to oversee MEP programs and activities. Cycles have passed when no board meeting occurred, due to lack of assistance to plan, organize and execute activities essential to convening the board.

From the corporate side, at times due primarily to scheduling and workload, the most influential corporate board champion is not able to attend meetings. This individual is usually at a company level sufficient to make budget and personnel decisions, and has influence over others in the company whose services and assistance may be needed to support our efforts. In these instances, the company recruiter attending our meeting is able to accurately relay board decisions to the major representative, but quite often, continuity and time are lost. Corporate personnel

promotions, turn over, redistribution of responsibilities, and down turn in the national economy also impact the degree to which a viable national advisory board is sustained.

Concluding Comments

According to the Black Issues in Higher Education, through 2005, our university consistently ranked in the top five nationally in undergraduate engineering degrees awarded to African-Americans¹. This accomplishment is even more significant when one considers that the engineering program on our campus comprises approximately 25% of the total student population, and African-Americans comprise approximately 9% of our total undergraduate engineering student enrollment. Further, across the United States, there are nine Historically Black Engineering Colleges, all of which are over 90% African-American. Only a few of these nine produces more African-American undergraduate engineers than our university¹.

At the graduate level, recent significant research contributions have been made by our College of Engineering African-American Ph.D. students in computer science², electrical engineering³, and computer engineering⁴. The all-time national record at that time in 2000, of six Ph.D. degrees awarded in one year to African-American females by our engineering college, resulted from a long-standing commitment to hiring, mentoring, promoting and celebrating a faculty that at the time included eight African-American professors. These faculty mentors and scholars provide additional credibility to campus-wide commitments through national recognition of their own accomplishments.

Two of these African-American faculty members are recipients of the 1998⁵ and 2003⁶ Presidential Award for Excellence in Science, Engineering and Mathematics Mentoring. Another is the first and only winner of the US Air Force Research and Development Award for research work done in support of the NASA International Space Station⁷⁻⁸.

Accomplishes such as those described here are made possible in part due to the dedicated, sustained support, assistance and advice that flows from our National Minority Engineering Programs Advisory Board. Persistent, aggressive efforts at all levels will insure we continue to be a national leader in the quest to help increase the quality and diversity of the nation's engineering workforce. For sure, our success will continue to be coupled quite closely with our ability to maintain our extremely valuable and effective National Minority Engineering Programs Advisory Board.

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