1. RESULTS OF PRIOR NSF SUPPORT

1.1. FACES Program

Facilitating Academic Careers in Engineering and Science (FACES), one of the original cohort of National Science Foundation Alliances for Graduate Education and the Professoriate (AGEP) programs, is a collaborative effort between the Georgia Institute of Technology, Morehouse College, and Spelman College. Initiated in 1998, FACES (see: http://www.omed.gatech.edu/programs/faces/) is comprised of several components, each designed to assist underrepresented engineering and science students with navigating the path to an academic career.

In the first component of FACES, undergraduate students who have completed their sophomore year are provided summer and academic year research experiences as a means of promoting their interest in research and graduate school. The academic year program provides students with valuable research experience, while also developing oral and written communication skills through annual symposia in which the students present the results of their research to faculty and students. In 2004, the Summer Undergraduate Research in Science/Engineering (SURE) Program entered its 13th year. The program has been very successful. Approximately 90% of SURE's 245 total previous participants have gone to graduate school, and nearly half of those have come to Georgia Tech. FACES graduate students are partially supported on doctoral fellowships throughout graduate school. This support is provided by a stipend that increases in value as the student meets milestones along the way toward the Ph.D. degree. Over the five-year duration of the program, 43 graduate students have been supported. Furthermore, over that same approximate span, a total of 103 underrepresented students have received Ph.D. degrees in science or engineering at Georgia Tech – the most in such fields in the nation. In the final component of the program, senior doctoral candidates annually compete for $20,000 Career Initiation Grants (CIGs), which they may use as start-up funds to assist them in their initial academic appointments. Since 1998, ten such grants have been awarded. Efforts to institutionalize FACES activities have led to the creation of an endowed professorship, the Motorola Foundation Professorship, which is currently held by Professor Gary May, FACES Program Director. Funds from this endowment provide ongoing support for research and the promotion of minority graduate education.

1.2. SURE Program

SURE is a 10-week, NSF-sponsored Research Experiences for Undergraduates (REU) site developed and coordinated by Dr. Gary May that is designed to attract minority students to pursue graduate degrees in engineering and science disciplines (see: http://users.ece.gatech.edu/~gsm/sure.html). Rising junior and senior level undergraduate students are selected on a nationwide basis and paired with faculty advisors to undertake research projects in the Colleges of Engineering, Sciences, Computing, and the NSF-sponsored Engineering Research Center in Low-Cost Electronic Packaging. SURE, which has existed at Georgia Tech since the summer of 1992, is currently funded by NSF Award Numbers EEC-0139116 ($242,700) and EEC-9402723 ($150,000). Since its inception, a total of 245 students have participated. A series of biennial surveys of past program participants have revealed that nearly 90% of these students have obtained a graduate degree, are currently enrolled in graduate school, or plan to enroll in the next two years. In comparison to a control group of members of the National Society of Black Engineers (NSBE), it was found that SURE participants were more likely to continue their studies in engineering [1-4].

2. INTRODUCTION

For decades, this nation has enjoyed a leadership role in the development of cutting edge research and technology. The investment that the U.S. has made in science and engineering research in industry, universities, and government laboratories has benefited the nation many times over in exports sold, jobs created, and increased productivity. However, to maintain a competitive edge in an environment of increased international competition the U.S. must bring more of its resources to bear to develop a society that is better educated and can provide the technological breakthroughs needed for the next century. A diverse population of engineers and scientists who hold advanced degrees are necessary in this highly productive work force. This issue of diversity is critical since many demographic studies indicate that the ethnicity of the U.S. workforce is changing dramatically.

According to Census Bureau projections [5], non-Hispanic white males will decline as a fraction of the working age (18 to 64) population from 37% in 1995 to 26% in 2050. Over that same span, the fraction of African-Americans in the workforce will increase from 12% to 14%, that of Hispanics will increase from 10% to 24%, and that of Asians will increase from 4% to 9% (Figure 1). The end result is that currently underrepresented groups will increase from about a quarter of the workforce to nearly half (48%). The current and projected need for more science, technology, engineering, and mathematics (STEM) workers, coupled with the fact that women, minorities,
and persons with disabilities comprise an increasing proportion of the labor pool, argue for policies, programs, and resources that support greater participation by these groups in STEM education and careers.

![Figure 1 - Population Projection for Ethnic and Gender Groups, Ages 18-64, 1995-2050](chart.png)

It is clear that despite some gains in the representation of minorities in engineering and science, much more must be done. In 1999, 16% of students who earned B.S. degrees in science and engineering came from underrepresented populations [6]. Although this represents a modest increase over the previous decade, underrepresented minority (URM) representation drops significantly for advanced engineering degrees, as only 11.5% of Master’s and 8.7% of the Ph.D. degrees awarded in that same year were earned by these students. This has led to a low number of tenure-track minority science and engineering faculty (6.8%). A 1994 study by Smith and Tang revealed that African Americans were the segment of the U.S. population which was least likely to seek graduate degrees in engineering or the physical sciences, took the longest to receive doctorates, were the least likely to attain the rank of full professor among tenured science and engineering faculty, and were the least employed doctoral recipients [7]. Thus, the need for a diverse population of researchers who hold the Ph.D. degree is compelling. Every segment of the population is needed to achieve this goal.

The FACES program is a significant ongoing commitment by the Georgia Institute of Technology, Emory University, Morehouse College, and Spelman College to increase the national production of doctorates awarded to minorities in engineering and the sciences. This program is a blending of the resources of these universities and NSF to focus specifically on increasing the production of African Americans who earn engineering and science doctoral degrees. The consortium of educational institutions has chosen to focus on African Americans because it currently impacts so many of this population of underrepresented students. This proposal has been initiated by African American faculty who are committed to this goal and recognize that success breeds success. Recruiting, mentoring and academic support programs initiated by Georgia Tech, Emory, Morehouse and Spelman have been quite successful in increasing retention, grades, and overall production of African American degree candidates. Our partnership has created a pipeline of successful African American undergraduates and this proposal describes a doctoral-focused program that builds on the successful undergraduate efforts. As one of the leading producers of minority engineers and scientists, this alliance is ideally positioned to increase the national production of African American students who earn doctorates and promote their representation in academic careers.

The FACES program is comprised of several components, and the aggregate program addresses each critical step along the path to an academic career. Undergraduate students who have completed their sophomore year are provided summer and academic year research experiences as a means of promoting their interest in research and graduate school attendance. These students are then encouraged to enroll in graduate programs using a series of recruitment efforts at national events such as the NSBE Annual Convention or Annual Biomedical Research Conference for Minority Students (ABRCMS), campus visits and tours, and a lecture/workshop series on the merit of graduate school and careers in academia. Admitted graduate students are supported on doctoral fellowship supplements throughout their matriculation. Graduate student support is provided by means of a stipend which increases in value as the student meets the critical milestones along the way toward the Ph.D. degree. Another portion of these funds is used to support travel to technical meetings for research presentations. Finally, senior
doctoral students compete for Career Initiation Grants, which they may use as start-up funds to assist in establishing their research programs in their initial academic appointments.

Institutionalization of the FACES program will be facilitated by the establishment of endowed faculty positions at the participating institutions. These chairs, which will be filled on a rotating basis with a five-year term, will serve as directors of the FACES management team and be responsible for supervision of FACES activities, planning new initiatives, program evaluation, and student tracking. Each chair will be assisted in program management activities by the staff of the Office of Minority Educational Development (OMED) at Georgia Tech.

3. THE ALLIANCE MEMBERS

The FACES strategy will continue to build on the partnership established between Morehouse College, Spelman College, and Georgia Tech. Since 1969, these institutions, along with Clark Atlanta University and other historically black universities have offered a dual degree program to undergraduates seeking engineering degrees. Upon completion of the program, students receive a bachelor’s degree from the first school and a bachelor’s degree in engineering from Georgia Tech. Currently, over 100 African American students are completing B.S. degrees at Georgia Tech through this program, and the majority of these students are from Morehouse and Spelman. In the FACES program, this pipeline will be strengthened significantly through targeted efforts to encourage doctoral study. One of the keys to increasing the number of URM students receiving graduate degrees is to have students seriously consider the possibility of graduate school as early in their undergraduate program as possible.

For this reason, we have extended the AGEP alliance to include Emory University, which has a number of successful initiatives that target first and second year students as well as programs that focus on transitioning students into graduate school and, ultimately, into the ranks of the professoriate. This proposal will build on Georgia Tech’s existing partnership with Emory that created a joint Department of Biomedical Engineering in the Fall of 1997. The collaborative relationship blends the expertise of medical researchers at the Emory University School of Medicine with that of the engineering faculty at Georgia Tech, and is the first of its kind between a public and private institution. The collaboration has resulted in a biomedical engineering program ranked third in the nation by U.S. News & World Report. The two universities also maintain a commercial research and development center called EmTech Bio that is primarily responsible for facilitating the transfer of biotech discoveries into marketable products and promoting the development of local biotech companies. In addition, Georgia Tech and Emory established the Georgia Tech/Emory Center for the Engineering of Living Tissues in 1998 through a grant from NSF.

Notably, this is not the first time that all of the institutions in this proposal have partnered with the goal to increase the number of talented URM students in the sciences. In 1999, all of the proposed alliance partners combined forces to inaugurate the Center for Behavioral Neuroscience (CBN). The CBN is a NSF Science and Technology Center comprised of eight institutions: Emory University, Georgia Institute of Technology, Georgia State University, Spelman College, Morehouse College, Morehouse School of Medicine, Clark-Atlanta University, and Morris Brown College. The CBN is committed to recruiting at least 30% underrepresented minorities at the graduate, postdoctoral, and faculty levels. To accomplish this we designed several innovative programs to prepare and encourage minority undergraduate students to continue their education in Ph.D. programs.

By joining forces, the alliance partners are able to present a large pool of undergraduate minority students with opportunities to interact with graduate students, conduct research, and choose from a variety of graduate degree options. This exposure to research and role models is essential in recruitment and retention. The strength of the FACES program lies in this partnership and the unique strengths of each of the institutions. The role that each of these institutions has played in supplying this nation with highly trained sciences and engineers is described below.

3.1. Georgia Institute of Technology

The Georgia Institute of Technology has an enrollment of over 16,000 and is a national leader in producing minority scientists and engineers. In its most recent ranking of undergraduate programs, U.S. News and World Report ranked the overall engineering program number five, and nine of its ten disciplinary programs in engineering in the top ten in the nation (with Industrial and Systems Engineering achieving the number one ranking for the 13th consecutive year). The evidence for the influence of Georgia Tech on the supply of underrepresented engineering students is unmistakable. According to the Engineering Workforce Commission, in 2003 Georgia Tech ranked:

- 2nd in the nation in number of engineering Ph.D. degrees awarded to African Americans
- 2nd in the nation in number of engineering M.S. degrees awarded to African Americans
- 2nd in the nation in number of engineering B.S. degrees awarded to African Americans
2nd in the nation in total number of engineering degrees awarded to African Americans
9th in the nation in number of engineering M.S. degrees awarded to Hispanic Americans
8th in the nation in number of graduate engineering degrees awarded to Hispanic Americans
2nd in the nation in number of engineering M.S. degrees awarded to underrepresented minorities
3rd in the nation in number of engineering Ph.D. degrees awarded to underrepresented minorities
1st in the nation in total number of engineering degrees awarded to underrepresented minorities
1st in the nation in total number of engineering degrees awarded to women

The College of Engineering enrollment is 6,158 undergraduates and 2,849 graduate students in nine schools, all of which offer doctoral degrees. Of these, 15% of the undergraduates and 13% of the graduate students are underrepresented minorities. There are more than 140 underrepresented minorities in Ph.D. programs in the College of Engineering. The College of Sciences student population is 860 undergraduate and 592 graduates in six schools. Of this, 9% of the undergraduates, and 12% of the graduate students are underrepresented minorities. The College of Computing student population is 1500 undergraduate and 418 graduates. Of this, 7% of the undergraduates, and 7% of the graduate students are underrepresented minorities. Tables A1-A3 in Appendix A provide detailed degree conferral data for the largest schools in these three Colleges since 1994. (In these tables, the following abbreviations are used: AE = Aerospace Engineering, CEE = Civil & Environmental Engineering, ChE = Chemical Engineering, CmpE = Computer Engineering, CS = Computer Science, EAS = Earth and Atmospheric Sciences, EE = Electrical Engineering, ISyE = Industrial & Systems Engineering, ME = Mechanical Engineering).

As a leading producer of URM engineers and scientists in the nation, Georgia Tech is positioned to continue its substantial contributions to increasing the national population of minority students who obtain doctorates in engineering and the sciences. Campus organizations, such as the Black Graduate Students Association (BGSA) and the Georgia Tech Chapter of the NSBE have served vital roles in the mentoring and retention of African American students. In fact, the efforts of the Georgia Tech chapter of NSBE have received national acclaim by being selected the NSBE Chapter of the Year a total of eight times (most recently in 2003).

Institutional commitment to retention and mentoring of graduate students is provided in part through OMED, which has developed one of the most successful minority transition programs in the nation. OMED sponsors GT Transitions, a program for incoming dual degree and graduate students who are traditionally underrepresented in engineering, science and math. The purpose of the program is to assist these students in making the difficult transition as smooth as possible through mentoring and academic support. Students who have participated in this transition program have performed above the Georgia Tech grade point average (see Section 4.2.2). FACES will continue to conduct similar mentoring and retention efforts for minority doctoral students.

3.2. Emory University

Emory has a long-standing commitment to increasing the number of minority students bound for research careers and the professoriate. Since the inauguration of the President’s Commission on the Status of Minorities in 1979, Emory has seen a significant increase in minority faculty and students. This rise was so dramatic that in 1999, the Journal of Blacks in Higher Education ranked Emory first among like institutions with respect to the number of full-time African-American faculty and student enrollment. Specifically, among the faculty, URMs account for 5% of full professors, 6% of associate professors, 10% of assistant professors, and 14% of lecturers. Underrepresented minority students account for approximately 12-15% of the College, 19% of the medical school students, and 13% of the graduate school student body. Tables B1 and B3 in Appendix B show STEM graduate degree production in Emory’s Graduate Division of Biological and Biomedical Sciences (GDBBS) since 1994.

To build upon this success, Emory has employed a “grow your own” approach in parallel with its recruitment efforts to cultivate a talented candidate pool of underrepresented minorities students who have a strong interest in science careers by implementing comprehensive initiatives that: (a) infect students at the earliest points in their education with an enthusiasm for science; (b) offer students interactive exposure to the first-rate research; and (c) strengthen science curricula and opportunities at all segments of the STEM pipeline. In order to ensure that its extant K-PhD programs are strategically brought to bear on the goals of AGEP, Emory will broaden its opportunities to more effectively represent as well as integrate all STEM fields into its extant programs.

3.2.1. Undergraduate Initiatives

Undergraduate initiatives have been exceptionally successful. Emory has introduced over 500 first and second year undergraduates to the CBN’s research thrusts through in-class instruction, seminars, internships,
research symposia, and collaborative meetings. Since the inauguration of the programs in 2000, Emory has migrated 10 underrepresented minority students into graduate programs in the neurosciences. Additionally, more than $4M in extramural funding has been acquired in order to expand the number of research opportunities and to extend the scope of the CBN educational programs to include a transitional post-baccalaureate initiative (2002) that has placed 80% of its first cohort in graduate school. These undergraduate initiatives, particularly the BRAIN (Behavioral Research Advancements in Neuroscience) program, have already attracted over 500 students and successfully cultivated a cohort of students interested in research careers.

These early exposure initiatives have received exceptional reviews from all of its participants with 66% stating that the program stimulated their interest in neuroscience and 76% stating that the program sparked their interests in doctoral studies. Intriguingly, 90% of participants touted the program as an effective springboard into the research enterprise of the CBN. Sixty percent stated that the program “broadened their career prospects and increased their interests in behavioral neuroscience.” Overall, the students thought that the program was most beneficial in that it provided them with “an appreciation for: (a) the integration of technology with neuroscience, (b) exciting careers other than medicine, and (c) cutting-edge research technology.” This year of the 100 Emory College students who completed the honors program, 25 were in the sciences. Of these, 16 were BRAIN participants. In the last three years, over 250 students participated in Research for Credit in the sciences during the academic year. Of these, 15% were underrepresented minorities, up from 4-5% in the early 1990s.

3.2.2. Post-Baccalaureate Initiatives

Prior to 2002, the pool of Emory URM matriculants was very small, and the attrition rate of URMs in the biomedical and biological sciences was an alarming 32% (more than twice that of whites), prompting the assembly of a task force to address these growing concerns. At present, URMs account for 11.7% of students matriculating in the GDBBS. The goal is to increase this percentage to reflect at least the national demographics for URMs (12-15%). The GDBBS will continue its cultivation of existing relationships with HBCUs and minority-serving institutions; frequenting Graduate Career Day and minority research symposia; and targeted mailings to minority students. In 2002, the CBN education team in conjunction with the graduate divisions of Emory and Morehouse School of Medicine implemented a post-baccalaureate program, PROMISE (Post-baccalaureate Research Opportunities for Minorities in the bioSciencEs ), to keep URMs “wedded” to science. PROMISE serves as an incubator in which participants receive a first-class research experience in the biomedical sciences; expert mentoring from preceptors, graduate students, and post-docs; in-class instruction to enhance communication and quantitative skills; and “survival skills” for the successful pursuit of a doctorate. PROMISE has been very successful. To date, each PROMISE fellow has completed graduate coursework with a 3.5 GPA or better and five PROMISE students have been admitted to prestigious graduate schools (University of Michigan, Duke, UNC-Chapel Hill, and Johns Hopkins). As a part of AGEP, Emory will request funds to provide two additional PROMISE slots that will be used exclusively to transition students into graduate engineering school

Regarding URM retention, exit interviews of several students revealed that minority students felt isolated, unsupported, and/or overwhelmed by the graduate school experience. These reasons for withdrawal prompted the creation of the Office of Student Development (OSD) to support URMs throughout graduate school. Since the creation of OSD in 2002, the minority attrition rate has been 0%. The Office of Student Development has also taken an aggressive approach to provide meaningful co-curricular experiences to transition students into professorships-including teaching experience and workshops on preparing a CV, letter of application, and job seminars.

3.3. Morehouse College

Morehouse College is an independent, fully accredited, predominantly black, liberal arts college for men. Its President is Dr. Walter Massey, former director of the National Science Foundation. In 2002-03, enrollment was 2,970 students from 42 states, the District of Columbia, and several foreign countries. The mean SAT for freshmen was 1050, and approximately 42% ranked in the top 10% of their graduating class. Approximately 40% of Morehouse students are science or mathematics majors.

Reflecting its standing in the academic community, Morehouse is one of only four historically Black colleges, and the first of only five Georgia colleges, with a chapter of Phi Beta Kappa. The College is also the only minority college or university having produced three Rhodes Scholars. Morehouse continues to excel in the number of graduates who have become physicians, dentists, lawyers, college presidents, and recipients of MBA and Ph.D. degrees. A recent report in the Wall Street Journal ranked Morehouse 29th among the top 50 feeder undergraduate institutions for the most selective graduate schools in medicine, law and business.
The Division of Science and Mathematics was established in 1999 and consists of the departments of Biology, Chemistry, Computer Science, Mathematics, Physics and Psychology. There are 61 faculty members in the Division, 79% of whom hold the Ph.D. Both Biology and Computer Science Departments have over 300 students, making them the largest departments in the Division of Science and Mathematics. Among the objectives of the Division are to: (1) foster development of interdisciplinary curricula and research; (2) enhance learning among students; and (3) promote the professional development of faculty. Interdisciplinary programs leading to a minor exists in Public Health, Neuroscience, Environmental Science and Telecommunications, and there are plans to establish minor programs in Materials Science and Bioinformatics.

The Dual Degree Engineering (DDE) program was initiated at Morehouse in 1969 with the help of a grant from the Olin Corporation Charitable Trust and others. Its objective is to remedy the underrepresentation of African Americans in the engineering profession by providing the framework for the pursuit of a baccalaureate degree in an engineering discipline with the added benefits of a liberal arts education. Initially, the program was an agreement between Morehouse and Georgia Tech. It has expanded to include the four undergraduate institutions in the Atlanta University Center (Clark-Atlanta University, Morehouse College, Morris Brown College, and Spelman College) and other engineering institutions such as Auburn University, Boston University, Dartmouth College, North Carolina A&T State University, Rensselaer Polytechnic Institute, and Rochester Institute of Technology.

The DDE student completes the program with two degrees: one in Biology, Applied Physics, Chemistry, Computer Science, Mathematics, or General Science at Morehouse College, and another degree in an engineering discipline. The agreement is that: (1) The student will attend Morehouse College for three years and complete the remainder of his Morehouse requirements as well as his engineering requirements during his two-year matriculation at Georgia Tech; and (2) Both the degree earned at Morehouse College and the engineering degree earned at Georgia Tech are awarded simultaneously upon the satisfactory completion of the requirements at both institutions.

Approximately 95% of Morehouse DDE students matriculate at Georgia Tech. Since 1974, the College has graduated 342 DDE students. Table C1 in Appendix C shows the annual numbers of Morehouse DDE graduates, along with science and mathematics graduates for the past ten years. All graduates are underrepresented (almost exclusively African American). The administrative staff for the DDE Program consists of Physics faculty who are otherwise obligated to full-time teaching/administrative responsibilities. They are: Dr. Robert Dixon, Chair; and professors Valerie Bennett and Olusegun Adeyemi. Leadership in support for academic advisement is provided by science department chairs: Dr. David Cooke (Biology), Dr. John Foster (Computer Science), and Dr. John Hall (Chemistry), Dr. Masilamani Sambandham (Mathematics), and Dr. J. K. Haynes (Dean of the Division).

3.4. Spelman College

Spelman College has an impressive legacy as a historically Black college for women. It enjoys high visibility and is recognized as a highly selective, national, liberal arts college. Founded in 1881, Spelman has prepared over six generations of African American women to reach the highest levels of academic, community, and professional achievement. The current 2100 Spelman students include some of the most academically talented women in the nation. Students come from 41 states and 30 countries with 20% residing in Georgia. The College has a faculty of 155 full-time members. Spelman is ranked as a Baccalaureate I institution by the Carnegie Foundation, joining Morehouse College as the only two HBCUs with this distinction. Money Magazine’s annual survey of colleges ranks Spelman as one of the nation’s 10 best college buys and U.S. News & World Report places Spelman among the nation’s top 20 liberal arts institutions. Recently, Spelman was awarded a chapter of Phi Beta Kappa. Upon graduation 40% of Spelman women enter graduate or professional school. The College ranks 5th among HBCUs whose graduates are employed by Fortune 500 companies.

The liberal arts setting promotes critical thinking, appreciation of the arts, and a knowledge of the social sciences and humanities and a strong interest in science. One-third of Spelman students are enrolled in STEM programs, and 30% of graduates have these majors. The science and mathematics faculty of 47 contains approximately 60% African Americans and 60% women, providing a rich source of role models and distinguished researchers. Students pursue majors in biology, biochemistry, chemistry, computer science, mathematics, physics, natural science with a concentration in environmental sciences. Through the Atlanta University Center, Spelman has a DDE program in cooperation with ten engineering institutions. The oldest agreement has been with Georgia Tech (1969), and an overwhelming majority of Spelman alumnae with engineering degrees have graduated from Georgia Tech. A profile of Spelman graduates in STEM fields and the DDE program is provided in Table D1 in Appendix D. All graduates are underrepresented students (almost exclusively African American).

Spelman’s commitment to producing African American women for leadership positions in STEM is fostered by a variety of programs, centers, and special programs. Spelman was selected by NSF and NASA as one
of six Model Institutions for Excellence (MIE). MIE is a program designed to increase the number of STEM minority baccalaureates, facilitate entry of STEM students into the STEM graduate pipeline, and enhance STEM academic and research-training capabilities. The Office of Science, Engineering and Technical Careers, the Office of Freshman Success, and the Health Careers Office provide academic support, internship placement, assistance with scholarships and graduate school applications, and GRE and MCAT preparation. The Center for Molecular Biology and the Center for Scientific Application of Mathematics provide opportunities for faculty research and student research training. Programs such as Women in Science and Engineering Scholars and the Undergraduate Student Awards for Research Program offer scholarships and research opportunities for talented STEM students. Spelman is also a member of the Georgia Space Grant Consortium, with Georgia Tech as lead institution.

The emphasis on pursuing graduate and professional studies, academic preparation, research training, academic support, and mentoring has resulted in a high level of success in the sciences. Spelman now ranks among the top five institutions in America whose graduates attend medical school. It ranks second among the nation’s colleges and universities as the baccalaureate origin of African American doctorates earned 1991-1995 in the natural sciences, social sciences, and engineering. Spelman is a model for college and universities that are interested in increasing the number of minority and women students who achieve in science, engineering and mathematics.

4. PROGRAM DESCRIPTION

FACES will continue to enable the alliance partnership to enhance its ability to recruit and retain underrepresented Ph.D. students, and at the same time, enhance our ability to place our underrepresented Ph.D. graduates in faculty positions. The FACES program consists of three important and integrated elements: (1) recruitment and student preparation activities; (2) graduate retention and mentoring activities; and (3) future faculty development activities to encourage our graduates to pursue faculty positions.

4.1. Recruitment Activities

Table A4 in Appendix A shows Georgia Tech graduate enrollment by ethnicity for the last five years in the departments listed in Tables A1-A3. Table B2 shows the corresponding data for Emory University. Data in these tables reveals that although graduate enrollment is strong, there is room for improvement in the sense that an insufficient fraction of the minority graduate population completes the Ph.D. Graduate degree completion data is presented in Tables A6, A7, and B1. It should be noted that for Tables A6 and A7, graduation rate was considered a more suitable measure of retention since Georgia Tech does not track graduate cohorts of matriculating students. There are several criteria associated with the Masters (Table A6) and Ph.D. (Table A7) levels:

1) Each academic year cohort of graduate students contains only individuals matriculating at that level. The graduation rate is based on Georgia Tech degrees awarded through AY2004. (Georgia Tech records only the first matriculation date without delineating MS or PhD degree admittance dates. Hence, the tables include only first-time graduate students and exclude undergraduate students continuing toward advanced degrees).

2) Multiple MS degrees awarded to a student are counted only once.

3) URM ethnicity does not include multiracial.

4) Graduating major was used to identify candidates for the cohorts if different from the entering major.

FACES will strive to continue to improve upon these statistics by both increasing the size of the graduate enrollment pool and encouraging a larger fraction of this pool of students to complete a Ph.D.

4.1.1. Research Careers Office

To provide a mechanism for the early recruitment of students into research and academic careers, Morehouse College will establish a Research Careers Office (RCO). The purpose of the Research Careers Office (RCO) is to increase the number of minority students attending graduate school in the sciences and mathematics. The Office will provide counseling and sponsor activities for students across the Division of Science and Mathematics at the College, which includes students majoring in Biology, Chemistry, Computer Science, Mathematics, Physics, and Psychology, as well DDE students. The RCO will:

- Provide career and academic counseling to students contemplating research careers.
- Maintain a library of reference materials relating to research careers, as well as catalogs of graduate schools.
- Disseminate information on research opportunities and summer research programs for undergraduate students.
• Arrange visits to the campus by recruiters representing graduate schools.
• Counsel students on obtaining financial aid for graduate school.
• Provide registration materials, practice books and other resources for preparation for the GRE.
• Sponsor a Science Research Club to foster interaction and feedback between students in the sciences.
• Publish a newsletter to inform students of services available through the office, dates of visits by recruiters, and to publicize student participation in undergraduate research.
• Encourage students to participate in and present papers at national meetings, such as the National Conference on Undergraduate Research and ABRCMS.

The RCO will provide a direct conduit for the undergraduate research activities described above. If successful, this model will be replicated at other partner institutions in the alliance.

4.1.2. Undergraduate Research

Achieving a greater number of underrepresented minority faculty in science and engineering requires an increase in the number of those who chose graduate education. One of the factors limiting the number of minority students going to graduate school is a lack of familiarity with the research process. It is well-established that a key factor for motivating students to pursue advanced degrees and research careers in science and engineering is a fruitful research experience as an undergraduate [9-10]. Such experiences can enhance a student’s competitiveness for graduate school admission and national fellowships. The FACES program will involve talented undergraduates in research experiences. One component of the program will consist of research experiences during the junior year, while the other component of the program will bring in rising senior students from various institutions nationwide to participate in summer research experiences at Georgia Tech or Emory. The student participants in either program will be designates as FACES Scholars. Former and future FACES Scholars will be recruited for the doctoral fellowship component of the FACES program (see Section 4.3.1).

4.1.2.1. Academic Year Component

For the academic year undergraduate research component, FACES Scholars will be drawn from each of the alliance partner institutions. Each student will work approximately ten hours per week conducting research under the supervision of a faculty member. As part of the research experience, each participant will be required to write an annual project report and participate in an annual symposium in the spring. In the symposium, students present the results of their research, highlighting their contributions to the research. Approximately 15 students will be supported under this component of the FACES program, and these students will each receive approximately $1,500/semester. In addition to the research, the undergraduate Scholars will participate in a series of professional development workshops. These workshops will cover topics such as: applying to graduate school, taking the GRE, effective technical communication, and being an effective researcher.

4.1.2.2. Summer Component

The summer component is currently Georgia Tech’s successful SURE program, directed by Professor May. SURE is a 10-week program designed to attract minority students into STEM. Approximately 30 rising juniors and seniors are recruited and paired with faculty advisors and graduate mentors to undertake research projects in the Georgia Tech Colleges of Engineering, Computing, and Sciences. Key elements of SURE include:
• Challenging research in various engineering and science areas.
• Pairing each student with both a faculty advisor and a graduate student mentor.
• A weekly seminar on emerging research in engineering and science.
• A monthly stipend competitive with what the students might receive from an industrial internship.
• Lodging and a travel allowance for participants.
• Opportunities to visit local industrial research sites.
• Oral and written research summaries prepared by the student participants.

Through the FACES program, the SURE model has been expanded by 20 slots at an approximate cost of $9,000/student to include students from other engineering and science disciplines. It is expected that alliance partner institutions will be a primary source of these students.

We also propose to increase the FACES programmatic activities to include BRAIN, a ten-week summer immersion in the biomedical sciences, which is directed by Dr. Danielle Gray. BRAIN is similar in scope to SURE,
differing only in the fact that it targets first and second year students. The majority of BRAIN alumni are Morehouse and Spelman students. We will support an additional ten BRAIN students at a cost of $7,500.

4.2.2. Campus Visits and Recruiting Trips

4.2.2.1. Laboratory Open Houses

The research enterprise provides an environment of excellence and distinction. Exposing undergraduate students to its world-class facilities is an effective way to excite them about graduate research. One key factor in generating such excitement is seeing minority faculty role models performing the research. Interaction with minority faculty and graduate students (such as FACES fellows) can provide affirmation that academia is a viable career path. This program maximizes exposure to research opportunities at Georgia Tech and Emory through open houses each year. These will include lab demonstrations and poster displays of on-going research.

4.2.2.2. Faculty Presence at the NSBE Convention

Georgia Tech has had a long-standing presence at the NSBE annual convention. This event is one of the largest confluences of scientists and engineers in the world, of whom about 7,500 are African Americans. Thus, the convention provides a focal recruitment and mentoring opportunity. Traditionally, Georgia Tech’s College of Engineering, in conjunction with the BGSA, sponsors ~10 graduate students on a recruitment trip to the convention. The Georgia Tech contingent sets up a booth at the Career Fair as well as the Graduate School Fair, and makes itself available to prospective applicants. The effectiveness of this approach has been further enhanced by: (1) the involvement of FACES faculty; and (2) the sponsorship of a dedicated Georgia Tech reception during the convention. The FACES program will continue these proven recruitment tools by providing travel and lodging for a FACES faculty member to attend the convention and continuing to sponsor the networking reception which provides a focused opportunity for students to interact, on an informal basis, with graduate students and faculty. The faculty member will play a significant role, including potentially conducting a workshop on the benefits and processes of pursuing a doctorate and an academic career. The effectiveness of these programs is reflected in the perennial ranking of Georgia Tech by NSBE students as the top program of choice for graduate studies.

4.2.2.3. Presence at ABRCMS

FACES will also recruit at ABRCMS, a national conference designed to encourage students to pursue advanced training in the biomedical sciences and provide mentors and advisors with resources for facilitating student's success. It is the largest biomedical sciences undergraduate student conference. Approximately 2,600 individuals, including 1,400 undergraduate students, 400 graduate students and 600 faculty attend the meeting each year. More than 150 graduate programs at U.S. colleges and universities as well as scientists from government agencies, foundations, professional scientific societies join in the ABRCMS exhibits program.

4.2.2.4. Collaboration with Focus

A unique and successful existing effort at Georgia Tech is the Focus program, which was established in 1992. Focus is a program which brings outstanding minority juniors and seniors from around the nation to Georgia Tech to celebrate Martin Luther King Jr. Week and to be encouraged and informed about the opportunities for graduate study. Focus scholars are supported for three nights lodging, meals, a cultural event, and a travel subsidy. They visit all six colleges, and enjoy participation in several King Week events. Students meet with professors, other students, tour labs, visit dormitories, and participate in graduate school workshops. Attendance has reached 200 students per year and provides Georgia Tech with a rich pool of highly qualified graduate school applicants.

FACES funding will enhance recruitment of students who attend Focus. FACES will collaborate with Focus in identifying qualified students who have been admitted to the Georgia Tech’s graduate engineering and science programs, and invite them to either attend Focus or visit the campus at another time. During visits, prospective candidates will talk one-on-one with graduate students and faculty members in their research area. In addition, the students will meet with faculty members who will discuss opportunities for becoming a FACES Fellow (see Section 4.3.1). FACES will cover the cost of travel and lodging expenses for the students unable to attend Focus. It is anticipated that twenty additional students per year will be brought to campus in this manner.

In 2002, the Focus Fellows component was added. In this component, minority doctoral students and postdoctoral researchers are invited to participate in an exploratory visit with a department of choice and professional development seminars on the requirements and advantages of a professorial career at a research university. Fellows meet with key administrators and faculty to discuss opportunities available at Georgia Tech. Ten
to twenty Fellows attend Focus each year, which has enriched the applicant pool of many faculty searches across campus. The FACES program will annually fund the travel and lodging of three Fellows. An increase in Georgia Tech’s minority faculty population will enhance the recruitment of African American graduate students.

4.2.3. Seminar Series

Spurring interest among students to pursue doctoral degrees and academic careers requires as much exposure to the process as possible. Under FACES, faculty will provide insights, strategies and other measures of inspiration and guidance for graduate school, the doctorate and academia. One seminar (each term) is to be conducted by a faculty member from each of the partner institutions (Georgia Tech, Emory, Spelman and Morehouse), while a guest speaker from outside the partnership will conduct the other. During the course of the grant, at least one seminar per year will take place on the campus of each partner institution.

4.3. Retention/Mentoring Activities

A diverse array of mentoring activities will be implemented as a part of the FACES program, including participation in the OMED GT Transitions program, graduate fellowships, support for research presentations, and workshops on navigating the path to the doctoral degree. These programs will be strengthened significantly by the presence and active participation of the African American Faculty at Georgia Tech. Georgia Tech possesses one of the largest and most capable groups of African American faculty in engineering and science in the nation. A list of these individuals is provided in Table 1. A similar list is provided for Emory in Table 2. This group of very accomplished educators and researchers includes NSF Presidential/National Young Investigators, CAREER award winners, a PECASE winner (Prof. DesRoches), and winners of several other prestigious national and international awards. Each member of the Georgia Tech and Emory African American faculty in the Colleges of Computing, Engineering, and Sciences is committed to ensuring the success of the FACES program by mentoring its participants through the successful completion of the Ph.D.

Table 1: Georgia Tech African American Engineering and Science Faculty

<table>
<thead>
<tr>
<th>Name</th>
<th>Academic Rank</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjo Amekudzi</td>
<td>Assistant Prof.</td>
<td>Civil and Environmental Engineering</td>
</tr>
<tr>
<td>Earl Barnes</td>
<td>Professor</td>
<td>Industrial &amp; Systems Engineering</td>
</tr>
<tr>
<td>Reginald DesRoches</td>
<td>Associate Prof.</td>
<td>Civil and Environmental Engineering</td>
</tr>
<tr>
<td>Paul Edmonds</td>
<td>Associate Prof.</td>
<td>Biology</td>
</tr>
<tr>
<td>Augustine Esogbue</td>
<td>Professor</td>
<td>Industrial &amp; Systems Engineering</td>
</tr>
<tr>
<td>Wilfrid Gangbo</td>
<td>Professor</td>
<td>Mathematics</td>
</tr>
<tr>
<td>Samuel Graham</td>
<td>Assistant Prof.</td>
<td>Mechanical Engineering</td>
</tr>
<tr>
<td>Zenzi Griffin</td>
<td>Assistant Prof.</td>
<td>Psychology</td>
</tr>
<tr>
<td>Charles Isbell</td>
<td>Assistant Prof.</td>
<td>Computer Science</td>
</tr>
<tr>
<td>Gary May</td>
<td>Professor</td>
<td>Electrical &amp; Computer Engineering</td>
</tr>
<tr>
<td>Stephen Ruffin</td>
<td>Associate Prof.</td>
<td>Aerospace Engineering</td>
</tr>
<tr>
<td>Marion Sewer</td>
<td>Assistant Prof.</td>
<td>Biology</td>
</tr>
<tr>
<td>Jeffrey Streator</td>
<td>Associate Prof.</td>
<td>Mechanical Engineering</td>
</tr>
<tr>
<td>Ifeanyi Charles Ume</td>
<td>Professor</td>
<td>Mechanical Engineering</td>
</tr>
</tbody>
</table>

Table 2: Emory University and Center for Behavioral Neuroscience African American Science Faculty

<table>
<thead>
<tr>
<th>Name</th>
<th>Academic Rank</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aduwoa Adunoum</td>
<td>Assistant Prof.</td>
<td>Biology</td>
</tr>
<tr>
<td>Dolores Bradley</td>
<td>Associate Prof.</td>
<td>Psychology</td>
</tr>
<tr>
<td>Otis Brawley</td>
<td>Associate Prof.</td>
<td>Cancer Biology</td>
</tr>
<tr>
<td>Eugene Emery</td>
<td>Associate Prof.</td>
<td>Psychology</td>
</tr>
<tr>
<td>George Jones</td>
<td>Professor</td>
<td>Biology</td>
</tr>
<tr>
<td>Peter Macleish</td>
<td>Professor</td>
<td>Neuroscience</td>
</tr>
<tr>
<td>Timothy Moore</td>
<td>Associate Prof.</td>
<td>Psychology</td>
</tr>
<tr>
<td>Michael Powell</td>
<td>Associate Prof.</td>
<td>NICHD</td>
</tr>
<tr>
<td>Tracy Rhone</td>
<td>Assistant Prof.</td>
<td>Anthropology</td>
</tr>
</tbody>
</table>
4.3.1. FACES Fellowship Program

4.3.1.1. Fellowship Structure and Stipend

The FACES Fellowship Program has proven to be vital in attracting under-represented students to and retaining them in the Ph.D. and academic pipeline. This component of the FACES program will continue with little change from the previous award period. Many students come to graduate school with thoughts of pursuing the Ph.D. and becoming a faculty member, but upon completing the Master's degree, find that the industry option appears more attractive. To motivate underrepresented students to continue beyond the Master's degree, the FACES program provides a two-tier fellowship award.

To be eligible for fellowships, a student must be a U.S. Citizen or permanent resident seeking a Ph.D. in science, engineering, or computing. Qualified students who express interest in the Ph.D. are awarded a FACES Fellowship that provides a supplemental stipend ($3,000 per year at Georgia Tech and $2,000 per year at Emory). The stipend is in addition to any and all other forms of support the student receives, such as research assistantships, teaching assistantships, and other fellowships. This stipend is the first tier of the program. When a FACES Fellowship recipient is officially advanced to Ph.D. candidacy (having successfully completed qualifying examinations), he or she will receive an enhanced stipend ($5,000 per year at Georgia Tech and $3,000 per year at Emory. Recipients of the FACES Fellowships will be designated as FACES Fellows. It is anticipated that 15 new FACES Fellows will be supported each year of the program.

4.3.1.2. Enrichment Activities

The core of the FACES Fellowship program is student exposure to the academic profession. Developing the skill sets that map to the professoriate is accomplished through a series of activities facilitated by the FACES steering committee. The developmental approach to preparing the FACES fellows for faculty positions includes workshops on: (1) proposal writing; (2) course development; (3) effective teaching and mentoring; and (4) research program development. These workshops are scheduled throughout the academic year. These workshops are a forum for students and faculty members to discuss the responsibilities of a professor. Toward the end of a student’s graduate experience, a FACES faculty mentor assists with the pursuit and evaluation of academic jobs.

4.3.2. GT Transitions

All FACES Fellows take part in OMED’s GT Transitions program, which assists incoming students in making their transition seamlessly. These students come to campus a week prior to the beginning of their first term. During this week, they are provided insight into the Georgia Tech academic, administrative, and social system. This insight is provided by Georgia Tech faculty, staff, and students. Over the past nine years, this program has demonstrated that properly designed mentoring and retention programs have dramatic success. In fact, as shown in Figure 2, students who have participated in the program have performed above the overall Georgia Tech grade point average. As a part of the GT Transitions program for FACES fellows, each student is paired with a faculty mentor who will support the fellow throughout their matriculation.

![GT TRANSITIONS (1994-2002)](image)

*Figure 2 – GPAs of participants and non-participants in GT Transitions compared with the total population.*
FACES Fellows will be given an initial orientation, as well as follow-up workshops. The orientation will be designed to: (1) familiarize the students with the goals of the FACES program; and (2) provide an overview of the challenges and opportunities the FACES Fellow is likely to face throughout their graduate education. The follow-up workshops (see Section 4.2.1.2) will discuss pertinent items such as: (1) how to approach graduate courses; (2) how to plan and conduct research; (3) how to prepare for preliminary and qualifying exams; and (4) how to write and publish technical papers.

4.3.3. Travel Support for Research Presentations at Technical Meetings

Presenting a paper at technical meetings is a component that the FACES program intends to continue to promote. It is readily acknowledged that such participation exposes the students to developments in their disciplines, reinforces their knowledge of the requisite material, and prepares them for presentations in their programs of study - a central function of an academic faculty. An added benefit is the strengthening of the student’s resume with regards to the list of presentations and publications. To facilitate students becoming totally immersed in the research culture, the FACES program will continue to provide travel and lodging expenses for student authors to present papers at technical conferences. Twenty trips per year at $1,000 per trip will be provided.

4.4. Future Faculty Development Activities

Georgia Tech and Emory have established track records of producing African American Ph.D. recipients who go on to join academia. Table 3 provides a few recent examples of such individuals. The development of engineering and science faculty is the central theme of the FACES program. FACES future faculty development activities consist of several components. Minority doctoral students near the completion of the Ph.D. are eligible to receive Career Initiation Grants (CIGs), which they may use for start-up funds to assist them in establishing research programs in their initial academic appointments. Second, a new teaching practicum will be developed to assist with curriculum development and delivery. Finally, a series of training workshops have been developed to help participants with the transition from graduate student to faculty member.

<table>
<thead>
<tr>
<th>Name (Department-Year)</th>
<th>Current Appointment</th>
<th>Name</th>
<th>Current Appointment</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Anderson (ECE-1992)</td>
<td>University of Florida</td>
<td>Aduwoa Aduonom</td>
<td>Morehouse College</td>
</tr>
<tr>
<td>Benita Beamon (ISyE-1994)</td>
<td>University of Washington</td>
<td>John Lawrence</td>
<td>University of Kentucky</td>
</tr>
<tr>
<td>Cameron Coates (AE-2001)</td>
<td>Armstrong Atlantic State University</td>
<td>Terri Lee</td>
<td>Georgia Perimeter College</td>
</tr>
<tr>
<td>Demetris Geddis (ECE-2003)</td>
<td>Norfolk State University</td>
<td>Carlos Mareno</td>
<td>Emory University</td>
</tr>
<tr>
<td>Christine Grant (ChE-1989)</td>
<td>North Carolina State University</td>
<td>Carolyn Monteith</td>
<td>Emory University</td>
</tr>
<tr>
<td>Calvin Mackie (ME-1996)</td>
<td>Tulane University</td>
<td>Andrea Morris</td>
<td>Haverford College</td>
</tr>
<tr>
<td>Deidra Paris (CE-2002)</td>
<td>Clark Atlanta University</td>
<td>Nelson Oyesiku</td>
<td>Emory University</td>
</tr>
<tr>
<td>Johne’ Parker (ME-1996)</td>
<td>University of Kentucky</td>
<td>Monica Palados</td>
<td>University of Massachusetts</td>
</tr>
<tr>
<td>Reginald Perry (ECE-1989)</td>
<td>Florida A&amp;M University</td>
<td>Inga Pinnix</td>
<td>Florida Community College</td>
</tr>
<tr>
<td>Valerie Bennett (ME-1999)</td>
<td>Morehouse College</td>
<td>Titus Reaves</td>
<td>University of South Carolina</td>
</tr>
<tr>
<td>Willie Rockward (Phys-1997)</td>
<td>Morehouse College</td>
<td>Marion Sewer</td>
<td>Georgia Tech</td>
</tr>
<tr>
<td>Janet Rutledge (ECE-1990)</td>
<td>University of Maryland</td>
<td>Lance Shipman</td>
<td>Morehouse College</td>
</tr>
<tr>
<td>Mark J. T. Smith (ECE-1984)</td>
<td>Purdue University</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marc Timmerman (ME-1992)</td>
<td>Louisiana State University</td>
<td></td>
<td></td>
</tr>
<tr>
<td>John Trimble (ISyE-1992)</td>
<td>Howard University</td>
<td></td>
<td></td>
</tr>
<tr>
<td>David Veazie (ME-1993)</td>
<td>Clark Atlanta University</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deidra Williams (ECE-1994)</td>
<td>Florida A&amp;M University</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frances Williams (ECE-2003)</td>
<td>Norfolk State University</td>
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</tbody>
</table>
4.4.1. Teaching Practicum

To expose them to the pedagogy of teaching a course, FACES Fellows will work closely with a faculty member in all aspects of course preparation and delivery. In addition, the Fellows will attend monthly meetings given by a lead faculty member in which they will be instructed on best teaching practices. FACES Fellows will become eligible to participate in the Teaching Practicum upon officially advancing to Ph.D. candidacy. During the semester in which they participate in the Teaching Practicum, Fellows will be supported with an additional stipend of $5000. This support, in conjunction with the ongoing FACES stipend level of $5000 per year will enable the Fellows to be supported at a level roughly equivalent to 1/3-time teaching assistants. The FACES Fellows will be responsible for assisting the course instructor with various aspects of the course including:

- Development of the syllabus
- Preparation and evaluation of problem sets and exams, and
- Delivery of lectures

A faculty member will remain in charge of the course, but will be encouraged to involve the Fellow at a level that provides ample exposure, but does not place too much of the course responsibility on the Fellow. The faculty member will be encouraged to provide feedback to the Fellow as to his/her effectiveness. It is expected that the fellow and the faculty instructor will share in the evaluation of various assignments. In addition, the participating FACES Fellows will attend a monthly seminar given by a faculty member on developing quality teaching methods.

4.4.2. Career Initiation Grants

FACES will award three CIGs per year in the amount of $30,000 each to currently enrolled minority doctoral students near the completion of their degree. Preference will be given to FACES Fellows. The grant will be redeemable by the student when s/he takes a faculty position in a STEM department at a U.S. university. The funds are intended to assist the new faculty members in obtaining necessary research equipment or hiring graduate students. The person seeking a faculty position will use this grant as an additional incentive for the selected institution to hire him/her. Each fall, applicants will submit a brief resume and short essay describing their plans for both teaching and research. A subcommittee of the FACES Steering Committee will review the applications.

The CIG program has been very successful. It has enabled Georgia Tech to place a number of its outstanding Ph.D. graduates in the professoriate. In addition to those listed in Table 3, the names and academic institutions of past CIG winners are as follows:

Dr. Joseph Owino (CEE), University of Tennessee (CIG Recipient, 1999)
Dr. Mark Lewis (ISYE), University of Michigan (CIG Recipient, 1999)
Dr. Janice McNair (ECE), University of Florida (CIG Recipient, 2000)
Dr. Jason Matthews (Chemistry), Howard University (CIG Recipient, 2001)
Dr. Ron Metoyer (CS), Oregon State University (CIG Recipient, 2001)
Dr. Deidre Paris (CEE), Clark Atlanta University (CIG Recipient, 2002)
Dr. Samuel Graham (ME), Georgia Tech (CIG Recipient, 2003)
Dr. William Robinson (ECE), Vanderbilt University (CIG Recipient, 2003)
Dr. Chekesha Liddell (ChemE), Cornell University (CIG Recipient, 2003)
Dr. Gregory Triplett (ECE), University of Missouri (CIG Recipient, 2004)

One past recipient, Mark Lewis, recently received the National Science Foundation PECASE Award (2004). Another, Samuel Graham, won the Society of Manufacturing Engineers International M. Eugene Merchant Outstanding Young Manufacturing Engineer Award (2004).

4.4.3. Portable Post-Doc

Post-doctoral training is a prerequisite to an academic appointment in many science disciplines. Some doctoral students are unable to establish the publication portfolio necessary to be competitive for a professorial position and need post-doctoral training to enhance their publication list. Access to post-doctoral positions is an issue for many minority students. Because of the lack of post-doctoral opportunities, some students abandon their pursuit of a career in academia. To address this need and further develop future faculty, the FACES program will fund a portable one year postdoctoral fellowship for a Georgia Tech or Emory doctoral graduate with a stipend of $35,000 (consistent with current NIH recommended salary levels). To apply for the fellowship, the applicants will submit a vitae and a brief description of their plans for research, teaching, and service. The applicants will be
selected by members of the FACES Steering Committee. Once selected, the awardees will be further mentored to assist in securing a post-doctoral position, provide feedback on the research and teaching plan, and offer ongoing support during their transition from doctoral student to postdoctoral researcher. The graduate will be responsible for securing the post-doctoral position, and Georgia Tech will transfer the funds to the hiring institution.

5. INSTITUTIONALIZATION

To facilitate institutionalization of the program, we will continue to pursue an endowment for FACES Chaired Professorships at partner institutions. During the first five years of the program, Georgia Tech established one such professorship (the Motorola Foundation Professorship, currently held by Professor May). At least $1,500,000 per chaired professorship will be solicited to provide an approximate annual yield of $100,000 per year per chair, thereby providing ongoing funds to support research and the promotion of minority graduate education. The chaired positions will be available to tenure track faculty of any academic rank at the participating institutions. FACES Chaired Professors will be appointed for five-year terms and be expected to raise funds for, develop, and oversee substantial scholarly programs to enhance the FACES program. These professorships will encourage talented faculty to develop scholarly approaches to increasing the pool of African Americans in the engineering and science professoriate. These chairs represent an opportunity to broaden the concept of academic scholarship.

6. OTHER PARTNERSHIPS

6.1. EMERGE

Empowering Minority Engineers to Reach for Graduate Education (EMERGE) is an alliance of eight universities dedicated to increasing the number of minorities earning graduate degrees in STEM disciplines. EMERGE amplifies the combined effects of existing national and regional programs across the K-Ph.D. spectrum to serve as an umbrella for STEM promotion, recruitment, retention, and empowerment. One tool for achieving this goal is the Cybernetwork, a virtual network of students, parents, educators, and other interested parties that serves as a vehicle for disseminating best practices for recruiting and retaining minority students. Recognizing the importance of collaborative efforts with programs that shared the same vision, a partnership between the FACES program and EMERGE was created three years ago. Through continued partnership with FACES, EMERGE is in a better position to disseminate information that will not only improve the current perception of academic faculty and academic career, but also encourage more minorities to make their way into the professoriate.

6.2. LSAMP

The programmatic and geographical proximity of NSF Louis Stokes Alliance for Minority Participation (LSAMP) programs are valuable for establishing partnerships. The Florida-Georgia LSAMP will specifically be engaged in endeavors such as student exchange and participation in regional conferences. A programmatic link between LSAMP and AGEP programs provides a vertically integrated cadre of undergraduates becoming successful graduate students. An enabling mechanism is the SURE program for the FACES initiative. This program, described previously, routinely involves a variety of students from diverse geographic regions. Special focus will be placed upon the recruitment of promising undergraduates from within the Florida-Georgia LSAMP as a viable means of crystallizing the link between FACES and LSAMP. The proximity of the programs may also facilitate academic year research opportunities. An additional means of tangibly partnering with the neighboring LSAMP programs is the support of research expositions. The annual Florida Georgia LSAMP Research Expo will be attended by FACES committee members to enhance recruitment.

7. PROGRAM MANAGEMENT, EVALUATION, AND ASSESSMENT

FACES is administered by a steering committee consisting of Professors Reginald DesRoches, Augustine Esogbue, Samuel Graham, Gary May, Stephen Ruffin, and Jeffrey Streator of Georgia Tech, Mr. Gordon Moore of OMED, Ms. Tabitha Barnette of Georgia Tech’s Office of Academic Affairs, Ms. Shirley Miller of EMERGE, as well as Ms. Marquette Brown of Spelman, Profs. Valerie Bennett and J.K. Haynes of Morehouse, and Dr. Danielle Gray of Emory. The committee manages all aspects of the program and is chaired by Professor May. The committee reports directly to Georgia Tech President G. Wayne Clough, who will continue to serve as the Principal Investigator for the FACES program. The specific duties of the members of the steering committee are shown in Table 4.

OMED (along with the steering committee) will manage the evaluation and assessment of the program components. OMED will monitor and report the GPA of each FACES student on a semesterly and annual basis.
OMED will also take the responsibility of recruiting all identified students for the GT Transitions program. Emory, Spelman and Morehouse will be responsible for monitoring and collecting all necessary information (participation, attendance, etc.) for their respective campuses and/or with their students, except for the transition program (i.e., lecture/workshop series, campus visits, etc.). All faculty members conducting/coordinating/facilitating the undergraduate research experiences are responsible for monitoring, collecting, and reporting to OMED all necessary information related to these activities. OMED will assist faculty in the administration of these efforts.

Table 4: FACES Steering Committee

<table>
<thead>
<tr>
<th>Name</th>
<th>Area of Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tabitha Barnette</td>
<td>FACES fellowships, mentoring activities</td>
</tr>
<tr>
<td>Valerie Bennett</td>
<td>Recruitment activities</td>
</tr>
<tr>
<td>Reginald DesRoches</td>
<td>Future faculty program, undergraduate research</td>
</tr>
<tr>
<td>Augustine Esogbue</td>
<td>FACES fellowships, mentoring activities</td>
</tr>
<tr>
<td>Samuel Graham</td>
<td>Teaching Practicum, mentoring activities</td>
</tr>
<tr>
<td>Danielle Gray</td>
<td>FACES fellowships, recruitment activities</td>
</tr>
<tr>
<td>J.K. Haynes</td>
<td>Recruitment activities</td>
</tr>
<tr>
<td>Gary S. May</td>
<td>Chair, undergraduate research</td>
</tr>
<tr>
<td>Shirley Miller</td>
<td>Recruitment activities</td>
</tr>
<tr>
<td>S. Gordon Moore, Jr.</td>
<td>Program evaluation and assessment</td>
</tr>
<tr>
<td>Stephen M. Ruffin</td>
<td>FACES fellowships, mentoring activities</td>
</tr>
<tr>
<td>Jeffrey L. Streator</td>
<td>FACES fellowships, recruitment activities</td>
</tr>
</tbody>
</table>

Measurement of program success will be accomplished in three phases. One phase will be the effort to continuously monitor academic performance of each student. The second phase will consist of compilation and dissemination of information about the milestones in the Ph.D. process. A sample list of milestones is:

- Preliminary Exams (as required by department)
- Qualifying Exams/Comprehensive Exams (as required by department)
- Proposal Defense
- Research Progress (publications, presentations, etc.)
- Dissertation Defense

The steering committee will confirm the timetables for these steps reported by the students each term (in the form of term reports). This information will then be reported to OMED to maintain an accurate database.

The third phase will assess the impact of the lecture series, workshops, campus visits, and other FACES programs through various survey instruments. An annual report will be generated with complete disclosure of academic performance and academic progress of each student, and any assessment data available on the program components. At the end of the five year period a final report will be generated that will include an overall summary of the FACES program, student performance, plans for continuation of the program beyond the NSF funding period, and any issues/concerns encountered during the period.

8. CONCLUSION

This proposal has described the Facilitating Academic Careers in Engineering and Science program, a collaborative effort between the Georgia Institute of Technology, Emory University, Morehouse College, and Spelman College designed to increase the number of underrepresented students receiving doctoral degrees in engineering and science fields and ultimately increase the number of these individuals entering the professoriate. A major advantage of FACES will be the intimate involvement of underrepresented faculty in all aspects of the program. Institutionalization of the FACES program will occur through the establishment of endowed faculty positions at the participating institutions. With the assistance of NSF funding to keep these elements in place, FACES will continue to provide a mechanism to "change the face" of the national engineering and science professoriate, substantially improving the current dearth of underrepresented engineering and science faculty.