PENNSTATE

Eberly College of Science

Strategic Plan 2008-2013

Embracing Excellence

June 2008

The Eberly College of Science: Great students, great science

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Vision

The Eberly College of Science: a vibrant scientific and educational community that is open and welcoming, creative and adaptable, and internationally renowned for excellence in education and research and for improving the world through its students, its discoveries, and its outreach.

Mission

The Eberly College of Science is the home of the basic sciences at Penn State, one of the world's leading research universities. Our faculty, staff and students work together to create, share, and apply knowledge in the basic sciences.
Our mission includes:

- advancing the frontiers of knowledge in the physical, biological and mathematical sciences;
- providing access to a rich educational experience that will motivate and enable all of our students, both in the College and from across Penn State, to seek the highest levels of intellectual achievement and personal growth; and
- sharing our knowledge, discoveries and inventions with the people of the Commonwealth, the nation and the world in order to improve appreciation and comprehension of science and to bring the benefits of science to society.

Goal

Enrich lives, improve society and address global challenges by producing scientifically-trained leaders and innovators, advancing the frontiers of science, and enhancing public understanding of science.

Executive Summary

The last decade has been one of remarkable growth in accomplishment and quality for the Eberly College of Science. The College attracts excellent students and has very strong undergraduate major programs, including a new degree in Forensic Science, as well as excellent graduate and postdoctoral education. Several areas of research, such as bioinformatics and genomics and high energy astronomy and astrophysics, have been substantially strengthened and entirely new areas, such as the vibrant effort in infectious disease dynamics, have been introduced. Many of the advances in research programs have been accomplished through collaborations among departments, with other colleges and with the Penn State interdisciplinary institutes. Major growth in the number of internationally renowned faculty, including academy members, has resulted in dramatic increases in the quality and reputation of many of our departments and programs.

Through the actions laid out in this plan, we will build upon and significantly extend the growth in quality and accomplishments in education, discovery, and outreach to produce tomorrow's leaders and ideas. Given the enormous impact of science and technology on society, the need is great for scientifically-trained professionals in many areas of education, business and government. We intend to increase the quality and diversity of our student body. We will strengthen undergraduate and graduate education using several mechanisms: training our students to identify and solve fundamental problems while building character and creativity; offering an education firmly grounded in knowledge and discovery; presenting a diverse and supportive environment in which to work and learn; and providing training in ethics integrated into the curriculum, career and leadership training, and substantial international academic experiences. We will work to offer a great learning experience and communicate the excitement of science and the joy of discovery to the many thousands of students who come to the College each year to satisfy general education requirements or to build foundations for their majors. We will continue to build excellence in academic accomplishment through support of existing programs and new initiatives, and through continuing recruitment and support of outstanding faculty members. Furthermore, we will marshal areas of strength in the College and work together with others around the University to address global challenges.

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Introduction

The present strategic planning takes place against a background of tremendous success of the scientific enterprise. Not only has the scientific approach enabled huge advances in our knowledge of the physical world, but also that knowledge has had an enormous impact on society. Science and technology have become enablers of improvements in the quality of life, drivers of the economy, keys to satisfying humankind's thirst for knowledge about our world, and primary tools for confronting many global challenges.

This planning also occurs in the context of the burgeoning success of the Eberly College of Science and Penn State. Penn State, with its roots in the Farmers' High School, has blossomed, and now ranks among the top 50 institutions of higher education in the world. The Eberly College of Science (ECOS), with its origins in the then-modern chemistry program established by Penn State's first president, Evan Pugh, has grown outstanding strengths in education and research across the physical, biological and mathematical sciences. Nearly 50,000 science professionals have graduated from the ECOS, going on to apply their knowledge and skills in a wide range of businesses and professions, including education, information technology, medicine, pharmaceuticals, and many more. Students and faculty regularly win national and international awards and recognition. Science research accomplishments from the College are frequently highlighted in premier journals and public media throughout the world. Reports about our K-12 science camps and other outreach programs have also appeared in publications across the country.

The Eberly College of Science is a major center of undergraduate education. With 225,000 student credit hours taught per year, the College is second only to the College of Liberal Arts in that arena. Approximately three-quarters of those student credit hours are for students from colleges other than the ECOS. Astronomy & Astrophysics teaches more students in general education courses than any other astronomy department in the country. The College attracts very high quality students to its own majors, with matriculating students regularly at the top or very near the top among Penn State colleges in mean high school grade point averages and SAT scores, and the ECOS consistently has the largest percentage of Schreyer scholars. Applications to the ECOS have increased 50% in three years, and the Colleges of Engineering and Science now stand second behind the Smeal College of Business with just over 6000 applications each for admissions to UP in 2008.

The last decade has brought substantial advances in quality, diversity, accomplishment, and recognition to departments and programs across the College. The proportion of women in our tenure-line faculty has risen from 11.1% to 20.0%, the proportion of African American and Hispanic American faculty has increased from 2.9% to 4.3%, and Asian Americans now constitute 18.7% of the faculty. The number of faculty members holding membership in one or more of the academies (National Academy of Sciences, American

Academy of Arts and Sciences, or the Royal Society (UK)) has increased from 7 a decade ago to 17 today. The most dramatic growth in departmental standing has come in Physics and in Biology. Physics moved in national reputational rankings from 55th fifteen years ago to 23rd this year, with three subfields ranked 13th or better. Biology has also made great strides. The department now has 6 academy members and a number of outstanding programs. It is difficult to get a simple measure of the relative quality of such a broad department in the biological sciences where there is substantial variability in how departments are organized. If we take as a measure the number of academy members plus ISI highly-cited faculty, the Department is among the top ten in the nation. These and other departments and programs around the College have demonstrated the elements necessary for sustained, significant improvement. Leadership is crucial, as are an environment of high expectations, a common sense of purpose, a talent for recruiting, and a commitment to the mission. We can build on the lessons we have learned and the momentum we have established to continue and extend the progress.

The ECOS, which already has international undergraduate exchange programs with eight institutions, has recently engaged in the development of a few wide-ranging partnerships with leading universities around the world. The first of these partnerships is with Peking University (PKU). The ECOS and the colleges/schools of mathematics, physics, chemistry and life sciences at PKU signed an agreement that provides for student and faculty exchange and collaboration. The first joint educational project is a summer 2008 mathematics course in Beijing with participation by PSU and PKU faculty and students.

As we have grown in accomplishment and ambition, we are increasingly competing in faculty recruitment and retention with better-funded institutions, many of them private institutions, and we must do so in an era of declining state support for public higher education. We compete also for excellent students, and to do that effectively, we must have more need- and merit-based scholarships, especially given the trend for well-funded private institutions to offer reduced or free tuition to lower, middle, and even upper-income students.

The change from a mostly state-supported university to essentially a private university with a public mission is a fundamental change and a great challenge. We have done very well in competitive support for research – our research and development expenditures in the physical sciences put us among the top ten universities in the nation – but sponsored research does not provide the full range of resources needed for excellence across our programs. Private support has become a vital component in our quest for greater excellence in our teaching, research and outreach missions. Our stepped-up development activities reflect the critical importance of private support in achieving our goals.

In the last decade, the University embarked on an ambitious infrastructure improvement program, with the construction of many new buildings and renovations of old ones. The College is benefiting greatly from the new Chemistry Building and a completely renovated McAllister Building as well as from the Huck Institutes' Life Sciences Building. Even with these wonderful improvements, the College still has a large infrastructure challenge; the declining state of other buildings threatens continued progress. The renovation of North Frear, just underway, will greatly enhance research facilities for gene regulation and plant science and teaching facilities for undergraduate laboratory instruction in BMB and some biology courses. We are planning a Student Academic Support Center to be housed in space recently vacated in Ritenour Building, with the renovation to be paid entirely by private support. There remain other pressing facility needs: an expansion of the teaching laboratories for undergraduate biology courses, a new building to house the Departments of Physics and Astronomy & Astrophysics, a new building for BMB, and further renovations and additional space for other departments and programs.

For the Eberly College of Science to achieve its vision, it is essential that we contribute to the resolution of some of the most significant challenges facing our nation and the world. Through its many graduates and through its discoveries and inventions, the ECOS has already contributed substantially to the economic and physical well-being of the nation and beyond. Today, while we so easily see the enormous benefits of science and technology for individuals and for society, we can also readily see where serious needs exist. In this country, the alarm has been sounded about retaining our economic and technological leadership and even remaining competitive. Around the globe, there is a growing urgency to confront and solve challenges including hunger, disease, renewable energy, climate change, and more. To make progress in addressing such challenges, we need not only scientific and technological breakthroughs, but also highly trained scientists, leaders, and innovators to carry out the work and a citizenry sufficiently knowledgeable about the issues to be able to participate productively in policy discussion and development and be active participants in implementing solutions.

The plan that follows outlines actions directed toward accomplishing our goal. Securing sufficient new resources will be a challenge, and choices will certainly have to be made as we implement the plan. However, given our recent success during a decade of limited resources, we have confidence in our ability to make great progress. This plan is both detailed and broadly ambitious. We focus on: enriching the student experience through educational and co-curricular enhancements and providing students with the preparation needed to succeed and lead in the global economy; on extending our success in building excellent science programs and substantially improving departments, thereby improving both the educational experiences of our students and our contributions to globally important science; and on stepping up to a new level in outreach, connecting with and engaging the world beyond.

Overview

The Eberly College of Science has:

- **Outstanding students and very strong undergraduate major programs.** The mean HSGPA and SAT scores for students who matriculate in the ECOS are regularly at the top or very close to the top among Penn State colleges, and the ECOS consistently has the largest percentage of Schreyer Scholars.
- **A growing ability to attract large numbers of high quality undergraduate students to Penn State.** With applications rising 50% in three years, the ECOS now stands second, tied with Engineering, behind the Smeal College of Business.
- **A very large teaching mission for students from across the University.** With 225,000 student credit hours taught per year, the ECOS is second only to the College of Liberal Arts in student credit hours.
- **A very high quality faculty that is growing in national and international recognition**. The number of academy members has grown from 7 to 17 over the last decade.
- **Excellent graduate and postdoctoral education**. By a wide margin, the ECOS is the largest center of postdoctoral training at Penn State.
- **A large and vigorous research portfolio that is both building on strengths in established areas and successfully striking out in new directions.** Areas of growing strength include, among others, genomics and bioinformatics, bioinorganic chemistry, high energy astrophysics, infectious disease dynamics, and nanoscience.
- **A track record of enhancing department and research program quality**. There has been substantial growth in the quality and accomplishments of departments and programs.
- **An increasingly diverse community**. This attribute is most notably seen in the gender diversity of our tenure-line faculty where the proportion of women has risen from 11.1% to 20.0% in a decade. In the same period, the proportion of African American and Hispanic American faculty has increased from 2.9% to 4.3%. Asian Americans now constitute 18.7% of the faculty.
- **A broad and growing international presence**. ECOS faculty have many international research collaborations, and the College has embarked on developing wide-ranging partnerships with a few leading institutions around the world.
- **A growing outreach program**. The already vigorous ECOS outreach program is poised to step up substantially in numbers and reach of activities and to emerge as a player on the national scene.

Building on the progress of the last decade, in the next 5-10 years, we will focus on:

- **Enhancing the undergraduate major experience through curricular and co-curricular enrichment** and increasing retention of undergraduate students in the College, thereby positioning increasing numbers of students to develop into the scientifically-trained leaders that are needed by society. (Action 1, page 7)
- **Continuing to increase the number, quality and diversity of undergraduate students who apply for admission to the Eberly College of Science** and further encouraging those admitted to matriculate. (Action 2, page 9)
- **Improving the educational experience of students across the University** who enroll in our courses to satisfy general education requirements or to build foundations for their majors. (Action 3, page 10)
- **Enhancing the quality and diversity of our graduate students** and providing those students with the research experiences and additional professional preparation that will set them on track to move up to leadership positions in a range of occupations. (Action 4, page 11)
- **Providing support and encouragement for every member of the College community –** students**,** staff, and faculty – to reach the highest level of intellectual achievement and personal and professional growth. (Action 5, page 12)
- **Extending our progress in improving our departments** by promoting the success of our faculty and by recruiting outstanding new faculty members, with extended efforts to increase the diversity of the faculty. (Action 6, page 13)
- **Enhancing the creative environment in the College and supporting the highest levels of intellectual accomplishment** within and across the disciplines. (Action 7, page 15)
- **Identifying and marshaling areas of strength around the College and working with others across the University to address global challenges.** (Action 8, page 17)
- **Entering a new era in outreach with enhanced local and regional programs and a presence on the national stage**, which will address the College's goal of enhancing public understanding of science and assist the University in becoming the leading innovative, engaged institution of higher education. (Action 9, page 20)
- **Continuing to operate the College in an efficient and responsible manner**, making the most of the resources available, and stepping up the efforts to secure additional resources. (Action 10, page 23)

With the result that we will:

- **Provide increasing numbers of undergraduate students with an education still rooted in excellent training in science, but significantly enhanced** with, among other things, an engagement with ethics, substantive international experiences, and greater opportunities for participation in the creation and/or application of new knowledge.
- **Improve the career information available to undergraduate and graduate students and provide them with preparation to be leaders and innovators** in a range of different types of organizations and circumstances.
- **See a continuing increase in numbers of applications for undergraduate admission to the ECOS, a growth in the quality of the matriculants, and increased retention for all students,** particularly for those from underrepresented groups.
- **Have an outstanding, inclusive climate for work and learning.**
- **Have vibrant new or enhanced research programs and centers addressing both basic scientific and broad global challenges.** Many programs will involve collaborations with faculty and centers across the University.
- **Have increased the quality and diversity of the faculty,** with a tenure-line faculty that is at least 25% women, has increased racial diversity, and has grown further in international recognition and includes more than 25 academy members.
- **Have increased program and department quality and accomplishment** to the point where nearly all of our departments will be ranked by reputation and/or specific quality measures among the top twenty in the nation and many sub-disciplines or programs will be ranked in the top ten.
- **See a growth in the quality and diversity of our graduate students** based on the growing reputation of the faculty and programs, better marketing of the programs, and on increased resources to make competitive offers of support.
- **Operate a vigorous and wide-ranging outreach program** that connects to K-12 students and teachers and enhances public understanding of science, engages and provides support and opportunities for our students and faculty, and is a player on the national scene.
- **Manage the College in a manner that will garner maximum benefit from the funds invested by all our stakeholders.**

Actions

1. <u>Enhance the undergraduate major experience and position students to become the scientifically-trained leaders of tomorrow.</u>

Excellence in academic programs and the quality and breadth of co-curricular and extra-curricular opportunities are keys to recruitment, retention and an outstanding educational experience for all students. Specific educational and co-curricular experiences can enhance the success and leadership potential of our students in their careers.

The core of this effort is

- Providing students with experiential learning opportunities that enhance their education, prepare them to be professionals in the 21st century, and equip them to be leaders.
    - Expand undergraduate research opportunities to provide every student the opportunity to create new knowledge.
    - Infuse engagement with ethical questions into the curriculum.
    - Increase our emphasis on substantive international learning experiences.
    - Provide additional career preparedness training and career information.
    - Encourage participation in co-op / internship / externship experiences.
    - Promote working and learning in a diverse environment.
    - Enable and encourage students to participate in outreach to K-12 and general public audiences.

Other specific plans include:

- Creation of a Student Academic Support Center where all College student support services will be located, including a new initiative in tutoring and collaborative learning. Centralizing and improving the facilities devoted to student support (including recruitment, advising, diversity programs, cooperative education, international programs and more) will create synergy among these programs and improve the quality of the services and the student experience. Planning and design of the Center in the east wing of Ritenour Building and fundraising to fully support the renovation are underway.
- Creation of a Center for Excellence in Science Education to promote and support faculty-driven improvements in teaching and learning in the College. This center will be housed in the Student Academic Support Center. The Center for Excellence in Science Education (CESE) will:
    - Provide leadership, support and focus for educational initiatives within ECOS.
    - Promote excellence and innovation in teaching across the College.

  - Initiate and support proposals for external support for teaching and learning initiatives.
  - Provide regular communication channels to other teaching and learning centers and activities across the University.
  - Provide linkage to science education faculty and activities in the College of Education.
  - Help promote careers in K-12 teaching for science majors.

- Supporting undergraduate success.
  - Improve undergraduate advising including appropriate placement based on FTCAP scores.
  - Improve the quality and diversity of our graduate students, many of whom serve as teaching assistants in undergraduate courses.
  - Develop new strategies to significantly improve and build on current retention strategies for students from underrepresented groups. Existing vehicles include FISE house, MURE and WISER programs, the Commonwealth Scholars program for students interested in medicine, and minority REU programs.
  - Improve student success in our courses by providing enhanced tutoring and collaborative learning and by employing new pedagogic strategies.

- Working with the University to redesign undergraduate instructional laboratories. The instructional laboratory needs are integrated into a long-range facilities needs assessment developed with the help of Sasaki Associates and OPP (see Action 5). The urgent instructional facility priority is 7000 ft^2 of new teaching space for Biology laboratories, because the current space has severely limited the instructional quality in courses taught to students from across the University. Ideally, the Biology instructional laboratories would be part of an Undergraduate Science Teaching Center identified in the Sasaki study, but the need is immediate, and not commensurate with the time scale for development of the Undergraduate Science Teaching Center.
- Enhancing opportunities for students interested in careers in K-12 education through collaboration with the College of Education.
- Continuing to work to increase the diversity of the faculty and the student body in accord with the plans laid out in the College's Framework to Foster Diversity plan.
- Working to maintain a respectful, inclusive, stimulating learning environment.
- Assessing learning outcomes in all majors. See Appendix I for a description of our Learning Outcomes Assessment process and a selection of preliminary results that have arisen from it.

2. <u>Continue to increase the numbers of undergraduate students who apply for admission to the Eberly College of Science and further encourage those admitted to matriculate.</u>

As noted previously, applications to the Eberly College of Science have increased almost 50% in three years. UP applications overall have increased 30%. While we do not know all of the reasons for the rapid increase – one contributor is the introduction of a new academic program, Forensic Science – we expect that the enhancements of programs, co-curricular enrichment, and academic and career support described above will further encourage applications and acceptances of offers of admission to the College.

For example:

- The Student Academic Support Center is intended not only to provide support for enrolled students but also to attract students to the College. The Center will house the office of the undergraduate recruitment coordinator as well as other student support services and will be the very visible one-stop hub of undergraduate academic support from the time students and their families make exploratory visits to the College until they graduate.

In addition, we will:

- Through fundraising, seek to increase substantially the number of scholarships available to our students.
- Build on current recruitment programs such as PA Junior Academy of Science and PA Convocation, Bunton-Waller programs, and initiate additional approaches to further increase the diversity of our applicants.
- Identify essential attributes of high-potential students and work to recruit more of this kind of student.
- Work to increase undergraduate applications from international students, in part through ECOS partnerships with institutions in other countries.
- Continue to improve the marketing of our programs through web sites, YouTube, enhanced on-campus experiences, and the like. Also, accelerate the process through the establishment of a marketing position in the College.
- Engage the newly formed Science LionPride student group in recruitment activities.

3. <u>Improve the educational experience of students across the University who enroll in our courses to fulfill general education requirements or to build foundations for their majors.</u>

Since the Eberly College of Science teaches the second highest number of student credit hours among Penn State colleges and campuses, and a majority of the teaching is for students from outside the College, we have an important responsibility to all students of the University. For example, our entry-level biology courses serve the needs of over 40 different programs and majors from across campus. Similarly, mathematics courses are taken by almost every student on campus; some take the developmental level courses while others jump right into third semester calculus. Every student is required to take science and quantitative general education courses, and many of the most popular general education courses are offered by the Eberly College of Science. Astronomy & Astrophysics teaches more students in general education courses than any other astronomy department in the country. It is our goal to improve the educational experience for every student enrolled in our courses and to enhance the general education offerings in the College.

A prime goal is to:

- Communicate the joy of discovery and ensure that every student who completes a general education course in the College appreciates the nature of science and scientific knowledge. Science is an incredibly powerful tool for learning and understanding the world and the universe in which we live.

Initiatives include:

- Promote and support improvements in teaching and learning in the College through the Center for Excellence in Science Education, with an emphasis in this context on foundation, developmental and general education courses. Analyze success rates and course evaluations to identify areas of focus.
- Engage the best of our tenure-line and instructional faculty to teach and coordinate these critical courses.
- Create an integrated multidisciplinary general education science course.
- Add more general education and introductory courses delivered in part or wholly online.
- Incorporate intercultural/multicultural components in our core courses where possible.
- Explore alternative methods for instruction and course delivery to improve student success and learning.
- Further engage other PSU colleges (our “client” colleges) in discussions about our entry-level courses, student success, retention, etc.

4. <u>Enhance the quality and diversity of our graduate students and provide those students with the research experiences and additional professional preparation that will set them on track to move up to leadership positions in a range of occupations.</u>

Graduate students are a key part of the ecology of the College. They are an essential part of our mission to produce the scientifically-trained leaders and innovators of tomorrow. We need to provide them not only with the in-depth, leading-edge research training that is the focus of graduate education but also with the broadening experiences and training that will equip them to be leaders and innovators. Graduate students play a crucial role in the quality and productivity of our research enterprise through their hard work, creativity, and intellectual contributions. They also contribute to undergraduate education in their roles as teaching assistants and as mentors for undergraduates engaged in research. Excellent graduate students support excellent undergraduate education.

The essential factors in recruitment of graduate students are the quality of our faculty and programs and our ability to provide highly competitive fellowships and teaching assistant (TA) and research assistant (RA) stipends.

Specific initiatives include:

- Improve the quality and diversity of graduate students accepted into our programs:
  - Provide larger stipends though increased fundraising for graduate fellowships and through increases in TA and RA stipends. Data from chemistry and physics departments show that we are well behind our peers in graduate student stipends.
  - Improve marketing of our programs and faculty.
  - Build on our recent successes in attracting minority students to increase the numbers of under-represented students enrolling in our graduate programs.
  - Promote better application processes, especially for overlapping interdisciplinary programs.

- Improve the quality of our graduate degree programs and the quality of the graduate student experience:
  - Assess our candidacy and comprehensive exams and make appropriate changes.
  - Provide more career information, counseling and preparation.
  - Provide leadership training opportunities for graduate students.
  - Add a component on ethics and responsible conduct of research to all graduate programs.
  - Increase opportunities for graduate students to have international experiences.
  - Put programs in place to improve retention and degree completion of graduate students, including those from underrepresented groups.

5. **<u>Provide support and encouragement for every member of the College community – students, staff and faculty – to reach the highest levels of intellectual achievement and personal and professional growth.</u>**

The College is its people. The Eberly College of Science cannot reach its full potential unless all members of the community are working together to reach that potential. Every individual should feel respected and valued, challenged and rewarded. We must enhance organizational structures and cultures that enable excellence, recognizing that faculty and staff time is our most precious resource.

Specific plans include:

- Continuous improvement of College and departmental leadership and processes.
    - Develop departmental and College structures and processes which seek simplicity, follow disciplined processes, and relieve workload.
    - Encourage systems of distributed leadership.
    - Invest in administrative support positions to reduce staff overload and to relieve clerical burdens from faculty.
    - Increase the diversity of our leadership.
    - Provide developmental experiences and training for future leaders.
- Continuous improvement in the climate across the College
    - Build on activities which have proven effective (e.g., College and department climate and diversity committees, annual distribution of the diversity brochure, Race Relations Project in all first year seminars).
    - Conduct periodic climate surveys, as in 2008. Develop a new survey tool.
    - Address the 2008 survey findings. See Appendix II for more information about the survey and follow up.
    - Recognize and reward those who work to improve the climate.
    - Mentor supervisors to improve feelings of respect in each work area.
    - Increase inclusion of staff and instructional and research faculty in the life of the departments and College in planning, decision making, problem resolution, and celebrations.
    - Increase the numbers of staff members from underrepresented groups.
    - Continue our focus on fostering a family-friendly environment.
- Support a culture of sharing and collaboration across the College.
- Provide appropriate levels of training and professional development for all members of the community, with an increased focus on post-doctoral scholars.
- Enhance processes and communication so that hiring, performance evaluation, salary administration and promotion are broadly perceived as fair and constructive.
- Put plans and procedures in place to keep our students and employees safe in both the course of a normal work day and in emergency situations.

6. <u>Extend our progress in improving our departments by promoting the success of our faculty and by recruiting outstanding new faculty members, with extended efforts to increase the diversity of the faculty.</u>

To improve our departments and programs and to attract outstanding new faculty members, the ECOS must work to facilitate the ever increasing success, impact, and reputation of the faculty members already here. We must invest in research in important areas, and we must improve the quality of our facilities and ensure the availability of necessary enabling technologies, resources, and support personnel. In addition, attracting outstanding faculty members requires a commitment to excellence in recruiting within the department. Leadership is crucial, as are an environment of high expectations, a common sense of purpose, and a commitment to the mission.

Specific initiatives:

- Work to increase the success, impact, and reputation of the faculty.
    - Respect faculty time by making additional investments in administrative support.
    - Facilitate the success of junior faculty through improved mentoring.
    - Recognize and reward success in mentoring.
    - Support and foster pursuit of center-level awards and training grants.
    - Provide appropriate venture funding (seed funding) for innovative research.
    - Practice proactive retention strategies – recognizing and rewarding outstanding performance.
    - Further engage foundations and industry for research support.
    - Support and facilitate technology transfer and entrepreneurial activities.

- Work to improve the quality of facilities and ensure the availability of necessary enabling technologies, resources, and support personnel.
    - Plan improvements in facilities and infrastructure to support all aspects of the educational experience.
    - With the help of Sasaki Associates and OPP, we carried out a long-range facilities needs assessment for the College and identified solutions that are compatible with University facilities and campus planning. The major needs are:
        - A new building capable of supporting 21st century teaching, research and outreach in the Departments of Physics and Astronomy & Astrophysics.
        - New and renovated spaces for the biological sciences, including a new building for the Department of Biochemistry and Molecular Biology.

        - Renovations of existing buildings to meet the needs of the other departments and programs.
        - A facility to house instructional laboratories and specialized classrooms for first-rate science education: an Undergraduate Science Teaching Center.
    - Partner with the University administration to identify opportunities for facility improvements and to address specific weaknesses.
    - Work with the Penn State interdisciplinary institutes to ensure availability of enabling technologies and resources in shared user facilities.

- Work to improve the reputation of the University and College, the units within the College, and the sub-discipline areas within and among colleges.
    - Support initiatives like workshops and conferences.
    - Hold external departmental reviews at least once every 7 years, and consider more frequent, less formal consultations with external experts.
    - Bring national and international science leaders to campus frequently.
    - Market our accomplishments and programs aggressively.

- Be open to flexible hiring strategies and practices.
    - Identify individuals and start recruiting during their post-doc years.
    - Seek out young stars from lower-ranked institutions.
    - Look for opportunities for cluster hires, perhaps in partnership with other departments or colleges.
    - Always be looking to identify and pursue movable stars.
    - Increase the number of qualified minority faculty who receive and accept our offers through targeted and aggressive recruiting.
    - Hire 5 senior faculty members over 5 years via an open, competitive process among disciplines. The intent is to hire new faculty who can contribute to fostering creativity and leading major research efforts, with an eye towards interdisciplinary activity.

- Explore instituting a position of Equity Officer in each department, drawing from senior influential faculty members. Responsibilities will include:
    - Monitor faculty hiring processes and practices to ensure that applicant pools match national availability.
    - Obtain and share knowledge about gender and race equity literature.
    - Work to increase the number of faculty offers made to minority candidates.
    - Sit in on P&T meetings to ensure equity.
    - Encourage recruitment, acceptance, and matriculation of minority graduate students and post-docs.
    - Participate in local and national workshops on gender and race issues.

7. Enhance the creative environment in the College and support the highest levels of intellectual accomplishment within and across disciplines.

The Eberly College of Science will strongly support the highest levels of intellectual endeavor. The opportunity for this kind of unfettered inquiry is essential to a vibrant scientific enterprise and, indeed, an essential part of the whole academic enterprise. The College and its disciplines are well recognized for exceptional levels of intellectual achievement, and our future work will build on this excellence.

Opportunities for future advances will lie both within existing disciplines and in the spaces around and between them. Traditional disciplines are expanding rapidly and new ones are emerging. In order for the College to realize its maximum potential over the next 5-10 years, we must foster creativity, we must enable and value collaboration and interdisciplinary work, and we must build on and enhance our connections to the global research community. Penn State is ahead of its peers in recognizing, facilitating, and rewarding interdisciplinary work, and we will continue to exploit this strength. We will furthermore find additional ways to support and nurture the creative energies of our faculty and students.

A priority will be:

- Supporting centers/institutes/new research initiatives. We intend to make investments in a few vibrant research programs and centers in areas selected from a range of possibilities drawn from, e.g., biofuels, plant science, solar nanomaterials, multimessenger astronomy, neurodegenerative diseases, cancer, the search for life beyond our planet, the interface between nanoscience and biology, quantum manipulation, network science, quantitative biosciences, and stochastic science. In addition, further investments in programs or centers in areas of current strength will pay significant dividends.

Other specific initiatives include:

- Rewarding and supporting those who take the risks to go in new directions.
- Creating a vibrant environment in which multi- and inter-disciplinary research and teaching can thrive and be rewarded.
- Removing perceived or real barriers or disincentives to interdisciplinary work, such as teaching credit problems or issues with the promotion and tenure process.
- Establishing graduate degree programs which involve different departments and arise organically out of research subjects, with possibilities such as new graduate programs in Interdisciplinary Mathematics or in Quantitative Biosciences.

- Developing mechanisms to systematically foster joint projects, such as:
    - Formal joint seminars
    - Workshops
    - Seed grants
    - Funds for joint postdoctoral fellows – two or more advisers might propose a new area for work and use a postdoctoral appointment to explore the area and develop enough data to seek external funding.
    - Planning grants for large proposals involving multiple investigators.
- Maintaining access to highly talented students and researchers by further connecting with the international community. In part, we will continue to build on our relationship with Peking University and look for other strategic partners around the globe.
- Building a broader sense of intellectual community in the College to foster collaboration, new research, and general respect and appreciation for the work of others. The College will encourage and support activities such as:
    - Informal lunches, meetings, retreats and other occasions to stimulate interactions among faculty.
    - The celebration of accomplishment and sharing of success, perhaps in part through bulletins/newsletters containing short research summaries from publications.
    - Hosting influential or leading visitors from a broad array of disciplines.

8. Identify and marshal areas of strength around the College and work with others across the University to address global challenges.

For the Eberly College of Science to achieve its vision, it is necessary that we contribute to the resolution of some of the most significant challenges facing our nation and the world. Through its nearly 50,000 graduates, and through its discoveries and inventions, the ECOS has already contributed substantially to the economic and physical well-being of the nation and beyond. Today, while we so easily see the enormous benefits of science and technology for individuals and for society, we can also readily see where serious needs exist. In this country, there is much concern about retaining our economic and technological leadership and perhaps even remaining competitive. Around the globe there is a growing urgency to confront and solve global challenges such as hunger, disease, climate change, renewable energy, pollution, and more. Many current research programs in the College and at Penn State speak directly or indirectly to some of these challenges. For example, in the area of energy sources, plant biologists, microbiologists and nanoscientists are all working on different approaches to efficient fuel or energy production. Also, many research programs in the College work on understanding the nature, spread, and/or potential treatment of a number of different diseases.

Indeed, most of what we do in the ECOS connects to national and global challenges, for we need not only scientific and technological breakthroughs to address many of the challenges, but also highly trained scientists, leaders, and innovators to carry out the work and a population of individuals sufficiently knowledgeable about the issues to be able to participate in policy discussion and development and be active participants in implementing solutions.

Examples of current ECOS contributions to some global challenges include:

Challenge	Examples of ECOS contributions
Enhancing K-12 education	- Multiple K-12 science teacher professional development programs. - Interactive laboratory activities for urban minority youth. - Teacher workshops on evolution. - Action Potential Science Camps. - Planetarium visits for schoolchildren.
Producing more scientifically-trained leaders and innovators	- 800+ graduates annually. Outstanding discipline knowledge and laboratory skills instruction preparing students for a wide range of careers or advanced degrees. - Ongoing summer schools in astrostatistics in US, India and Brazil.
Enhancing public understanding of science	- Frontiers of Science Lecture Series. - Museum exhibits viewed by tens of thousands of children and adults. - Events for the public: Exploration Days, AstroFest, BioDays, etc. - Press releases appearing in hundreds of media around the world.

Hunger	- Developing stress resistant and drought resistant agricultural crops. - Studies on nutrition as related to starvation and protein malnutrition and how to improve adaptation and treatment of malnutrition.
Disease	- Identifying the causes of various cancers (e.g. breast, colon and brain), diabetes, obesity, and neurodegenerative diseases (e.g. Friedreich's Ataxia) and understanding the molecular, genetic and cellular mechanisms that contribute to these disease processes. - Investigating host-parasite interactions, characterizing and predicting the spread of pathogenic microorganisms through human populations in time and space, and determining how best to combat pandemics. - Developing treatments to combat deadly bacterial and viral diseases (e.g. Progressive Multifocal Leukoencephalopathy), cancer, diabetes, obesity, and neurodegenerative diseases through drug discovery, vaccine production, nutritional and behavioral modifications. - Understanding the mechanisms that contribute to the development of antibiotic resistance of bacterial pathogens (e.g. the etiologic agents of tuberculosis or staph infections), and identifying cellular structures that could be targeted by new classes of antibiotics. - Applying next-generation sequencing and gene amplification techniques to the discovery of emerging microbial pathogens.
Human Health	- Identifying the genetic, environmental and nutritional causes of growth defects. - Studying nutrition as related to starvation and protein malnutrition. - Working to understand the cause of Cartilage Hair Hypoplasia, a severe multi-systemic disorder that leads to dwarfism and immunodeficiency. - Investigating cellular processes (e.g. microtubule organization, dendrite growth and branching) that may influence mental retardation or contribute to potential recovery after stroke. - Unlocking the secrets of the human genome, the blueprint of life. - Employing the fields of comparative and functional genomics to better understand susceptibility to disease, and to apply this information to disease prevention and development of effective therapeutic strategies. - Enhancing the completeness and quality of biomedical databases using bioinformatics approaches.
Energy	- Oil reservoir depletion modeling. - Working to develop optimum sources of, and routes to, biofuels. - Developing efficient and inexpensive solar cells. Advancing the science of new kinds of solar cells based on nanostructured materials. - Working on biological extraction of energy from coal. - Developing tools and methods to speed the development of fuel cell catalysts. - Working on carbon sequestration technologies.
Environment	- Through study of animals now extinct, showing how important mammalian species can be maintained. Other studies on maintaining species diversity. - Developing tools for remediation of contaminants in soil and groundwater. - Understanding the impact of global climate change on life. - Modeling of forest fires.
Safety and Security	- Working on a vaccine for anthrax. - Understanding the potential for WMD based on infectious diseases. - Developing a "data security" minor with IST. - Partnering in a telescope that will give early detection of near-earth asteroids.

Plans include:

- Working with faculty to identify areas where the ECOS is best positioned to contribute to progress in addressing global challenges.
- Developing research programs in collaboration with other colleges and Penn State interdisciplinary institutes. Resolution of most of the challenges will require contributions from a number of disciplines.
- Providing seed funding for centers and/or particularly promising research programs.
- Partnering with the Penn State interdisciplinary institutes to hire new faculty with interests and expertise that will help build relevant research programs.

9. <u>Enter a new era in outreach with enhanced local and regional programs and a presence on the national stage, which will address the College's goal of enhancing public understanding of science and assist the University in becoming the leading innovative engaged institution of higher education in the country.</u>

In its vision statement, Penn State Outreach commits itself to "... aggressively advance the University as the leading innovative, engaged institution of higher education in the country." This vision is both appropriate and achievable, and it is our intention to work with that office and with others to assist in its realization. Many partnerships between Penn State Outreach and the ECOS are already in place and have achieved notable success.

Within the College, we expect that the recent reorganization and expansion of our Office of Outreach will propel us into the ranks of major players on the state and national outreach scenes. A new Director of Outreach (hired in January 2008) comes from the NIH where she advised federal agencies on STEM (Science, Technology, Engineering, and Math) education issues; presented national workshops on best practices in education; developed and evaluated outreach programs for the NIH and DOE; and provided feedback on STEM initiatives to the White House Office of Science and Technology and the National Science Board. She has been joined by our first Associate Director of Outreach and a Director of Summer Science Camps.

Our second focus comes from recognition of the expanding importance of online education: we intend to develop and deliver online courses and programs to meet the needs of domestic and global audiences, from pre-college students to adult learners. Noting the difficulties associated with delivering laboratory-based instruction online, our strategic approach to investing College resources focuses initially on the mathematical sciences. The College supported development of online programs in Statistics and is co-funding with the World Campus the new position of Director of Online Instruction in Mathematics. We anticipate the need to make further investments – alone or in partnership with the World Campus – in other College online programs, particularly in Astronomy, Physics, Biochemistry and Molecular Biology, and Forensic Science. Astronomy has already developed extremely popular online general education courses for resident students.

Specific initiatives include:

- Partnering within the Commonwealth to increase STEM education –
    - Become active participants in the PA STEM Initiative, created by the National Governor's Association, to increase the number of students (especially members of underrepresented groups) who are considering STEM careers.
    - Contribute to the statewide efforts on workforce development by retaining and retraining the current STEM workforce.

  - Enhance the educational benefits to underrepresented and disadvantaged populations, including the Upward Bound Math Science program.

- Providing national leadership –
  - Work with the National Defense Education Program to bring STEM science curriculum developers to collaborate with PSU faculty.
  - Participate in governmental advisory panels on STEM educational issues.
  - Present national workshops on best practices in outreach education.
  - Teach workshops and graduate seminars for the NIH on how bench scientists can be better educators and K-12 curriculum developers.
  - Host a national conference on 21st century workforce skills and adapting to a global workplace.
  - Develop short summer "science camp" programs for business leaders to showcase current and emerging technologies used in such areas as forensic science, nanotechnology, biotechnology, and astrostatistics.

- Working with colleagues at Penn State –
  - Support the World Campus in the Military Grant-in-Aid Pilot Initiative.
  - Design and deliver a new course "Scientists Teaching Science" to introduce undergraduates to the science teaching profession.
  - Pursue the development of World Campus courses that would be eligible to receive dual high school and college credit.
  - Work with the College of Education-housed Center for Science and the Schools (CSATS) to develop a research-based model of teacher professional development.
  - Partner with CSATS and the College of Education in an NSF GK-12 grant proposal for a program that will bring scientists, science teachers, and students together to improve STEM education.

- Working within our community –
  - Expand the Action Potential Science Experience science camps and redesign the curricula to match state and national science standards.
  - Continue to support the extremely successful Frontiers of Science Saturday morning lecture series.
  - Continue to provide stargazing and planetarium programs for schoolchildren and for the public.
  - Design and raise funds for a modern planetarium and visualization center in the Arboretum and dramatically improve planetarium offerings.
  - Produce museum demonstrations on our science and collaborate with "Discovery Space of Central PA" nonprofit agency to design an interactive science museum in downtown State College.

- Expanding the College portfolio in online education –
    - Provide incentives and training for faculty who wish to become involved in online course development and delivery.
    - Work with individual departments and programs and with the World Campus and e-Learning Cooperative to set realistic but expanded goals for the delivery of online courses to majors and non-majors at University Park and at the campuses.
    - Work with the World Campus to develop and offer online courses to pre-college and professional audiences.
    - Encourage all of our majors to experience at least one online course during their tenure here.
    - Initiate faculty-student quality control groups to ensure that the highest standards of quality are maintained by our offerings.

- Continue and extend the College's contribution to public information about science through the writing and distribution of press releases about new science results from the Eberly College of Science. Our press releases are regularly picked up and used as the basis for reports by dozens and not infrequently by hundreds of public media throughout the world.

10. **Continue to operate the College and its departments and programs in an efficient and fiscally responsible manner, making the most of the resources available while vigorously seeking additional resources.**

No matter what the financial resources available to the College over the next five years, we will need to be strategic in how we allocate those resources. For example, it will be critical to look for mechanisms other than linear growth in numbers of faculty to improve our educational programs and research accomplishments. Our progress over the past ten years shows us that much improvement can be made under conditions of constrained resources.

In some cases, investment in one initiative will need to cease in order to free up resources for a new, high-potential initiative. Collaborations across colleges and institutes will be a key mechanism for leveraging investments in people, in equipment, in space, etc. Administrative efficiency will be essential to keeping up with increasing activity.

All our stakeholders need to have confidence in our ability to use resources wisely and efficiently.

Specific plans:

- Maximize student success in every course; reducing repeat enrollment saves both the student and the College money.
- Develop new administrative tools and processes to simplify and streamline tasks; share across departments and units wherever possible.
- Hire carefully and strategically. Maximize the probability of success of each new faculty member to minimize total start-up expenses.
- Support and facilitate activities that create new sources of income for the departments and the College.
    - Explore World Campus opportunities for offering popular courses.
    - Develop Professional Masters degree programs in a way that provides financial incentive for the department or College and the University.
    - Explore opportunities for developing on-line certificate programs.
- Support and facilitate activities that free up resources for the departments and the College. Potential areas include:
    - Visa processing.
    - Promotion and tenure dossier preparation.
    - Grant budget management.
- Centralize some aspects of the College's computing environment and combine services that may be redundant. Management of the network, firewalls, and IP

address assignments will be centralized over time. A central file server will be made available to all departments. The centralized College network support will drive and facilitate IPAS compliance, reduction in redundancy in hardware, and minimization of diversity among desktop systems for efficiency of set up, maintenance, and training. Also centralize a College web server, migrate all sites to WebLion, and develop database tools as needed for use across the College. Invest wisely and conservatively; replace items centrally when departmental equipment is obsolete. Develop a savings account to be ready for big equipment expenses.

- Be more active in supporting and encouraging entrepreneurship and licensing technology.
- Be more aggressive and creative in obtaining industrial support.
- Support our development officers in their quest to realize the plans laid out in our development case statement. Provide broad participation from our department heads, faculty and administrators in the task of securing private support for the College.
- Reduce financial risk wherever possible.
    - Work with OSP to develop processes that require small companies to pay before sponsored work is performed. Have tighter controls on over-due invoices.
    - Comply with IPAS to reduce the risk and accompanying financial vulnerability that comes with security breaches.

Resources

Across the University, we share a great responsibility and enormous opportunity – to enrich lives, improve society, and address the challenges facing the nation and the world. The strategic plan outlined in this document is broad and ambitious. Its actions speak directly to enhancing the Eberly College of Science's central role in addressing the national needs to sustain our scientific and technological leadership, engage the next generation in science-based careers, continue to attract the best and the brightest from around the world, and elevate public understanding of science.

The plan impacts all major areas of the College's portfolio of activities, yet it is selective and detailed in identifying areas of need and opportunity. The actions will further the growth in excellence and accomplishment, very visibly and substantially enhance academic support for students, promote excellence in teaching and learning for all students, provide significant curricular and co-curricular enrichment, support an increase in the quality and diversity of our students, staff and faculty, and boost an ambitious outreach program.

The connections and synergies among the various parts of the plan multiply the impact of each part. The collective effect will be transformative. The resources needed to enable these actions are also very substantial. However, they are within reach with a combination of new general funds, redirected College funds and income from annual gifts and endowments to be raised. As shown in the table below, the total additional annual budget needed to implement the plan is just over $7 million. A 5% increase in the College's general funds budget and redirected College funds together will provide about $3.5 million, and we look to endowment income and annual gifts to provide another $3.5 million. In addition to what is shown in the table, we have a very ambitious target of six additional department head chairs in the current fundraising campaign. When established, those chairs will provide discretionary funds for departments that can be used for educational and research initiatives and will also support the objectives of the plan.

Our development priorities as outlined in the College campaign case statement are fully integrated with this plan. However, we recognize that getting commitments from benefactors will take time, and there will frequently be a substantial interval between the time a benefactor makes a commitment and the time endowment earnings are available for use. Hence, the resource plan directs general funds to high priority uses and to areas that are not as amenable to being supported by external fundraising. Implementation of the plan will be directed by a balancing of priorities with our successes as the development campaign proceeds.

Resource plan with a 5% general funds increase:

Purpose	Estimated annual expense in $K	New general funds	Redirection of College funds	Income from endowments and annual gifts	Justification from the Strategic Plan
Undergrad Education					
Scholarships - financial need, merit, and honors	1,150			1,150	Improve access, recruitment, retention
Improve academic advising	50	50			Improve retention, success and climate
Create a Student Academic Support Center (one time renovation)				5,000	Co-locate and enhance student services to improve recruitment and retention
Director of CESE – salary plus program support	200	100	50	50	Improve teaching and learning, esp. in Gen Ed and introductory courses
Staff support for CESE	40	40			Improve teaching and learning, esp. in Gen Ed and introductory courses
1.5 Instructional Designers for e-learning	80	55	25		Improve e-learning; increase number of on-line courses
Instructor to oversee / coordinate retention activities and tutoring / collaborative learning	60	30	30		Improve undergrad retention, climate and success, especially students from URG
4 TA lines and GIA's to support tutoring and collaborative learning	150	70	80		Improve undergrad retention and success, especially URG
Support for International experiences	100	50		50	Train leaders; support more students having an international experience
Marketing Position	65	65			Enhance recruitment of students and reputation
Career Information Coordinator	40	40			Enhance retention by making students aware of career opportunities
Expanded undergraduate research opportunities	200	50	50	100	Train leaders; Improve retention by engaging students in research and giving them a home in a research group
Expanded Co-op/internship opportunities	50			50	Train leaders; Improve retention by engaging students in real work experiences
Support for students interested in careers in K-12 education	100			100	Enhance recruitment, retention; contribute to the national need
1 FTE instructor - workplace skills, ethics, leadership skills, new GenEd courses	50	25	25		Train leaders; Enhance retention by teaching workplace skills, ethics; new Gen Ed courses
Undergrad Education subtotal	2,335	575	260	1,500	

Graduate Education					
Increased stipends for all TA's ($2000/TA)	650	650			Improve quality of incoming students with competitive stipends
20 Distinguished graduate fellowships	250			250	Improve quality of incoming students with competitive stipends
20 named grad assistantships	200			200	Improve quality by more competitive stipends
Support for International experiences	50	50			Train leaders; create more opportunities for international experiences
Provide better career information (see Undergrad Ed)					Make students aware of career opportunities
Teach workplace skills, leadership skills and ethics (see Undergrad Ed)					Train leaders; workplace skills, ethics
Graduate Ed subtotal	1150	700	0	450	
Research					
5 senior faculty lines	900	450	450		Support interdisciplinary work; global challenges
5 staff assistant positions	175	110	65		Improve faculty productivity; reduce administrative load lty
Venture/seed funding; global challenges	300		100	200	Support risk-taking; foster creativity; support inter-disciplinary research; support addressing global challenges
Interdisciplinary post-docs - 4/yr at $50K each	200	50		150	Foster creativity; support inter-disciplinary research
Funds to foster/support center and institute activities	300	50		250	Confront global challenges; Invest in centers and institutes
8 Endowed professorships	400			400	Retain outstanding faculty
6 Career Development Professorships	150			150	Recruitment of outstanding faculty
Enhance the intellectual environment in the college	50			50	Foster creativity, synergy, interdisciplinarity; enhance climate
Research subtotal	2475	660	615	1200	
Outreach					
Support for k-12 summer camps	50			50	Enhance K-12 education, attract students to STEM
Support for Frontiers in Science Lecture Series	15			15	Enhance public understanding of science
Support for a new planetarium (one time construction expense)				6,535	Astronomy is a flagship outreach activity; new planetarium enables greater impact
Support for new outreach programs	85			85	Enhance K-12 education, enhance public understanding of science
Outreach subtotal	150	0	0	150	

Climate and Diversity					
Departmental equity officers (support funds & travel)	70	35	35		Enhance diversity, respect, success of individuals from underrepresented groups
Minority student fellowship support	600	250	100	250	Increase diversity of our graduate students;
Climate and Diversity subtotal	670	285	135	250	
Centralize IT support					
IT Director position	90	90			Lead College IT
Central Network/Sys administrator	60		60		Centralize college network support, IPAS compliance, reduce redundancy, minimize diversity of desktop systems for efficiency
Central web and database design	60		60		Centralize college web server, migrate all sites to WebLion; develop database tools as needed.
Hardware budget	50	25	25		
IT subtotal	260	115	145	0	
TOTAL ADDITIONAL ANNUAL BUDGET	7,040	2,335	1,155	3,550	Additional annual budget required to accomplish all items
ONE TIME INVESTMENT				11,535	Construction and renovation expense for the Student Center and for the Planetarium

Supporting information for this resource plan:

Since we teach so many service credit hours, improvements in the success of students and retention in our entry level courses will have a major impact across campus. Although mathematics is perhaps most often mentioned as the discipline which gives first-year students trouble, many of the entry level courses in the College cause some students to stumble. We propose creation of a **Center of Excellence in Science Education and request funding for a director of the Center and a staff position**. The major responsibilities of this Center will be to work with the faculty to explore and implement improvements in teaching and learning, with an emphasis on foundation, developmental and general education courses. The Center will also oversee and facilitate pedagogical research, seek funding support for new pedagogical initiatives, facilitate linkage and sharing among departments, and act as our liaison with other teaching and learning initiatives across the University and beyond.

As an integral part of improving the quality of education and of improving retention in the College, we propose to institute a system of tutoring and collaborative learning opportunities in the College. This function will be housed in our new Student Academic Support Center in Ritenour Building. **We request half the funding to support an instructor or lecturer to direct the effort and for four TA lines to fund graduate students to provide tutoring and collaborative learning support in the center**. We will look for TAs who are especially talented and committed to student learning for this initiative. In accord with the tutoring and collaborative learning initiative, we propose a concerted effort to improve retention in the Eberly College of Science. The director of collaborative learning will head up a team of individuals from across the College dedicated to improving retention in the College. Although 100% retention is clearly not the right goal, since many students simply find other areas of interest, it is important for the health of the College, the University, and the nation as a whole that we encourage and support student interest in and passion for the basic sciences.

A frequently cited reason for students' lack of persistence in science and math majors is "that American students find careers in science and engineering of 'limited attractiveness.'"(from an article in the Chronicle of Higher Education, June 6, 2008). To address this issue, **we request funds to create a career information coordinator staff position** to be housed in the Student Academic Support Center. This individual will gather information from our alumni and from companies that recruit scientists and provide information to students about a wide range of employment opportunities and career paths that are available to scientifically-trained professionals. This individual will also be asked to help support a new "Careers in Science" seminar series where our alumni will talk with our students about careers enabled by science degrees.

One of our main goals is to graduate, either with the BS or with the PhD, individuals who are equipped to be leaders in our society. To this end, we will add opportunities for learning workplace skills, for integrating ethics education into our curricula, for substantive international experiences, for leadership training, and for more undergraduate research opportunities. To support these initiatives, **we request funding for half of an instructional faculty member to develop the various offerings and partial funding to support an increase in the number of undergraduates we can provide with research opportunities.**

E-learning will play a role in several aspects of our plan. Students should be exposed to some online education during their college years; it will likely be an important means by which they will keep themselves current in their adult lives. We expect that the online enhancements to some of our courses will help improve student success and retention. E-learning might also be an effective means of augmenting an engagement with ethics or to offer the members of the College community diversity programming. E-learning will also be an important part of our College outreach initiatives. **We request funds to support one instructional designer.** Redirected College resources will provide additional support.

Our goals in graduate education center on improving the quality and diversity of our students and on improving the student experience and success rate. To this end we **request funds to increase TA stipends so that we can more effectively compete with our peer institution for high quality students**. At present, we are generally $2,000 or more below our peers in annual TA support. **We also request funds that we will combine with College and endowment funds to support additional graduate students who are members of underrepresented groups**. For minority students, we need to provide a minimum 2 years of fellowship support as they start their graduate careers; many universities offer five years of fellowship support. Graduate students also want more career information and experiences that will equip them to be leaders. Any programs offered for our undergraduates students will be made available to our graduate students as well. **We request some funding to allow us to offer more international experiences for our graduate students.**

Attracting outstanding students and others to the college requires telling our story well. We also see that the success and satisfaction of individuals already in the College is enhanced through excellent communication. To these ends, **we request resources to create a marketing position in the College**. The individual in this position will be responsible for giving us a professional face on many fronts: marketing undergraduate offerings, academic and extra-curricular, to recruits and to enrolled undergraduates with a goal of improving the number and quality of applicants and of improving undergraduate retention and success in the College; marketing our graduate programs with a goal of improving the number and quality of applicants and paid accepts; marketing our

intellectual achievements to members of the ECOS community; fostering awareness of research thrusts, centers and institutes across the College and PSU; adding to the intellectual environment of the College; marketing our conferences and workshops to the broader science community; and marketing our outreach activities to K-12 audiences and to the general public.

Although we are certainly not in a position to grow research accomplishments and reputation simply by growing the number of faculty members, we are poised to make a significant difference through the careful hiring of a few, select individuals who can provide leadership and facilitate interdisciplinarity. We are seeking to bring in five new senior hires. Each hire will be overseen by a cross-disciplinary faculty advisory committee in the College. The goal is to bring in people who can contribute to addressing global challenges and fostering creativity and who can lead interdisciplinary efforts, including submission of training grants and center-level grants. These individuals should have a track record of leadership, mentoring, and working in interdisciplinary research. Other hiring in the College will be made possible by natural turnover and will be done in concert with these new positions where appropriate. **We request half of the salary funds needed for these 5 senior positions.** The other half will come from a combination of College, department, and institute contributions.

In the process of preparing this strategic plan, in engaging our faculty and staff in discussions about the future of the College, and in discussing issues of climate broadly across the College, it has become clear that our staff members across the College are overloaded. We already have initiatives underway to reduce workload and add staff positions in a few places around the College. At the same time that this information is crystallizing, we are also seeing that the administrative, service, and even clerical loads on our faculty are increasing. It has become clear that in some cases the best thing we can do to enhance productivity and enable excellence is to add staff positions in support of our faculty. Typically one staff person can support five to ten faculty members depending on the nature of their work. Thus, **we request partial funding for five staff assistant positions to support clusters of faculty most in need of that support to improve teaching and research productivity and enable excellence.**

Fostering creativity and new interdisciplinary activity are goals in our plan. We want to facilitate and encourage submission of center-level proposals and training grants. One effective way to facilitate risk-taking and promote interdisciplinary research is to fund a postdoc to work in the new area, generally with advisors from more than one discipline. The postdoc can help generate enough data and knowledge to provide the base of a competitive proposal for external funding. Therefore, **to foster creativity, risk-taking, and new interdisciplinary work, we request funding for a postdoctoral position which would be competed for by teams of two or more faculty from across two or more**

disciplines. We will seek to fund three similar positions with endowment funds so that the College will have four such positions active at all times.

One of the major initiatives of the College is to create a more diverse community. We will increase the diversity of our student body, our graduate students, our post-docs, our faculty and our staff. This kind of progress does not come by accident. Recruitment is only one part of the puzzle; it is equally important to have a welcoming, inclusive and supportive environment and to have mechanisms and processes in place to support and mentor these individuals. **We request funding to support an Equity Officer role for a faculty member in each department with possibly some modest supplemental income, but certainly funds for training, travel, and the like**. This individual will become knowledgeable about the literature on gender and race issues, will be an advocate for diversity in recruitment and hiring decisions, will be a resource on proper process and weighting of contributions at P&T time, etc. This kind of position has been used with success at other institutions.

Finally, a recent audit of IT in the College pointed clearly to the need to begin some centralization of IT structures in the College. **We request funding for an IT Director position in the College and for some on-going equipment funds.** We are also redirecting some College funds to support other central IT positions.

Other Resource Scenarios:

Recycling 1% of the budget each year:

Over the past decade, we have managed our recycling through a combination of reductions in the discretionary budget for the College (the "College support budget" which is used to fund start-up packages, educational initiatives, staff positions for the Dean's Office, etc.), elimination of departmental allotment budgets, reductions in staff positions, and many smaller reductions in other areas. Recently, some departments have found it necessary to return funds for tenure-line faculty positions. To compensate for the reduction in the College support budget and still do hiring and retention, the College fully committed its one-time discretionary funds that were intended to be seed funding for new initiatives.

Today, most of our departments have no departmental allotment funds left. They rely on salary savings and Research Incentive Funds to pay expenses. Departments cut up to three staff positions to contribute their share of the recycling. Those and other cuts have been hard on morale, and we have come to see that the departments are having a difficult time functioning at the reduced staffing level. The College has allocated some funds to replace a few staff positions in the departments. Most departments continue to feel understaffed.

Looking forward, if we had to recycle 1% of our budget each year with no compensating budget increases, we would have to do it primarily through the elimination of tenure-line faculty positions. Assuming an average junior faculty salary of $75K in 2009, 5 years of 1% recycling would imply a reduction of something like 30 junior positions. Some of these faculty positions would be replaced with instructors, and hence more tenure-line positions would have to be eliminated to reach the 1% requirement. Increased earnings through the World Campus might be able to offset some of the reductions for some departments, possibly growing to as much as one or even two year's recycling. Increased annual gift funds and endowment funds for some activities might be used to replace some general funds, but these would be limited, since endowments do not generally pay for core salaries or regular College operations. New endowment funds would allow us to carry out some of the actions in this plan, including increased scholarships and fellowships, support for international experiences, some venture funding for research, and faculty support through professorships. The College carries out internal recycling of faculty salary funds which would allow some continued ability to respond to opportunities and to develop initiatives. We would, of course, continue to work with the Penn State interdisciplinary institutes and other colleges. The challenges would be very large, given that our costs for faculty hiring and infrastructure have been increasing rapidly and would be difficult to handle even with no recycling. In any case, we would retain our commitment to excellence, including always offering competitive salaries and startup packages to new faculty, and would look for ways to become better while becoming smaller.

Recycling of 1% with half the funds returned to the College:

Assuming that we would make the same reductions in tenure-line faculty numbers as with no return of recycled monies, the return of half of the recycled funds would allow some investment in other initiatives in this plan in addition to those funded through development such as the ones described immediately above. Top priorities for the returned funds would be the establishment of the Center for Excellence in Science Education and increased stipends for graduate teaching assistants.

Recycling of 1% with all of the funds returned to the College:

This scenario would allow maintaining close to our current level of faculty and staff positions while funding some of the initiatives in this strategic plan. Again, our top priorities would be the Center for Excellence in Science Education and increased stipends for graduate teaching assistants. However, in the present environment, with the ever-increasing size of competitive startup packages and the ever-increasing demands for infrastructure to support research (clean rooms, bio-safety laboratories, advanced NMR's and DNA sequencing instruments, new greenhouses and plant growth chambers, etc.), even level funding means that sustaining the same numbers of faculty and staff will be a big challenge. Under this scenario, we will continue to exercise the discipline of recycling and look for administrative and other efficiencies wherever we can. Under any of the scenarios, we will be as aggressive as possible to ensure success of our development campaign. Private support and income through the World Campus and related kinds of educational outreach provide opportunities for increasing income and for investment in the strategic plan initiatives.

Conclusion

The Eberly College of Science has been a highly responsible steward of University resources. The College has accomplished great things and is poised to do even more. In the highly competitive academic environment and constrained fiscal environment in which we operate, continued effort is necessary to sustain and build on the gains. A significant infusion of resources is necessary for us to follow through on the actions laid out in this plan. The success of our development campaign will be essential in realizing the exciting future that we see for our College. Similarly, careful stewardship of every dollar will be essential. The future holds great promise, and this plan provides guidelines for realizing that promise.

Appendix I: Learning Outcomes Assessment

The Eberly College of Science was selected by the University to pilot the assessment plan for student learning as recommended by the Middle States Commission on Higher Education after its accreditation review of 2005. The college began in fall 2007 to hold regular meetings of departmental assessment chairs, ECOS Academic Advising Center staff, and dean's office personnel. These meetings and subsequent discussions resulted in timely development of assessment vehicles for program objectives linked to courses in all ECOS major degree programs. A sampling of the proposed initiatives that resulted from the learning outcomes assessment process follows.

- Expanding the range of online astronomy offerings from Astro 001, 010, and 011 to other courses.
- Using the Pollock computer test facility, initiate pilot projects to deliver "concept inventories" to determine ways to deliver assessment questions to students in the large introductory courses in Physics.
- Maintaining portfolios of student work in Chemistry.
- Reorienting first and second year coursework in Biology so that students will acquire an overview of the discipline from molecular, cellular, genetic, organismic, community, and evolutionary perspectives.
- Requiring Biochemistry and Molecular Biology students to critique cases of ethical conduct in the sciences with particular emphasis on the field of molecular biology.
- Developing and testing a mastery-based approach to college algebra which offers students multiple paths to success.
- Implementing a course mentoring system in Statistics in which each faculty member in the department is assigned two courses as a designated mentor.
- Expanding the opportunities for non-majors to take coursework introducing them to the foundations of Forensic Science.
- Reformulating the major in general science to include options closely coupled to the professional workplace (examples: science and intellectual property law, science and public policy, science and business, science writing, science outreach, science and international studies, etc.).

Appendix II: Results of the 2008 Climate and Diversity Survey in the ECOS

Introduction:

The Eberly College of Science strongly supports the imperative of a community that is richly diverse and seeks to provide an environment of mutual respect among individuals of all backgrounds and among individuals holding differing perspectives and ideas. We strive to have a climate supportive and welcoming for everyone, including those of diverse cultures, racial and ethnic backgrounds, differing sexual orientation, religious beliefs, and physical disabilities. The ECOS also strives to promote equal access to education and equal success and graduation rates for all constituent groups including minorities, women, and others who are under-represented in the ECOS disciplines nationally. To this end, we believe that the ECOS can and must make a contribution to enhancing the participation and success of individuals from groups historically underrepresented in the mathematical, physical, and life sciences. This commitment drives our recruiting and retention efforts for minorities and women at all levels, from undergraduates through senior faculty.

In this plan, we build on a foundation of improving and enhancing climate across the College and on increasing representation of individuals from underrepresented groups (URG, defined as underrepresented racial, ethnic, religious, sexual, gender, disability, age or international status). Our College strives to be welcoming and inclusive as we are all enriched, and better prepared for the future, by working and learning in a diverse community.

Climate Survey Spring, 2008

A climate survey of all faculty, staff, and students in the College was conducted during the Spring semester, 2008. The survey was conducted by the Penn State Center for the Study of Higher Education. The survey focused on the climate in the ECOS for individuals from underrepresented groups, but some questions probed general work environment, inter-personal relationships and climate issues. The total response rate was 24% (students=21%; faculty=35%; staff=66%). Eight percent of respondents reported experiencing conduct that interfered with their ability to work and/or learn in the College, most often as being deliberately ignored or excluded or as being intimidated or bullied. This conduct was most likely to occur within positions (staff on staff, student on student). Faculty, however, were most likely to report undergraduate students as the source of the conduct. Seventy-nine percent of respondents reported being “very comfortable” or “comfortable" with the general climate within the College. Most rated the climate as respectful for individuals from underrepresented groups; the climate for members of the LGBTQ (Lesbian, gay, bisexual, transgender, queer) community was rated lowest. The quality of teaching and

learning in the College received some negative comments stemming from the impersonal nature of some courses, a perception that teaching is not valued in the College, and frustrations with perceived communication barriers between students and non-native-English-speaking instructors. Some respondents made a point of praising the educational experience in the College while others reported frustration with the pace of change in the College. Some respondents reported being afraid to speak up due to fear of retaliation. Respondents had very mixed views on both the value and efficacy of the survey and the value and efficacy of the diversity programs and emphasis on diversity in the College. Some respondents felt that any new diversity programming in the College should include a focus on issues relating to country of origin. Generally the mixed responses to issues relating to fostering and supporting diversity in the College indicate that "diversity-related programming should encourage majority populations to appreciate the benefits of diversity and recognize their positions of privilege." [Quoted from the final report on the survey, which can be found at http://www.science.psu.edu/diversity/climate/index.html]

Activities planned in response to the results of the survey:

We will continuously improve the climate for building equity and community across the College. We will:

- Retain key activities which have proven to be effective, (e.g., College and department climate and diversity committees, annual distribution of the diversity brochure, Race Relations Project in all first year seminars).
- Conduct periodic climate surveys.
- Respond to the 2008 survey findings:
    - Address issues of reported conduct that affect community members' ability to work and/or learn.
    - Raise awareness of behaviors that affect community members' ability to work and/or learn.
    - Raise awareness of issues and concerns for members of the LGBTQ community.
    - Develop diversity-related programming that encourages majority populations to appreciate the benefits of diversity and recognize their positions of privilege.
    - Recognize and reward those who work to improve the climate.
    - Mentor supervisors on specific initiatives designed to increase the level of respect among employees in each work area.
    - Increase inclusion of staff and non-tenure-eligible faculty in the life of the departments and the College in planning, decision making, problem resolution, and celebrations.

- Develop a follow-up assessment to probe issues of workplace climate for staff/faculty and educational setting issues for faculty/students.
- Increase the numbers of staff members from underrepresented groups.
- Continue our focus on fostering a family-friendly environment.

As a result, in the coming years, we will:

- See increased support and understanding for the need to improve the climate in the College for all students, faculty, and staff.
- See improvement in the climate for working and learning across the College.
- See support and encouragement for every member of the College to reach the highest level of intellectual achievement and personal and professional growth.

Appendix III: Strategic Performance Indicators

The following measures will show our progress in achieving our goals:

Action 1: Enhance the undergraduate major experience and position students to become the scientifically-trained leaders of tomorrow.

1.1 Retention statistics including number, quality at entry and diversity of graduates (Quality at entry data will be gathered)
1.2 Participation in Co-op, study abroad, and externship programs
1.3 Track leadership training, career training and other new programs (new initiative; data to be gathered)
1.4 Student satisfaction survey results
1.5 Post-graduation survey results (new initiative; data to be gathered)

Action 2: Continue to increase the numbers of undergraduate students who apply for admission to the Eberly College of Science and further encourage those admitted to matriculate.

2.1 Number, quality and diversity of applicants
2.2 Number, quality and diversity of paid accepts
2.3 Number of Schreyer Scholars coming to the ECOS

Action 3: Improve the educational experience of students across the University who enroll in our courses to fulfill general education requirements or to build foundations for their majors.

3.1 Enrollments and success rates (% at A, B, or C) of all developmental, general education or entry-level (100's and 200's) courses in the College. (new imitative; data to be gathered)
3.2 SRTE scores for those same courses (new initiative; data to be gathered)

Action 4: Enhance the quality and diversity of our graduate students and provide those students with the research experiences and additional professional preparation that will set them on track to move up to leadership positions in a range of occupations.

4.1 Quality and diversity of applicants, of those admitted and of matriculants
Note: Data presented are from the Graduate School records. Typically only students who are accepted into departmental programs apply to the Graduate School. The ECOS will begin to collect data on our applicants, those who are admitted, and matriculants separately.
4.2 Post graduation survey results
4.3 Benchmark data on graduate student stipends

Action 5: Provide support and encouragement for every member of the College community – students, staff and faculty - to reach the highest levels of intellectual achievement and personal and professional growth.

5.1 2008 Climate survey results (See Appendix II)
5.2 Results of a new survey tool developed based on learning from the 2008 survey (new initiative; data to be gathered)
5.3 Diversity metrics for staff

Action 6: Extend our progress in improving our departments by promoting the success of our faculty and by recruiting outstanding new faculty members, with extended efforts to increase the diversity of the faculty.

6.1 H – indices and supporting data
6.2 Number of Evan Pugh, National Academy and Royal Society members
6.3 Departmental rankings as available from a variety of sources
6.4 Diversity metrics for faculty
6.5 Metrics on success to tenure

Action 7: Enhance the creative environment in the College and support the highest levels of intellectual achievement within and across the disciplines.

7.1 Numbers of interdisciplinary proposals
7.2 Interdisciplinary funding as a percentage of the total College funding
7.3 Results of a faculty survey asking about the creative environment and support for intellectual achievement (new initiative; data to be gathered)

Action 8: Identify and marshal areas of strength around the College and work with others across the University to address global challenges.

8.1 A record of new initiatives, successes and contributions

Action 9: Enter a new era in outreach with enhanced local and regional programs and a presence on the national stage, which will address the College's goal of enhancing public understanding of science and assist the University in becoming the leading innovative, engaged institution of higher education in the country.

9.1 Measures of K-12 impact in schools
9.2 Measures of K-12 impact here (camps, visits, etc)
9.3 Measures of public engagement here or via programs developed here
9.4 Measures of public engagement via the popular press

Action 10: Continue to operate the College and its departments and programs in an efficient and fiscally responsible manner, making the most of the resources available while vigorously seeking additional resources.

10.1 Development income
10.2 Total external funding
10.3 Industrial and foundation funding
10.4 Income from technology transfer activities
10.5 Other income to the College and the departments

Action 1: Enhance the undergraduate major experience and position students to become the scientifically-trained leaders of tomorrow.

1.1 Retention statistics including number, quality at entry and diversity of graduates

Retention study of first-time Fall 1998 degree-seeking Undergraduate Students

Fall 2004 Status by Initial College of Eberly College of Science at University Park

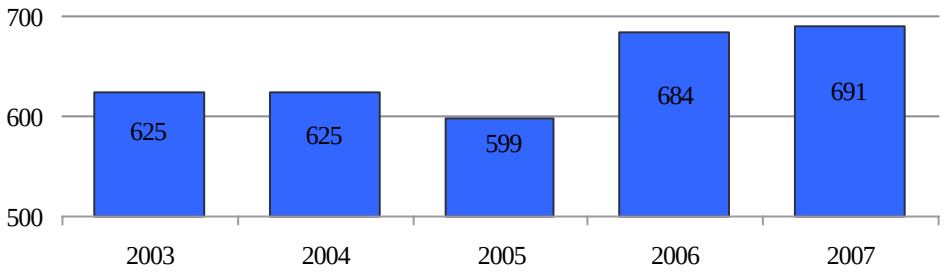
# of Fall 1998 First time, Fulltime Degree-Seeking Students	%Graduated by Fall 2004 in Initial College	%Graduated by 2004 Not in Initial College	% Enrolled Fall 2004 in Initial College, Did Not Graduate	%Enrolled Fall 2004 Not in Initial College, Did not Graduate	% Not Enrolled Fall 2004, Did not Graduate
686	49%	37%	0%	1%	12%

Graduating College for Students who Graduated Outside Their Initial College of the Eberly College of Science at University Park as Initial Campus

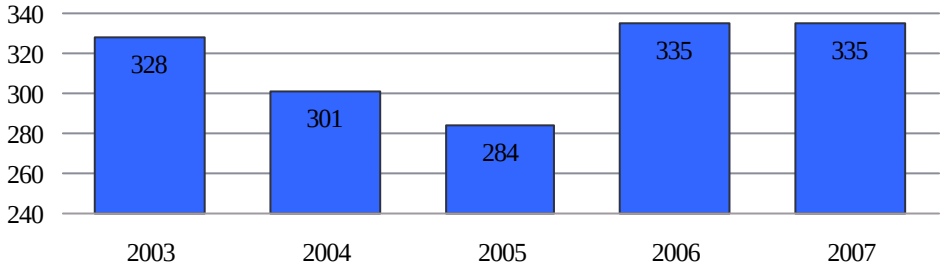
Abington College	0.2%
Agricultural Sciences	0.7%
Arts and Architecture	1.5%
Behrend College	0.4%
Commonwealth College	0.2%
Communications	2.3%
Earth & Mineral Sciences	0.2%
Education	3.2%
Engineering	5.5%
Health & Human Development	10.5%
Liberal Arts	8.8%
Smeal College of Business	5.8%
Total % Graduating In Different College	37.5%

Eberly College of Science
Baccalaureate Degrees Conferred – Number and Diversity

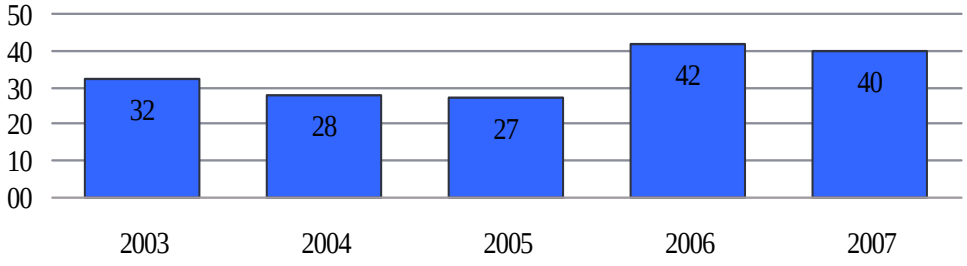
Baccalaureate Degrees Conferred



Baccalaureate Degrees Conferred to Women

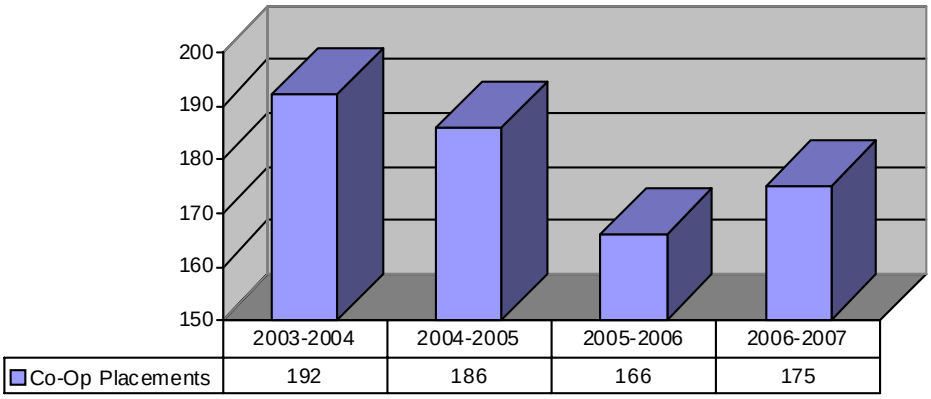


Baccalaureate Degrees Conferred to Students from Underrepresented Minority Groups

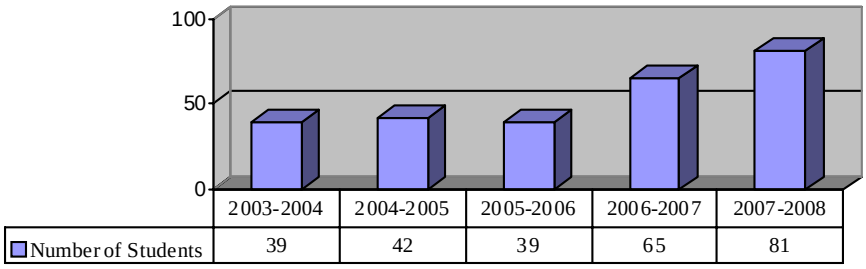


1.2 Participation in Co-op, study abroad, and externship programs

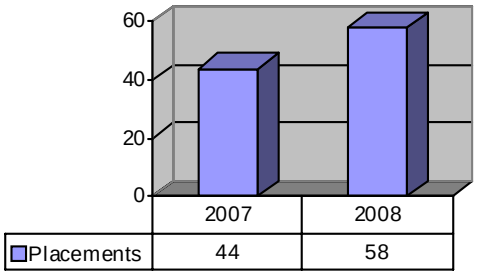
Co-Op Program



Study Abroad



Externships



*****_The summer externship program began in 2007_

1.4 Student satisfaction survey results

2007 Penn State Student satisfaction Survey

Number of Eberly College of Science respondents was 291.
Number of Penn State University, University Park respondents was 3,304.

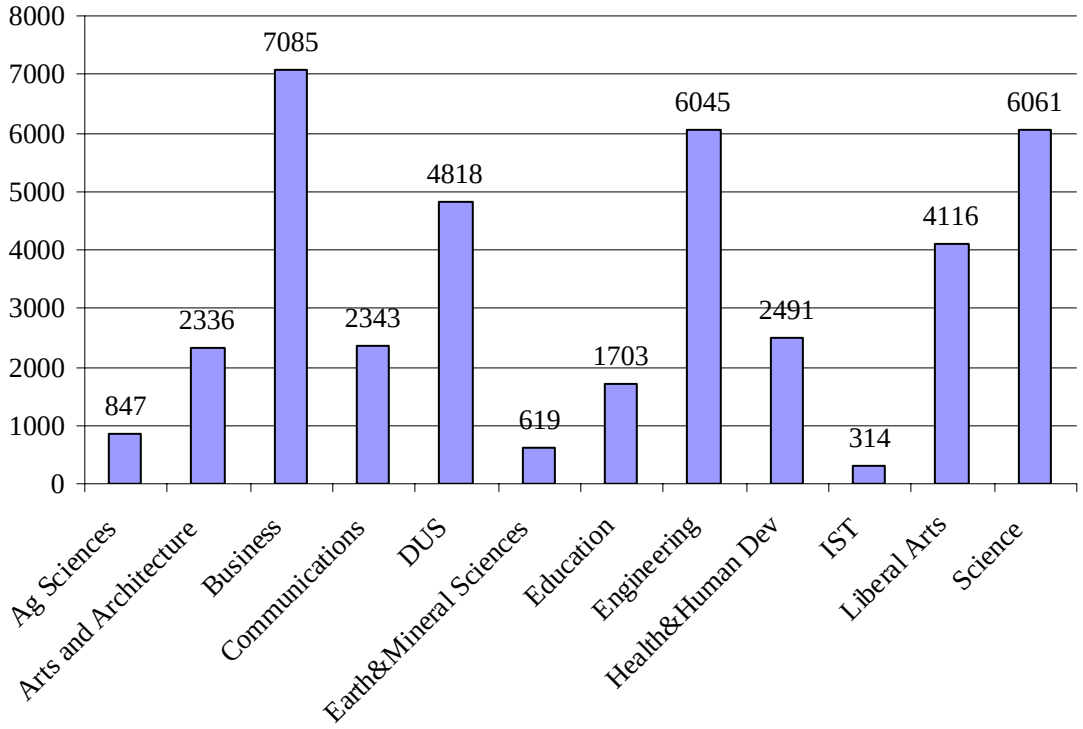
1 = Very dissatisfied
2 = Somewhat dissatisfied
3 = Neutral
4 = Somewhat satisfied
5 = Very satisfied

	Eberly College of Science	**University Park**
How satisfied are you with the overall quality of your:	Mean	Mean
Formal academic experiences?	4.20	4.27
Your sense of belonging at Penn State?	4.05	4.17
How satisfied have you been at Penn State with:		
The quality of teaching?	3.87	3.96
The quality of academic courses you've taken?	4.08	4.06
The quality of your classroom/lab facilities	4.03	4.10
Your opportunity to participate in an independent research project with a faculty member	3.60	3.36
Your opportunity to participate in a Penn State study abroad program?	3.68	3.70
Your opportunity to participate in a Penn State approved Co-op, internship, or student teaching experience?	3.66	3.65
The courses you have taken in your major or field of study?	3.95	4.13
The availability of courses to make progress toward your degree?	3.98	3.86
How satisfied have you been this past year with the:		
Accessibility of your academic advisor (e.g., by e-mail, phone, office hours, and/or appointments)?	3.94	3.93
Information and/or referrals your advisor provides to help you make informed decisions?	3.64	3.69
Overall quality of your academic advising?	3.71	3.76

Action 2: Continue to increase the numbers of undergraduate students who apply for admission to the Eberly College of Science and further encourage those admitted to matriculate.

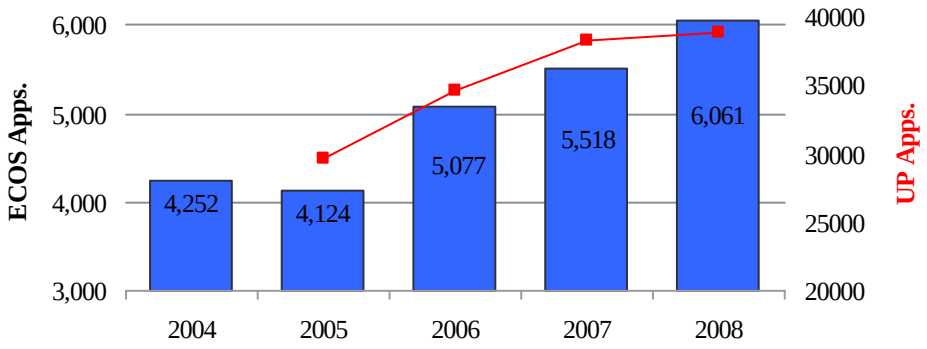
2.1 Number, quality and diversity of applicants

University Park Applications for Admission, Week 30 of 2008

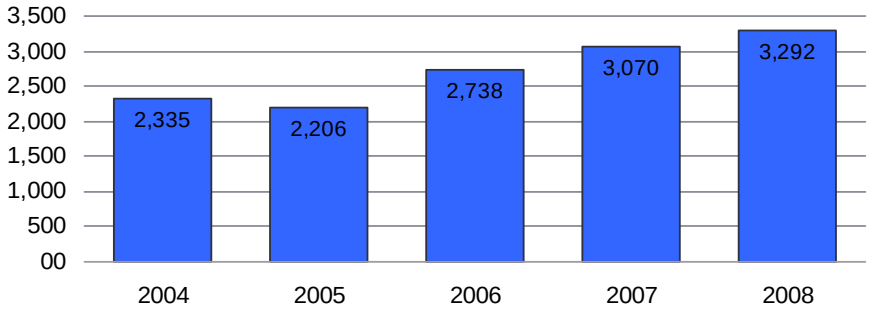


2008 Undergraduate Applications: Numbers and Diversity

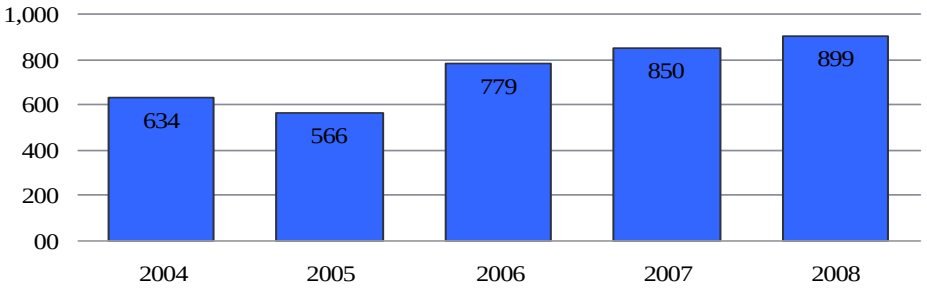
ECOS and UP Admissions Applications, Week 30



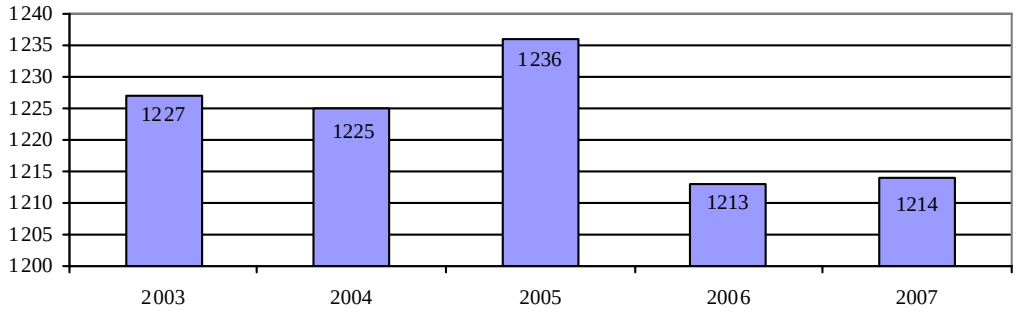
Applications from Women, Week 30



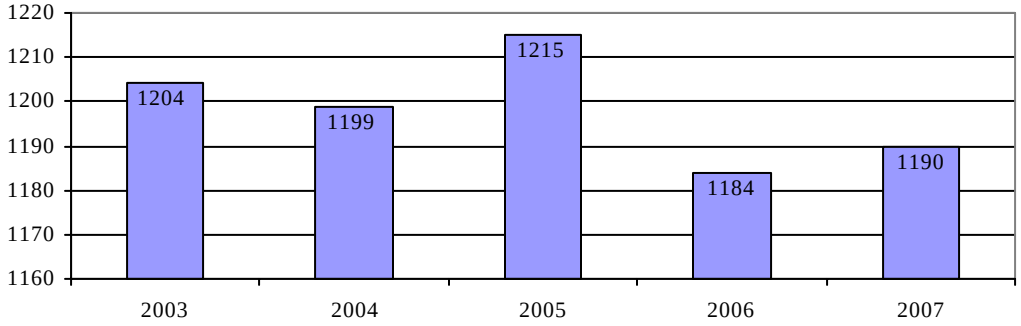
Applications from Underrepresented Minorities, Week 30



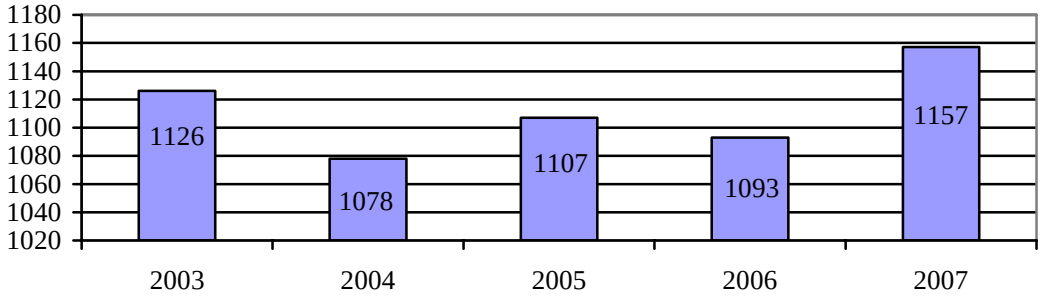
Average Total SAT of All Applicants



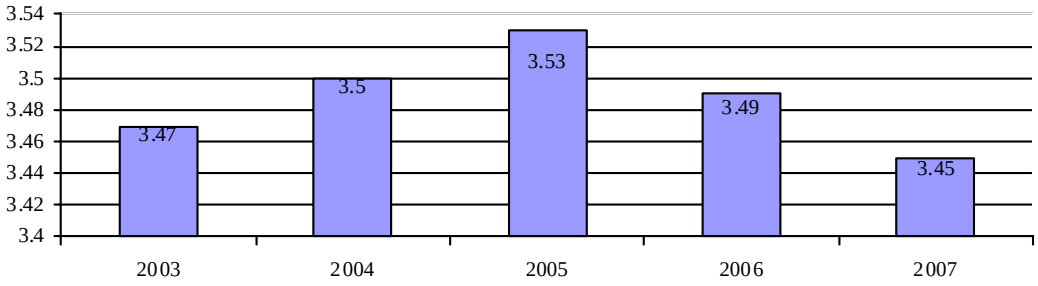
Average Total SAT of Women Applicants



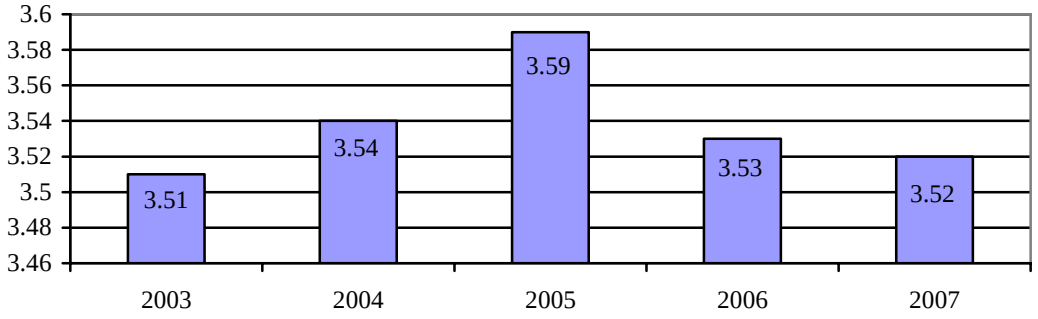
Average Total SAT of Underepresented Minority Applicants



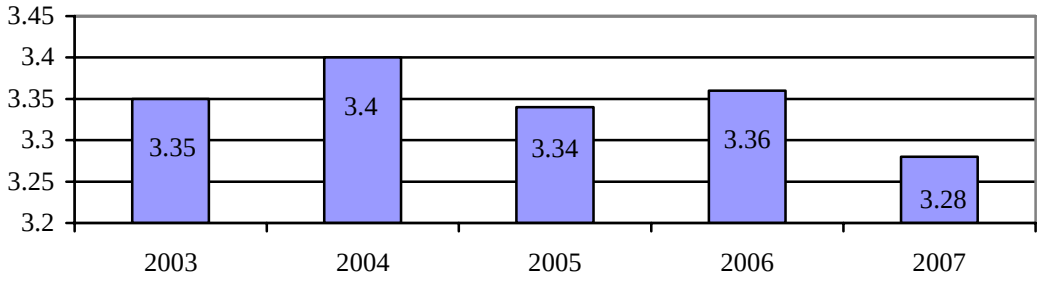
Average HSGPA of Total Applicants



Average HSGPA of Women Applicants

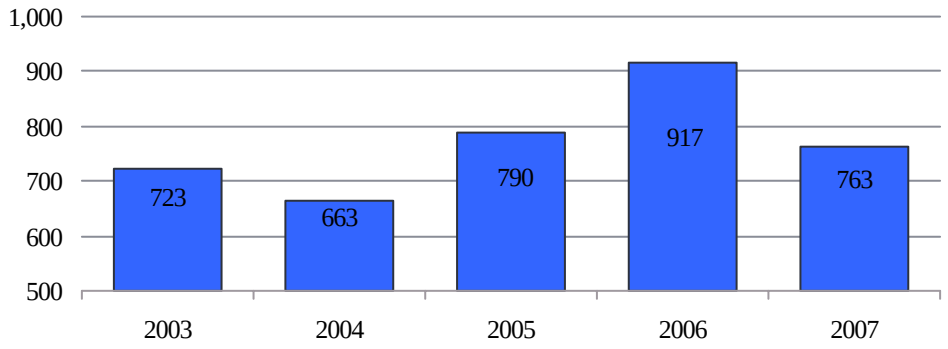


Average HSGPA of Underrepresented Minority Applicants

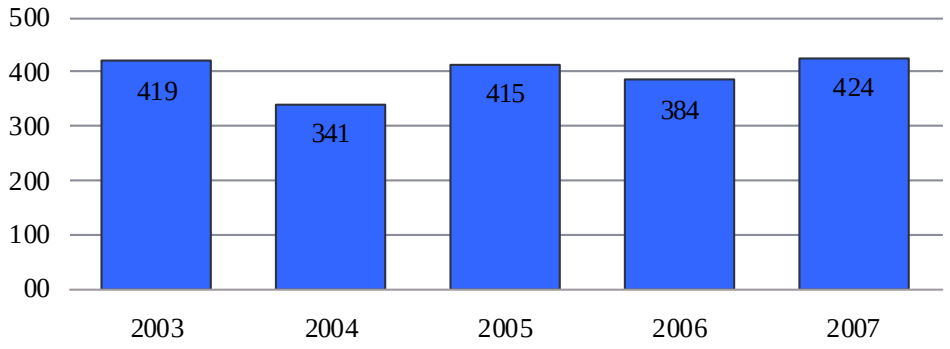


2.2 Number, quality and diversity of paid accepts

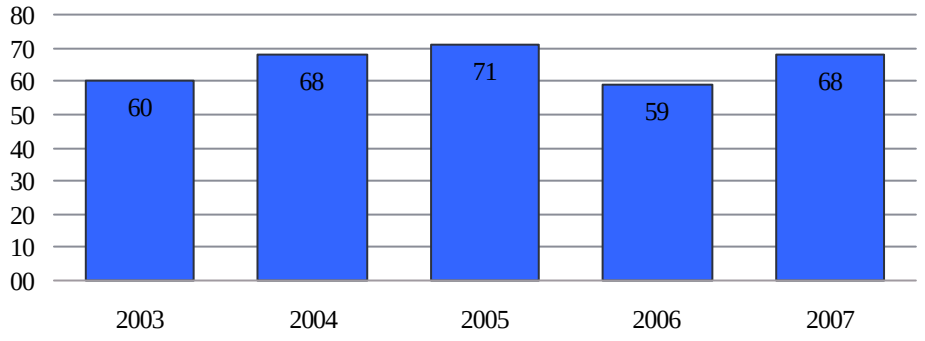
ECOS Paid Accepts: Number and Diversity



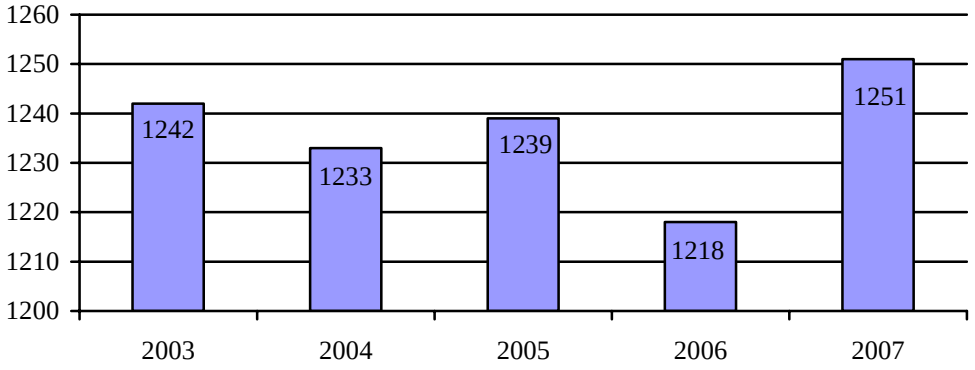
Paid Accepts: Women



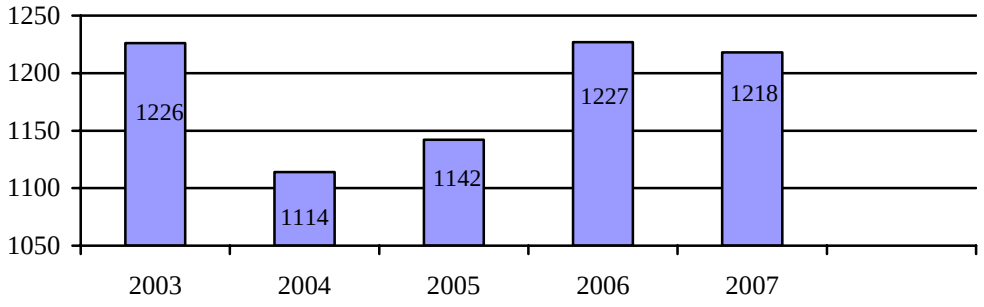
Paid Accepts: Underrepresented Minorities



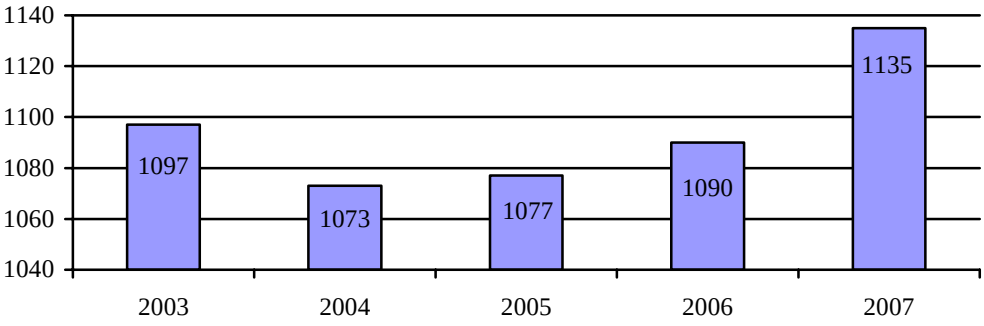
Avg Total SAT of All Paid Accepts



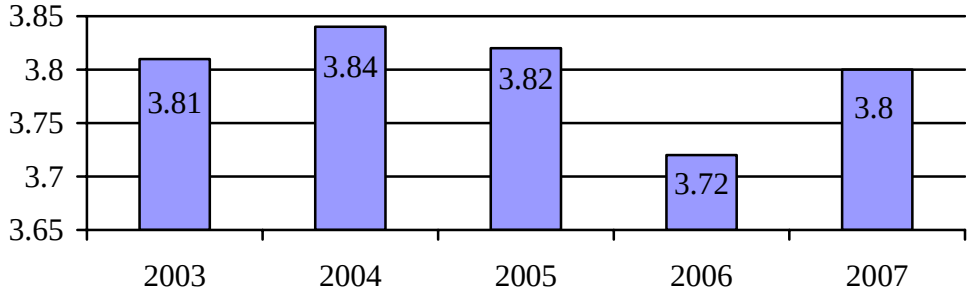
Avg Total SAT of Paid Accepts, Women



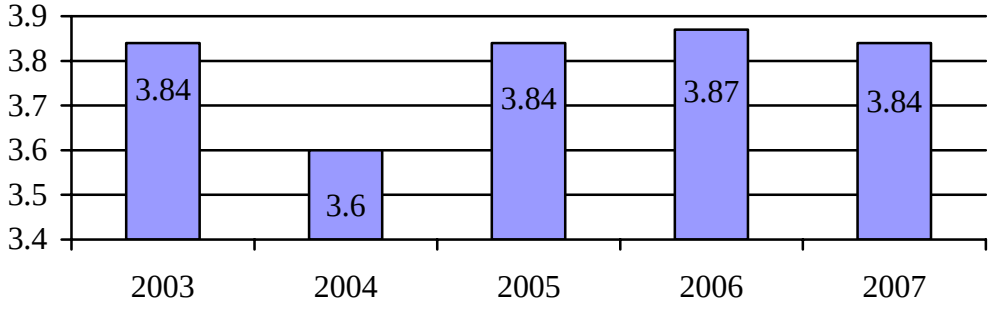
Avg Total SAT Paid Accepts, Underrepresented Minorities



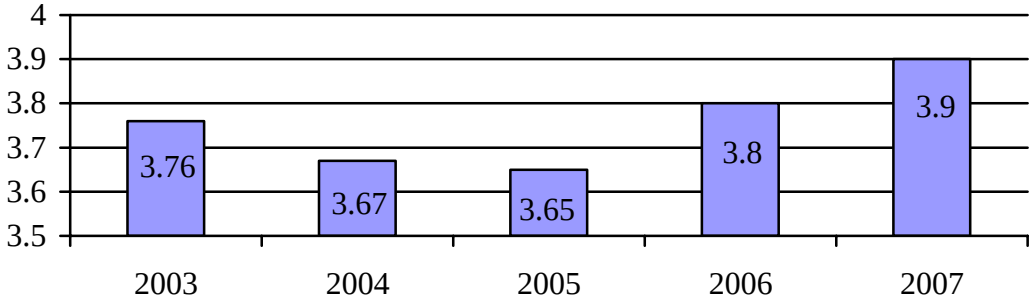
Avg HSGPA Total Paid Accepts



Avg HSGPA Paid Accepts, Women

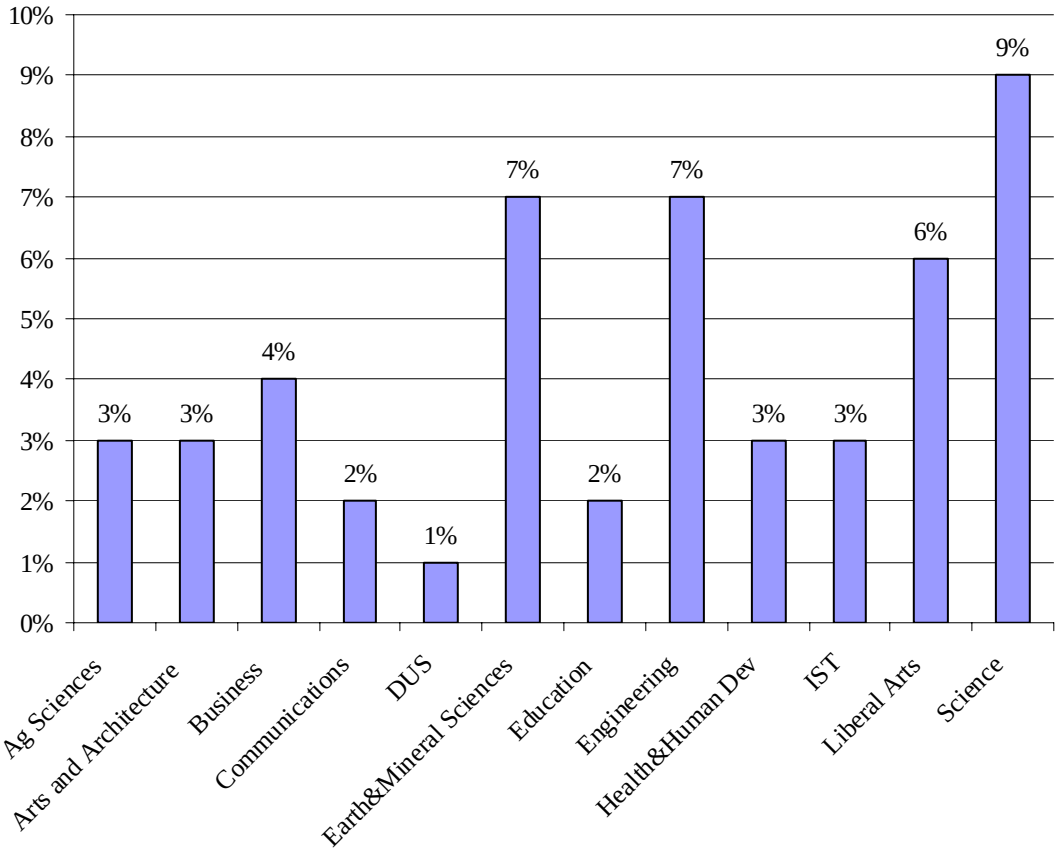


Avg HSGPA Paid Accepts, Underrepresented Minorities

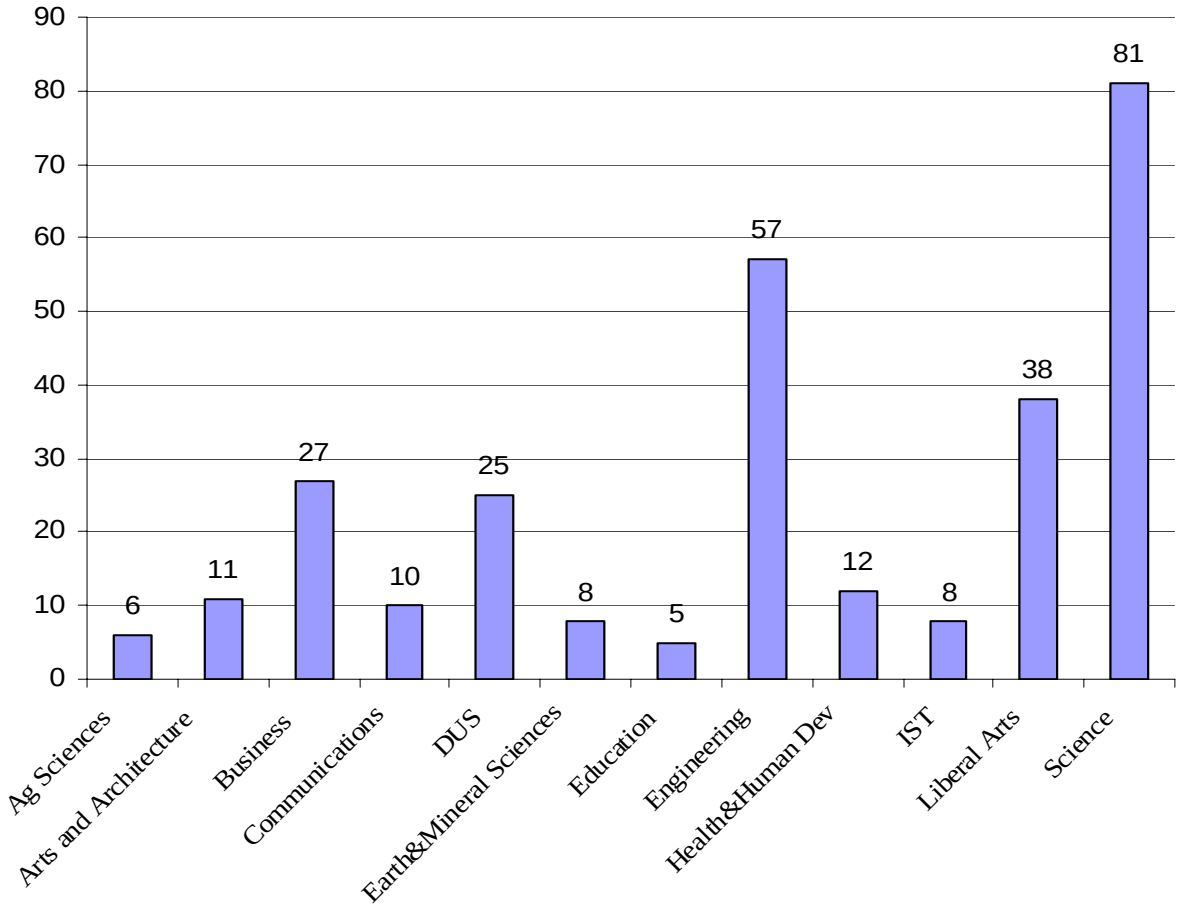


2.3 Number of Schreyer Scholars coming to the ECOS

Percentage of Students who are Schreyer Scholars, Fall 2007



Numbers of Matriculating Schreyer Scholars, 2007

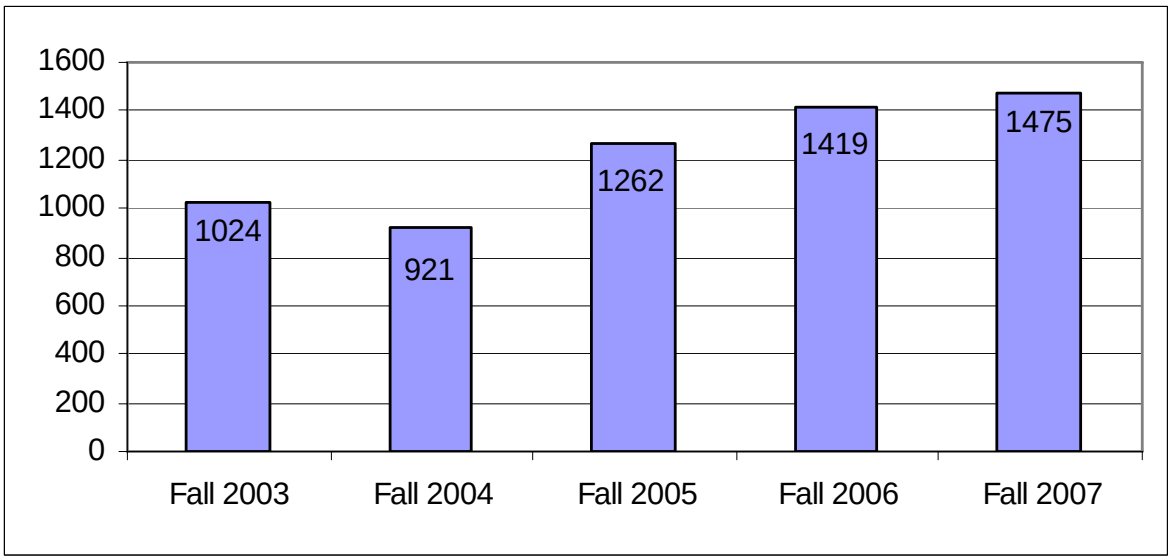


Action 4: Enhance the quality and diversity of our graduate students and provide those students with the research experiences and additional professional preparation that will set them on track to move up to leadership positions in a range of occupations.

4.1 Quality and diversity of applicants, of those admitted and of matriculants

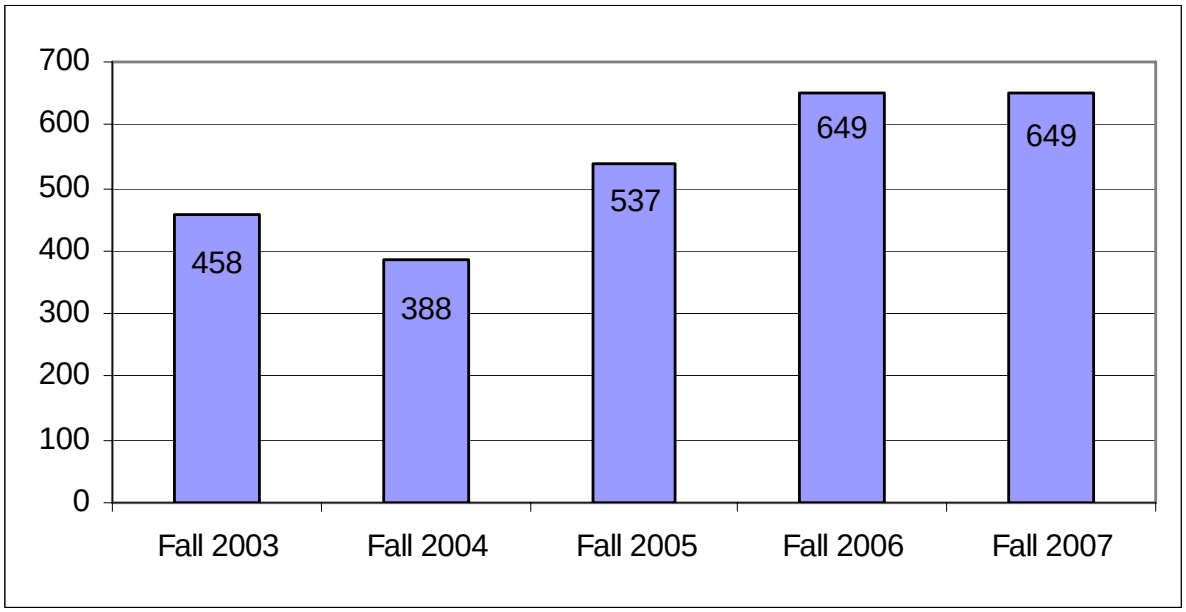
ECOS Graduate Students

EOCS Graduate Student Applicants



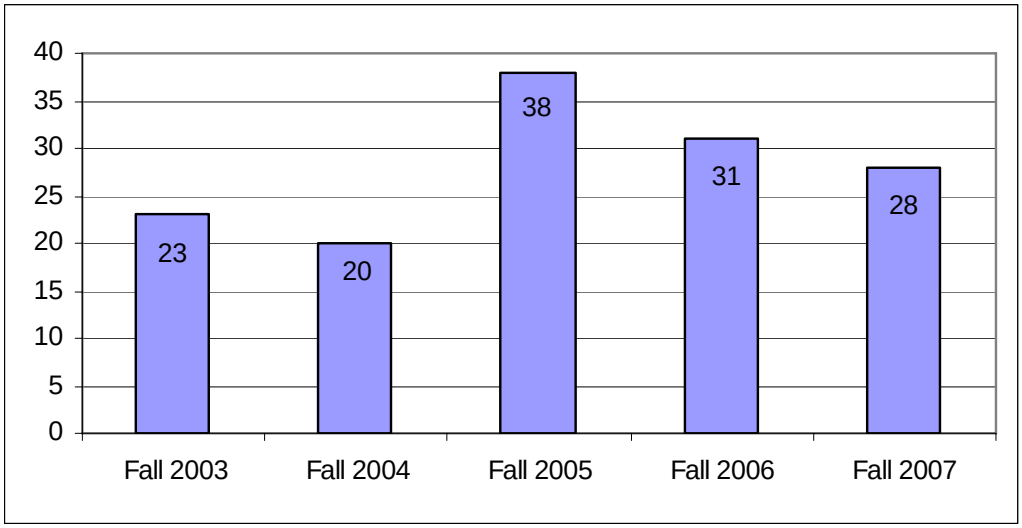
Year	All Applicants	Avg Jr Sr GPA	Avg GRE Quant	All Matriculants	Avg Jr Sr GPA	Avg GRE Quant	Total Enrollment	Degrees Conferred**	
Fall 2003	1,024	3.51	757.7	199	3.54	745.2	730	94	**2002-03**
Fall 2004	921	3.55	758.7	162	3.55	746.4	722	116	**2003-04**
Fall 2005	1,262	3.52	750.7	191	3.52	727.0	711	141	**2004-05**
Fall 2006	1,419	3.52	752.1	147	3.54	739.0	691	169	**2005-06**
Fall 2007	1,475	3.52	751.5	172	3.57	744.6	715	152	**2006-07**

Female Applicants



Year	Female Applicants		Avg Jr Sr GPA	Avg GRE Quant	Female Matriculants		Avg Jr Sr GPA	Avg GRE Quant	Total Female Enrollment		Degrees Conferred** To Women		
Fall 2003	45%	458	3.54	751.9	36%	71	3.55	742.1	34%	246	37%	35	**2002-03**
Fall 2004	42%	388	3.56	755.3	34%	55	3.52	736.5	33%	237	33%	38	**2003-04**
Fall 2005	43%	537	3.56	742.0	38%	73	3.54	700.0	35%	246	33%	46	**2004-05**
Fall 2006	46%	649	3.55	747.9	46%	67	3.60	727.6	36%	246	37%	63	**2005-06**
Fall 2007	44%	649	3.56	745.0	34%	59	3.48	716.4	36%	255	36%	55	**2006-07**

Applications from Members of Underrepresented Groups



Year	URG Applicants		Avg Jr Sr GPA	Avg GRE Quant	URG Matriculants		Avg Jr Sr GPA	Avg GRE Quant	Total URG Enrollment		Degrees Conferred** to URG		
Fall 2003	2%	23	3.53	655.2	3%	6	3.60	720.0	4%	27	2%	2	**2002-03**
Fall 2004	2%	20	3.47	697.9	3%	5	3.53	658.0	4%	29	4%	5	**2003-04**
Fall 2005	3%	38	3.36	597.1	5%	9	3.36	551.1	4%	26	3%	4	**2004-05**
Fall 2006	2%	31	3.26	622.1	6%	9	3.28	681.3	4%	26	4%	6	**2005-06**
Fall 2007	2%	28	3.45	641.8	4%	7	3.45	681.4	3%	25	5%	7	**2006-07**

Intercollege Graduate Programs with Advisors in the ECOS

Year			Enrollment	Female***		Underpresented Minority***			Degrees Conferred**		
Fall 2003			121								
Fall 2004			121								
Fall 2005			99	56%	55	3%	3				
Fall 2006			92	50%	46	0%	0			12	**2005-06**
Fall 2007			100	46%	46	1%	1			12	**2006-07**

*Data for Interdisciplinary Graduate Programs (ID) Advised by the Eberly College of Science was gathered from sources outside the Enterprise Information System (EIS).

** Degrees Conferred are counted from Summer of the first year through Spring of the next year

*** Historical data for ID with Advisor information was not available for Gender and Ethnicity.

4.2 Post graduation survey results

Graduate School "Exit Survey Advanced Degree Graduates"
ECOS graduates

0 = Of Little Value
1 = Less Than Satisfactory
2 = Satisfactory
3 = Good
4 = Excellent

	05-06	06-07	07-08
The overall quality of the faculty with whom you interacted:	Mean	Mean	Mean
In your major	3.16	3.23	3.21
Outside your major	3.00	3.06	3.11
The quality of the teaching in courses you took:			
In your major	2.58	2.97	2.66
Outside your major	2.73	2.80	2.80
The quality of advising or guidance you received with respect to the following:			
Plan of study, choosing courses, other non-thesis matters	2.30	2.65	2.70
Developing your thesis, project, or master's paper	2.56	3.03	2.83
Conducting your thesis, project, or master's paper	2.75	2.97	2.94
Writing your thesis, project, or master's paper	2.36	2.91	2.85
Career alternatives at the beginning of your program	1.64	1.65	1.82
Planning and preparing for your professional career	2.06	2.00	2.30
The educational value of your graduate assistantship or fellowship in relation to:			
Research (if RA)	3.14	3.40	3.20
Teaching (if TA)	2.71	3.14	2.75
Total Number of completed surveys	38	35	67

Graduate School "Exit Survey Advanced Degree Graduates" cont.

Top 6 most cited areas needing improvement.
Number of respondents is a total from 2005, 2006, and 2007.

What areas in your degree program are in need of improvement?	Responses
Career development opportunities	46
Faculty advising/mentoring	37
Non-academic career opportunities	33
Course availability	30
Program Environment	21
Office/work space for graduate students	20

4.3 Benchmark data on graduate student stipends

Chemistry*

University	Half-time Salary
Ohio State	$15,000
Penn State	**$15,165**
Michigan	$15,667
Wisconsin	$15,709
Michigan State	$15,948
Indiana	$16,923
Minnesota	$16,996
Purdue	$17,157
Illinois	$17697
Iowa	$18,742
Northwestern	$20,232

*Chemistry Departments reported academic year stipends without summer support.

Physics

Note: The data below were gathered from the 2007 Midwest Chairs of Physics Departments Survey Data and are a randomized representation.

Participating School	Annual Total
Colorado State	$17,400
Indiana	$17,750
Iowa State	$17,817
Michigan State	$18,000
Notre Dame	$18,407
Northwestern	$18,600
Ohio State	$18,720
Ohio University	$19,000
Purdue	$19,000
Rutgers	$19,226
Stony Brook	$19,450
University of Cincinnati	$19,547
University of Connecticut	$19,555
University of Iowa	$19,585
University of Massachusetts – Amherst	$19,620
University of Minnesota	$20,137
University of Rochester	$20,400
University of South Carolina	$20,540
University of Toledo	$20,636
University of Washington	$21,280
University of Wisconsin-Madison	$21,840
West Virginia	$22,250

Penn State Physics Department's Annual Total is $17,165

Action 5: Provide support and encouragement for every member of the College community – students, staff and faculty - to reach the highest levels of intellectual achievement and personal and professional growth.

5.3 Diversity metrics for staff

Comparison of 1998 and 2008 staff

Underrepresented Minorities

	1998		2008		Change
White	162	95.3%	180	94.7%	-1%
African American	1	0.6%	3	1.6%	1%
Hispanic American	2	1.2%	2	1.1%	0%
Asian American	5	2.9%	4	2.1%	-1%
Native American	0	0.0%	0	0.0%	0%
Unknown	0	0.0%	1	0.5%	1%
Total employees	170		190		
Percent Minority employees		4.7%		5.9%	1.2%

Data include regular appointments including standing, fixed-term 1 and fixed-term multi-year.

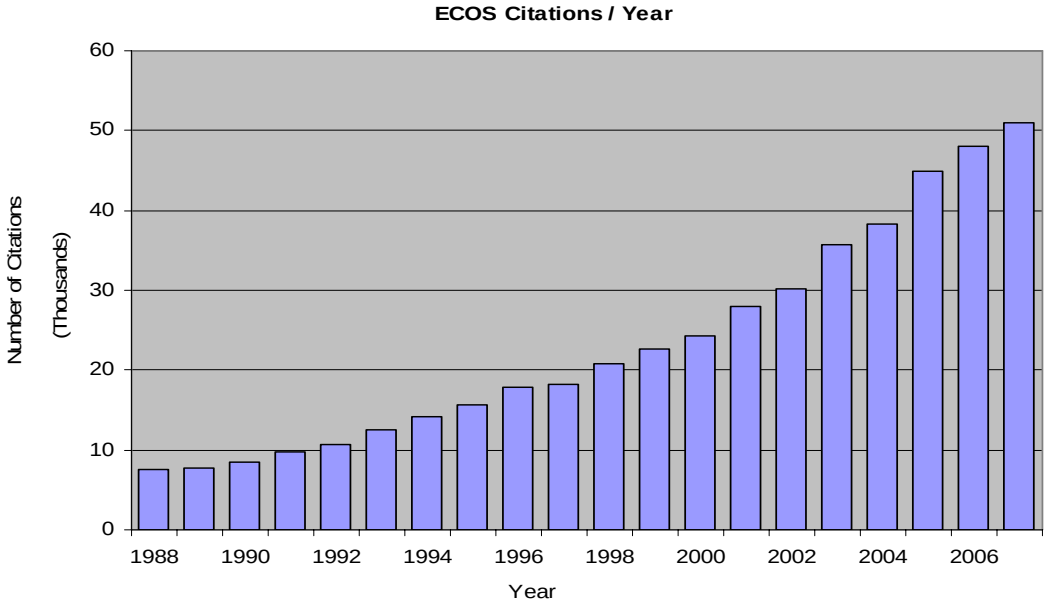
Gender

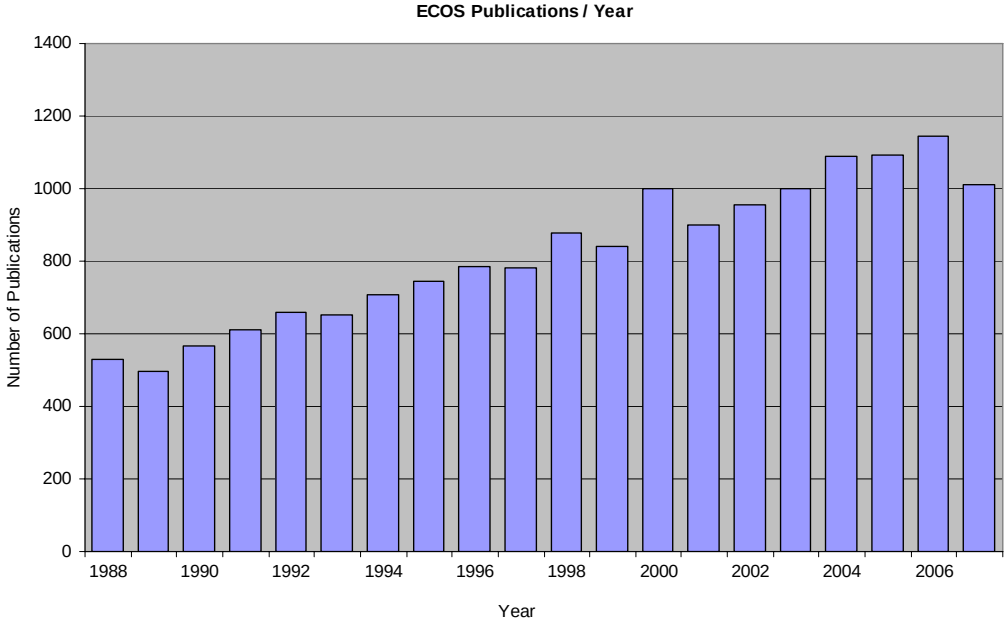
	Staff				Tech Service			
	1998		2008		1998		2008	
Female	130	76%	139	73%	1	5%	1	6%
Male	40	24%	51	27%	21	95%	17	94%
Total	170		190		22		18	

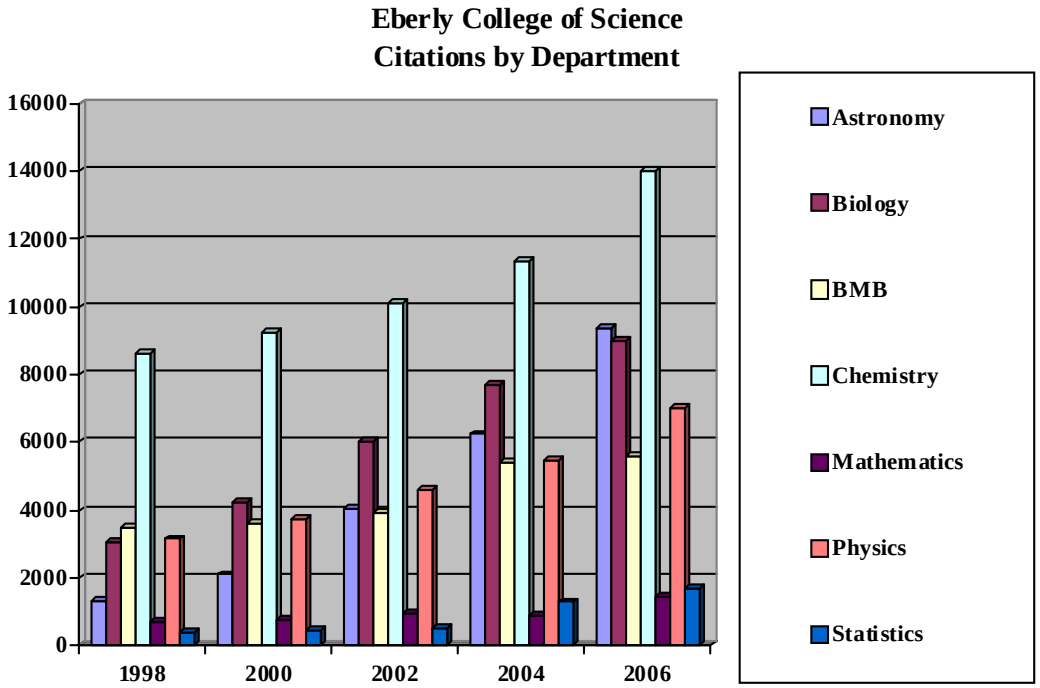
Data include regular appointments including standing, fixed-term 1 and fixed-term multi-year.

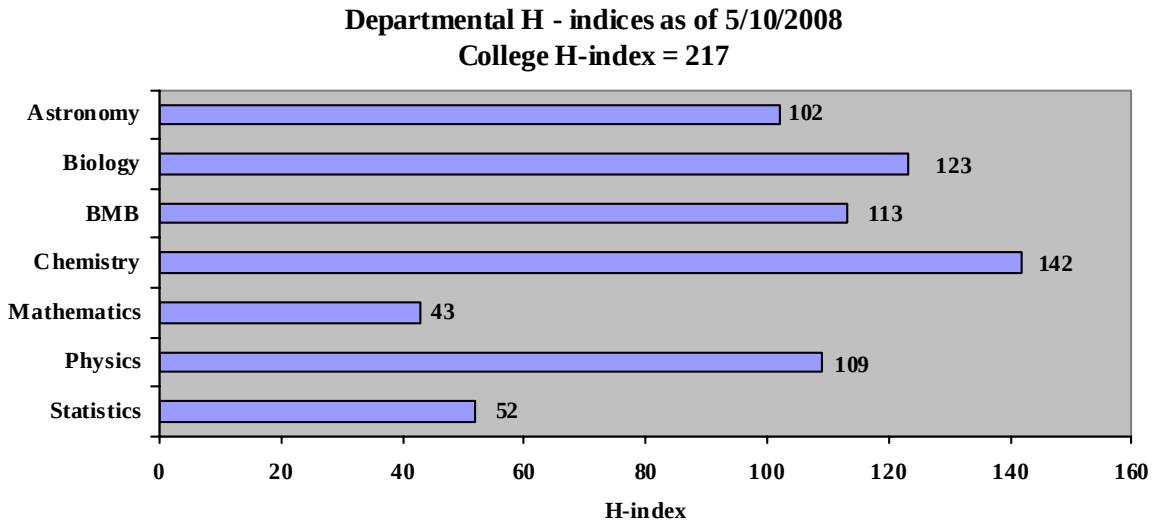
Action 6: Extend our progress in improving our departments by promoting the success of our faculty and by recruiting outstanding new faculty members, with extended efforts to increase the diversity of the faculty.

6.1 H-indices and supporting data



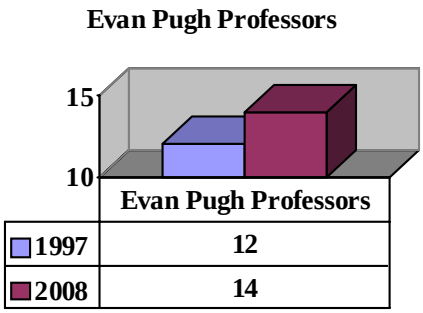




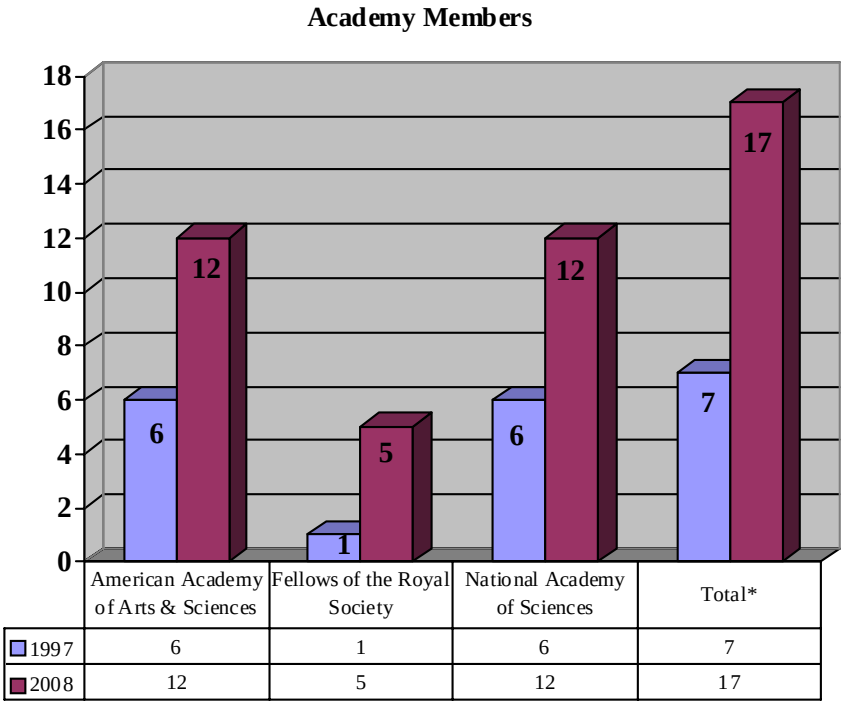


The H index is a measure of faculty or unit productivity and impact where H is the largest number such that H publications have H or more citations.

6.2 Numbers of Evan Pugh Professors



Numbers of Academy Members



**Some individuals are members of more than one academy. The total is the number of individuals with membership in one or more academies.*

6.3 Departmental rankings as available

	95' NRC	08' US News
Astronomy	21	NR
BMB	45	42
Biology	-	
Chemistry	18	16
Mathematics	37	28
Physics	55	23
Statistics	19	NR

NR = This discipline not ranked.

6.4 Diversity metrics for faculty

Underrepresented Minorities

Comparison of 1998 and 2008 Tenure Line Faculty	Professor		Associate Professor		Assistant Professor		Total	
Year	**1998**	**2008**	**1998**	**2008**	**1998**	**2008**	**1998**	**2008**
Under-represented minorities (Af.Am., Native Amer., Hispanic Amer.)	1	5	1	2	4	3	6	10
Asian American	12	22	5	6	17	15	34	43
Percentage of under-represented minorities	0.8%	3.8%	2.4%	5.1%	8.3%	4.8%	**2.9%**	**4.3%**
Percent change		3.0%		2.7%		-3.6%		1.4%
Percentage Asian Americans	10.3%	17.2%	11.9%	15.4%	35.4%	23.8%	**16.4%**	**18.7%**

	Instructional Ranks*		Research Ranks**		Total Instructional and Research Ranks	
Year	**1998**	**2008**	**1998**	**2008**	**1998**	**2008**
Total Faculty	59	63	32	61	91	124
Underrepresented minority	3	4	0	2	3	6
% of underrepresented minority	5.1%	6.3%	0.0%	3.3%	3.3%	4.8%
Percent change	1.3%		3.3%			1.5%
Asian American	8.0%	10.0%	22.0%	13.0%		

**Instructional Ranks include Instructors, Lecturers and Senior Lecturers.*
*** Research Ranks include Research Associates, Senior Research Associates and Senior Scientists.*

Gender

Comparison of 1998 and 2008 Tenure Line Faculty	Professor				Assoc. Professor				Asst. Professor				Total	
	1998		2008		1998		2008		1998		2008		1998	2008
Female	10	8%	15	11%	4	10%	8	20%	9	19%	24	38%	**11.1%**	**20.0%**
Male	109	92%	117	89%	37	90%	32	80%	39	81%	39	62%	89%	80%

	Instructional Ranks*		Research Ranks**		Total Instructional and Research Ranks	
Year	**1998**	**2008**	**1998**	**2008**	**1998**	**2008**
Total Faculty	59	63	32	61	91	124
Female	27	30	13	23	40	53
Percentage Female	45.8%	47.6%	40.6%	37.7%	44.0%	42.7%
Male	32	33	19	39	51	72
Percentage Male	54.2%	52.4%	59.4%	63.9%	56.0%	58.1%

6.5 Metrics on success to tenure for the ECOS

	All			Female			Male		
Cohort Entry Year	**Entrants**	***Tenured within seven years**	**Rate**	**Entrants**	***Tenured within seven years**	**Rate**	**Entrants**	***Tenured within seven years**	**Rate**
1990	14	11	79.0%	2	2	100.0%	12	9	75.0%
1991	10	7	70.0%	2	1	50.0%	8	6	75.0%
1992	15	13	87.0%	3	3	100.0%	12	10	83.0%
1993	11	7	64.0%	2	1	50.0%	9	6	67.0%
1994	17	8	47.0%	2	0	0.0%	15	8	53.0%
1995	14	8	57.0%	2	2	100.0%	12	6	50.0%
1996	5	2	40.0%	1	0	0.0%	4	2	50.0%
1997	14	8	57.0%	3	1	33.0%	11	7	64.0%
Totals	100	64	64.0%	17	10	59.0%	83	54	65.0%

**Reasons for not being tenured include departures to positions elsewhere, withdrawals from the tenure process and tenure denials.*

Action 7: Enhance the creative environment in the College and support the highest levels of intellectual achievement within and across the disciplines.

7.1 Numbers of interdisciplinary proposals*

Interdisciplinary Proposals and Awards

	1998-1999	2000-2001	2002-2003	2004-2005	2006-2007
Proposals Submitted	41	69	118	150	136
Awards	21	36	63	75	77

** Proposals or awards with principal investigators from two or more departments*

7.2 Interdisciplinary funding as a percentage of the total College funding

	Interdisciplinary Funding				
	1998-1999	**2000-2001**	**2002-2003**	**2004-2005**	**2006-2007**
Total Interdisciplinary Funding	$2,995,205	$17,034,370	$24,012,542	$23,526,674	$27,973,799
% of College Total	7.5%	30%	30.2%	34.5%	40.5%

Action 8: Identify and marshal areas of strength around the College and work with others across the University to address global challenges.

8.1 A record of new initiatives, successes and contributions

Potential areas of contribution by the ECOS in confronting global challenges are summarized below. New initiatives will be tracked, as will successes and contributions.

Global Challenge	ECOS contribution	Partnering Colleges	Partnering Institutes
Enhancing K-12 education	Committed faculty, Outreach	Education, EMS, COE, CAS, HHD, IST	MRI, Huck, PSIEE, SSRI, ICS
Producing more scientifically-trained leaders and innovators	Committed instructional and tenure-track faculty, outreach, advisors, Multicultural Coordinator, all student support functions	Education, EMS, COE, CAS, HHD, IST	MRI, Huck, PSIEE, SSRI, ICS
Enhancing public understanding of science	Outreach, Public Information, e-learning, committed faculty, staff, and students	Education, EMS, COE, CAS, HHD, Communications, IST	MRI, Huck, PSIEE, SSRI, ICS
Hunger	Plant science, modeling, biology, BMB, statistics, math	CAS, Hershey, HHD, CLA, IST	Huck, PSIEE, SSRI
Disease	Infectious disease, network, modeling, biology, BMB, statistics, math	HHD, CAS, Hershey, IST	Huck, PSIEE, SSRI, ICS
Renewable Energy	Chemistry, physics, math, statistics, biology, astronomy	EMS, COE, IST	MRI, Huck, PSIEE, ICS, SSRI
Water	Chemistry, math, statistics, biology, ecology	COE, EMS, CAS	PSIEE, ICS, Huck, MRI
Environmental Stewardship	Ecology, chemistry, biology, physics, math, statistics	COE, EMS, CAS, IST	MRI, PSIEE, Huck, ICS, SSRI
Human Health	BMB, biology, chemistry	Hershey, COE, HHD, CAS, CLA, IST	Huck, ICS, SSRI
Safety and Security	Chemistry, physics, biology, math, statistics, astronomy	COE, EMS, IST, CAS	MRI, Huck, PSIEE, ICS, SSRI

Action 9: Enter a new era in outreach with enhanced local and regional programs and a presence on the national stage, which will address the College's goal of enhancing public understanding of science and assist the University in becoming the leading innovative, engaged institution of higher education in the country.

9.1 Measures of K-12 impact in schools

K-12 Teacher Workshops
2007: 6 workshops; 120 teachers

Rural Multi-District
Academic Space Alliance
3 school districts; 6400 students
435 teachers

9.2 Measures of K-12 impact here (camps, visits, etc)

Visits by school groups
hosted by the ECOS
2007: 18 schools; over 4,000 students (mainly middle school and elementary students)

Action Potential Science Experience camps
2006: 652 students registered; 610 attended
2007: 818 students registered; 646 attended

PA Junior Academy of Science
(hosted competition)
2007: 3,200 students

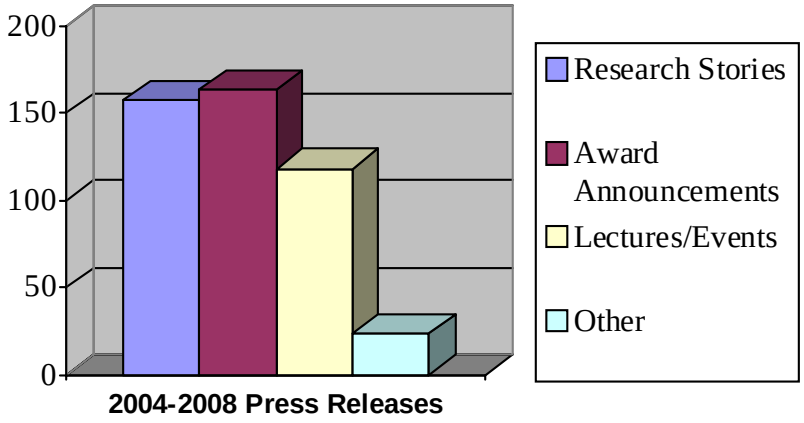
9.3 Measures of public engagement here or via programs developed here

Exploration Day
2007: 1500 attendees
2008: 1200 attendees

Astro Fest
2007: 1800 people over 4 nights
(better weather brings out more people)
2006: 2000 people over 4 night

9.4 Measure of public engagement via the popular press

Press releases produced and distributed by the Office of Media Relations in the ECOS
6/30/2004 – 6/30/2008



Action 10: Continue to operate the College and its departments and programs in an efficient and fiscally responsible manner making the most of the resources available while vigorously seeking additional resources.

10.1 Development income

Endowment for faculty and program support:

Faculty Support	
Year	Endowment Market Value
1998	$17,212,372
1999	$20,811,175
2000	$23,293,854
2001	$21,573,531
2002	$20,362,988
2003	$19,120,457
2004	$23,753,672
2005	$25,195,927
2006	$27,335,613
2007	$35,020,751
*2008	$33,622,571

Program Support	
Year	Endowment Market Value
1998	$1,218,432
1999	$1,590,068
2000	$3,296,850
2001	$4,403,112
2002	$3,316,333
2003	$3,195,029
2004	$3,781,800
2005	$4,647,541
2006	$5,517,747
2007	$7,543,460
*2008	$8,304,061

Endowment for graduate and undergraduate student support:

Graduate Student Support	
Year	Endowment Market Value
1998	$7,184,948
1999	$8,748,994
2000	$10,652,176
2001	$10,107,745
2002	$8,781,105
2003	$8,184,982
2004	$9,323,900
2005	$9,076,282
2006	$10,451,851
2007	$12,426,188
*2008	$12,281,711

Undergraduate Student Support	
Year	Endowment Market Value
1998	$7,184,948
1999	$8,748,994
2000	$10,652,176
2001	$10,107,745
2002	$8,781,105
2003	$8,184,982
2004	$9,323,900
2005	$9,076,282
2006	$10,451,851
2007	$12,426,188
*2008	$12,281,711

**2007-2008 gifts not fully recorded as of 6/30/2008*

Gift income and total endowment level:

Year	Number of Gifts	Gift Income	Total Endowment
1998-1999	5,277	$6,501,006	$42,598,053
1999-2000	5,338	$7,344,720	$50,248,738
2000-2001	5,267	$10,604,636	$52,236,003
2001-2002	6,119	$8,021,822	$47,694,330
2002-2003	6,579	$4,650,577	$45,177,391
2003-2004	6,221	$5,550,099	$53,170,686
2004-2005	5,817	$5,206,134	$56,563,095
2005-2006	5,772	$5,827,214	$63,357,557
2006-2007	5,823	$9,260,472	$78,711,501
2007-2008	5,684	$5,911,035	$78,060,177

**2007-2008 gifts not fully recorded as of 6/30/2008*

Scholarships and fellowships awarded:

Year	# Graduate Students	Awarded	# Undergrad	Awarded
1998-1999	140	$533,003	204	$643,388
2000-2001	262	$897,063	228	$780,913
2002-2003	292	$1,104,330	262	$880,944
2004-2005	280	$98,1430	277	$985,521
2006-2007	287	$998,550	362	$1,260,660

Scholarship and fellowship endowments:

Year	Graduate	Undergraduate	Total
1998-1999	16	49	65
2000-2001	20	61	81
2002-2003	23	82	105
2004-2005	23	98	121
2006-2007	30	108	138

10.2 Total external funding

Sponsored program awards and expenditures:

Fiscal Year	College Administered Awards	Full Credit Awards	Faculty Participation Awards*	Organized Research Total Expenditures
1998-1999	$38,600,301	$41,124,076	-	$50,910,270
2000-2001	$50,659,156	$55,305,880	-	$65,310,000
2002-2003	$57,726,122	$76,084,974	$62,881,142	$76,189,000
2004-2005	$52,717,100	$68,544,464	$56,469,172	$83,555,000
2006-2007	$51,123,247	$64,560,880	$54,479,739	$87,830,000

**Data not available for years prior to 2002.*

10.3 Industrial and foundation funding

Year	# of Industrial Awards	Total	%*	# of Foundation Awards	Total	%*
1998-1999	87	$1,979,960	4.9%	40	$2,020,226	5.0%
2000-2001	65	$2,420,197	4.3%	18	$1,489,453	2.6%
2002-2003	69	$3,237,706	4.1%	20	$167,060	0.2%
2004-2005	50	$1,506,376	2.2%	13	$522,977	0.8%
2006-2007	53	$4,275,547	6.2%	18	$505,720	0.7%

**Percentage of College total for the year.*

10.4 Income from technology transfer activities

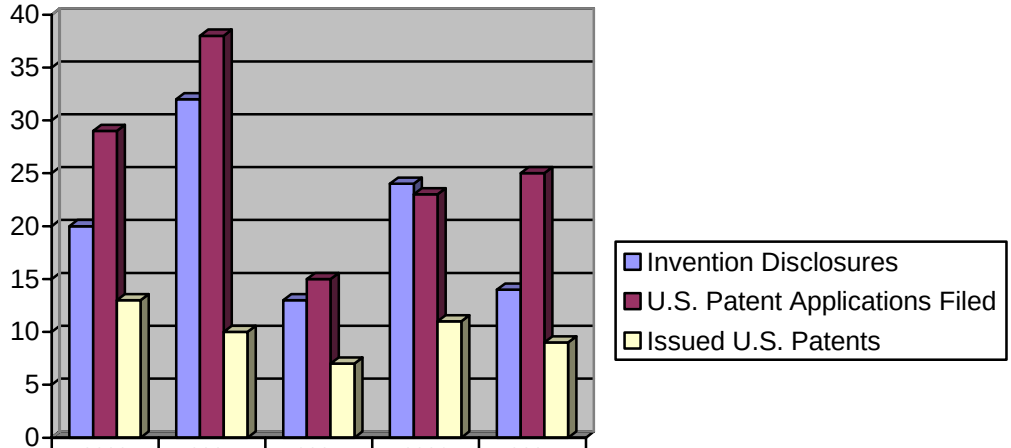
Distribution of Licensing Revenues

Year	Income to the ECOS
2003	$67,702
2004	$33,275
2005	$97,828
2006	$33,902
2007	$92,623

License Agreements Executed

Year	Invention Disclosure No.	Company	Inventor	Effective Date	Type of Agreement
2005	2002-2640	Bristol Myers Squibb Co.	Craig Cameron	1/13/2005	License
2005	2001-2436	NanoPolaris	Peter Eklund	8/11/2005	License
2005	2000-2285	Taisho Pharmaceutical	Song Tan	10/10/2005	License
2005	96-1615	VioQuest Pharmaceuticals	Xumu Zhang	12/12/2005	License
2006	2006-2285	Merck & Company	Song Tan	8/11/2006	License
2006	2006-3157	National Federation of Blind	Rodney Kreuter	9/19/2006	License
2007	N/A	Cilag GmbH International	Don Wojchowski	9/28/2007	License

Invention Disclosures and Patent Information



	2003	2004	2005	2006	2007
Invention Disclosures	20	32	13	24	14
U.S. Patent Applications Filed	29	38	15	23	25
Issued U.S. Patents	13	10	7	11	9

10.5 Other income to the College and the departments

Eberly College of Science
Other Income

	FY 01/02	FY 02/03	FY 03/04	FY 04/05	FY 05/06	FY 06/07
CE & World Campus						
Income	132,491	143,795	195,558	222,420	497,936	383,643
Expense	0	0	0	0	0	0
Net	132,491	143,795	195,558	222,420	497,936	383,643
Post Baccalaureate Program						
Income	41,227	37,266	66,573	85,537	111,289	144,103
Expense	13,819	14,493	14,075	22,703	19,637	14,640
Net	27,408	22,773	52,498	62,834	91,652	129,463
Co-op Program						
Income	186,384	152,725	160,427	178,757	213,560	133,590
Expense	146,996	138,692	127,183	116,433	143,081	148,239
Net	39,388	14,033	33,244	62,324	70,479	-14,649
Bioprocessing Workshops						
Income	169,700	161,119	225,107	229,517	183,824	225,129
Expense	153,440	163,086	137,941	138,418	164,491	132,336
Net	16,260	-1,967	87,166	91,099	19,333	92,793
Total						
Income	529,802	494,905	647,665	716,231	1,006,609	886,465
Expense	314,255	316,271	279,199	277,554	327,209	295,215
Net	215,547	178,634	368,466	438,677	679,400	591,250

Appendix IV: Summary of how the elements of the *Framework to Foster Diversity* are incorporated into the College strategic plan.

Introduction:

The principles and goals of the University and College *Framework* plans are integrated with and are woven throughout this strategic plan.

The Eberly College of Science strongly supports the imperative of a community that is richly diverse and seeks to provide an environment of mutual respect among individuals of all backgrounds and among individuals holding differing perspectives and ideas. We strive to have a climate supportive and welcoming for everyone, including those of diverse cultures, racial and ethnic backgrounds, differing sexual orientation, religious beliefs, and physical disabilities. The ECOS also strives to promote equal access to education and success for all constituent groups including minorities, women, and others who are under-represented in ECOS disciplines nationally. The ECOS can and should make a contribution to the national effort to enhance the participation and success of individuals from historically underrepresented groups in the mathematical, physical, and life sciences. The Eberly College of Science cannot achieve its goal without having a diverse community and a climate of respect and inclusiveness. Only then can we truly attract the best faculty, staff and students, only then can everyone reach the highest levels of intellectual and professional achievement and personal growth, and only then can we provide our students, the future leaders and innovators, with the experience of living and working in a diverse and respectful community.

In what follows in this appendix, we collect together the statements about climate and diversity that are found throughout the plan.

Elements of the *Framework* within this strategic plan include:

Vision: The Eberly College of Science: a vibrant scientific and educational community that is ***open and welcoming****, creative and adaptable, and internationally renowned for excellence in education and research and for* ***improving the world through its students****, its discoveries, and its outreach.*

Mission:
…providing ***access to a rich educational experience that will motivate and enable all of our students****, both in the college and from across Penn State, to seek the highest levels of intellectual achievement and personal growth…*

Introduction

The last decade has brought substantial ***advances in quality, diversity, accomplishment****, and recognition to departments and programs across the College.* ***The proportion of women in our tenure-line faculty has risen from 11.1% to 20.0%, the proportion of African American and Hispanic American faculty has increased from 2.9% to 4.3%, and Asian Americans now constitute 18.7% of the faculty.***

Overview

The Eberly College of Science has:

- ***An increasingly diverse community****. This attribute is most notably seen in the gender diversity of our tenure-line faculty where the proportion of women has risen from 11.1% to 20.0% in a decade. In the same period, the proportion of African American and Hispanic American faculty has increased from 2.9% to 4.3%. Asian Americans now constitute 18.7% of the faculty.*

Building on the progress of the last decade, in the next 5-10 years, we will focus on:

- ***Enhancing the undergraduate major experience through curricular and co-curricular enrichment*** *and* ***increasing retention of undergraduate students*** *in the College, thereby positioning increasing numbers of students to develop into the scientifically-trained leaders that are needed by society.*

- ***Continuing to increase the number, quality and diversity of undergraduate students who apply for admission to the Eberly College of Science*** *and further encouraging those admitted to matriculate.*

- ***Enhancing the quality and diversity of our graduate students*** *and providing those students with the research experiences and additional professional preparation that will set them on track to move up to leadership positions in a range of occupations.*

- ***Providing support and encouragement for every member of the College community*** *– students****,*** *staff, and faculty – to reach the highest level of intellectual achievement and personal and professional growth.*

- ***Extending our progress in improving our departments*** *by promoting the success of our faculty and through the recruitment and retention of outstanding new faculty members****, with extended efforts to increase the diversity of the faculty****.*

With the result that we will:

- ***See a continuing increase in numbers of applications for undergraduate admission to the ECOS, a growth in the quality of the matriculants, and increased retention for all students, particularly for those from underrepresented groups.***
- ***Have an outstanding, inclusive climate for work and learning.***
- ***Have increased the quality and diversity of the faculty,*** *with a tenure-line faculty that is at least 25% women, has increased racial diversity, and has grown further in international recognition and includes more than 25 academy members.*
- ***See a growth in the quality and diversity of our graduate students*** *based on the growing reputation of the faculty and programs, better marketing of the programs, and on increased resources to make competitive offers of support.*

Specifically, we list the following actions:

1. <u>Enhance the undergraduate major experience and position students to become the scientifically-trained leaders of tomorrow.</u>

- *Providing students with experiential learning opportunities that enhance their education, prepare them to be professionals in the 21st century, and equip them to be leaders.*
    - *Expand undergraduate research opportunities to provide every student the opportunity to create new knowledge.*
    - *Infuse engagement with ethical questions into the curriculum.*
    - ***Increase our emphasis on substantive international learning experiences.***
    - *Provide additional career preparedness training and career information resources.*
    - *Encourage participation in co-op / internship / externship experiences.*
    - ***Promote working and learning in a diverse environment.***
    - *Enable and encourage students to participate in outreach to K-12 and general public audiences.*

Creation of a Student Academic Support Center where all College student support services will be co-located, including a new initiative in tutoring and collaborative learning. ***Centralizing and improving the facilities devoted to student support (including recruitment, advising, diversity, cooperative education, international programs, and more) will create synergy among these programs and improve the quality of the services and the student experience.***

Supporting undergraduate success:

- ***Improve undergraduate advising including appropriate placement based on FTCAP scores.***
- ***Improve the quality and diversity of our graduate students, many of whom serve as teaching assistants in undergraduate courses.***
- ***Develop new strategies to significantly improve and build on current retention strategies for students from underrepresented groups. Existing vehicles include FISE house, MURE and WISER programs, the Commonwealth Scholars program for students interested in medicine, and minority REU programs.***
- ***Improve student success in our courses by providing enhanced tutoring and collaborative learning and by employing new pedagogic strategies.***

Continuing to work to increase the diversity of the faculty and the student body in accord with the plans laid out in the College's Framework to Foster Diversity plan.

Working to maintain a respectful, inclusive, stimulating learning environment.

2. ***Continue to increase the numbers of undergraduate students who apply for admission to the Eberly College of Science and further encourage those admitted to matriculate.***

Through fundraising, seek to increase substantially the number of scholarships available to our students.

Build on current recruitment programs such as PA Junior Academy of Science and PA Convocation, Bunton-Waller programs, and initiate additional approaches to further increase the diversity of our applicants.

Identify essential attributes of high-potential students and work to recruit more of this kind of student.

Work to increase undergraduate applications from international students*, in part through ECOS partnerships with institutions in other countries.*

3. <u>Improve the educational experience of students across the University who enroll in our courses to fulfill general education requirements or to provide the foundation for their majors.</u>

It is our goal to improve the educational experience for every student enrolled in our courses and to enhance the general education offerings in the College.

Promote and support improvements in teaching and learning *in the College through the Center for Excellence in Science Education,* ***with an emphasis in this context on foundation, developmental and general education courses****.*

Create an integrated multidisciplinary general education science course.

Incorporate intercultural/multicultural components in our core courses where possible.

Explore alternative methods for instruction and course delivery to improve student success and learning.

4. <u>Enhance the quality and diversity of our graduate students and provide those students with the research experiences and additional professional preparation that will set them on track to move up to leadership positions in a range of occupations.</u>

*Graduate students are a key part of the ecology of the College. They are an important part of our mission to produce the scientifically-trained leaders and innovators of tomorrow. …..****Graduate students impact our undergraduate teaching mission in their roles as TAs and as mentors for undergraduates engaged in research.*** *They play a key role in the quality and productivity of our research enterprise through their hard work, creativity, and intellectual contributions.*

Improve *the quality and* ***diversity of graduate students accepted into our programs*** *through:*

- ***Providing larger stipends though increased fundraising for graduate fellowships and through increases in TA and RA stipends.***
- ***Building on our recent successes in attracting minority students to increase the numbers of under-represented students enrolling in our graduate programs.***

Improve the quality of our graduate degree programs and the quality of the graduate student experience:

- ***Increase opportunities for graduate students to have international experiences.***
- ***Put programs in place to improve retention and degree completion of graduate students, including those from underrepresented groups.***

5. ***<u>Provide support and encouragement for every member of the College community – students, staff and faculty - to reach the highest levels of intellectual achievement and personal and professional growth.</u>***

The College is its people. The Eberly College of Science cannot reach its full potential unless all members of the community are working together to reach that potential. Every individual should feel respected and valued, challenged and rewarded.

- ***Increase the diversity of our leadership.***
- ***Provide developmental experiences and training for future leaders.***

From Appendix II: Results of the SP'08 Climate and Diversity Survey in the ECOS

In this plan, we build on a foundation of improving and enhancing climate across the College and on increasing representation of individuals from underrepresented groups (URG, defined as underrepresented racial, ethnic, religious, sexual, gender, disability, age or international status). Our College strives to be welcoming and inclusive as we are all enriched, and better prepared for the future, by working and learning in a diverse community.

Climate Survey Spring, 2008

A climate survey of all faculty, staff, and students in the college was conducted during the Spring semester, 2008. The survey was conducted by the Penn State Center for the Study of Higher Education. ***The survey focused on the climate in the ECOS for individuals from underrepresented groups, but some questions probed general work environment, inter-personal relationships and climate issues.*** *The total response rate was 24% (students=21%; faculty=35%; staff=66%). Eight percent of respondents reported experiencing conduct that interfered with their ability to work and/or learn in the college, most often as being deliberately ignored or excluded or as being intimidated or bullied. This conduct was most likely to occur within positions (staff on staff, student on student). Faculty, however, were most likely to report undergraduate students as the source of the conduct. Seventy-nine percent of respondents reported being "very comfortable" or "comfortable" with the general climate within the college. Most rated the climate as respectful for individuals from underrepresented groups;* ***the climate for members of the LGBTQ (Lesbian, gay, bisexual, transgender, queer) community was rated lowest****. The quality of teaching and learning in the college received some negative comments stemming from the impersonal nature of some courses, a perception that teaching is not valued in the college, and frustrations with perceived communication barriers between students and non-native-English-speaking instructors. Some respondents made a point of praising the*

educational experience in the college while others reported frustration with the pace of change in the college. Some respondents reported being afraid to speak up due to fear of retaliation. ***Respondents had very mixed views on both the value and efficacy of the survey and the value and efficacy of the diversity programs and emphasis on diversity in the college. Some respondents felt that any new diversity programming in the college should include a focus on issues relating to country of origin. Generally the mixed responses to issues relating to fostering and supporting diversity in the college indicate that "diversity-related programming should encourage majority populations to appreciate the benefits of diversity and recognize their positions of privilege." [Quoted from the final report on the survey, which can be found at http://www.science.psu.edu/diversity/climate/index.html]***

<u>Activities planned in response to the results of the survey:</u>

We will continuously improve the climate for building equity and community across the college. We will:

- ***Retain key activities which have proven to be effective, (e.g., college and department climate and diversity committees, annual distribution of the diversity brochure, Race Relations Project in all first year seminars).***
- ***Conduct periodic climate surveys.***
- ***Respond to the 2008 survey findings:***
    - ***Address issues of reported conduct that affect community members' ability to work and/or learn.***
    - ***Raise awareness of behaviors that affect community members' ability to work and/or learn.***
    - ***Raise awareness of issues and concerns for members of the LGBTQ community.***
    - ***Develop diversity-related programming that encourages majority populations to appreciate the benefits of diversity and recognize their positions of privilege.***
    - ***Recognize and reward those who work to improve the climate.***
    - ***Mentor supervisors on specific initiatives designed to increase the level of respect among employees in each work area.***
    - ***Increase inclusion of staff and non-tenure-eligible faculty in the life of the departments and the college in planning, decision making, problem resolution, and celebrations.***
- ***Develop a follow-up assessment to probe issues of workplace climate for staff/faculty and educational setting issues for faculty/students.***
- ***Increase the numbers of staff members from underrepresented groups.***
- ***Continue our focus on fostering a family-friendly environment.***

As a result, in the coming years, we will:

- ***See increased support and understanding for the need to improve the climate in the College for all students, faculty, and staff.***
- ***See improvement in the climate for working and learning across the college.***
- ***See support and encouragement for every member of the college to reach the highest level of intellectual achievement and personal and professional growth.***

From the plans listed under Action 5:

Enhance processes and communication so that ***hiring, performance evaluation, salary administration and promotion are broadly perceived as fair and constructive.***

6. <u>Extend our progress in improving our departments through the recruitment and retention of outstanding faculty members, with extended efforts to increase the diversity of the faculty.</u>

Be open to flexible hiring strategies and practices

- ***Identify individuals and start recruiting during their post-doc years.***
- *Seek out young stars from lower-ranked institutions.*
- ***Look for opportunities for cluster hires, perhaps in partnership with other departments or colleges.***
- *Always be looking to identify and pursue movable stars.*
- ***Increase the number of qualified minority faculty who receive and accept our offers through targeted, aggressive and sensitive recruiting.***

Explore instituting a position of Equity Officer in each department, drawing from senior influential faculty members. Responsibilities will include:

- ***Monitor faculty hiring processes and practices to ensure that applicant pools match national availability.***
- ***Obtain and share knowledge about gender and race equity literature.***
- ***Work to increase the number of faculty offers made to minority candidates.***
- ***Sit in on P&T meetings to ensure equity.***
- ***Encourage recruitment, acceptance, and matriculation of minority graduate students and post-docs.***
- ***Participate in local and national workshops on gender and race issues***

9. <u>Enter a new era in outreach with enhanced local and regional programs and a presence on the national stage, which will address the College's goal of enhancing public understanding of science and assist the University in becoming the leading innovative engaged institution of higher education in the country.</u>

Partnering within the Commonwealth to increase STEM education –

- ***Become active participants in the PA STEM Initiative, created by the National Governor's Association, to increase the number of students (especially members of underrepresented groups and women) who are considering STEM careers.***
- ***Contribute to the statewide efforts on workforce development by retaining and retraining the current STEM workforce.***
- ***Enhance the educational benefits to underrepresented and disadvantaged populations, including the Upward Bound Math Science program.***

Appendix V: List of Acronyms and Abbreviations

BMB	Biochemistry and Molecular Biology
CAS	College of Agricultural Sciences
CESE	Center for Excellence in Science Education
CLA	College of the Liberal Arts
COE	College of Engineering
CSATS	Center for Science and the Schools
DOE	Department of Energy
ECOS	Eberly College of Science
EMS	College of Earth and Mineral Sciences
FISE	First-year in Science and Engineering
FTCAP	First-year Testing Counseling and Advising Program
FYS	First Year Seminar
Gen Ed	General Education
H index	A measure of faculty or unit productivity and impact where H is the largest number such that H papers have H or more citations
HHD	College of Health and Human Development
HSGPA	High School Grade Point Average
Huck	Huck Institutes of the Life Sciences
ICS	Institute for CyberScience
IPAS	Internet Privacy and Security
ISI	ISI Web of Science on-line citation index service
IST	College of Information Sciences and Technology
K-12	Kindergarten through grade 12
LGBTQ	Lesbian, Gay, Bisexual, Transgender, Queer
MRI	Materials Research Institute
MURE	Minority Undergraduate Research Experience funded through the PA Space Grant Consortium
NIH	National Institutes of Health
NR	This discipline is not ranked
NRC	National Research Council
OPP	Office of the Physical Plant
OSP	Office of Sponsored Programs
PA	Pennsylvania
P&T	Promotion and Tenure
PKU	Peking University
PSIEE	Penn State Institutes of Energy and the Environment
PSU	The Pennsylvania State University
RA	Research Assistantship

REU	Research Experience for Undergraduates
SASC	Student Academic Support Center
SAT	Scholastic Aptitude Test
SCH	Student Credit Hours
SRTE	Student Rating of Teaching Effectiveness
SSRI	Social Sciences Research Institute
STEM	Science, Technology, Engineering, and Math
TA	Teaching Assistantship
UK	United Kingdom
UP	University Park
US News	The magazine *US News and World Report*
WISER	Women in Science and Engineering Research program funded through the PA Space Grant Consortium