VISION

The Eberly College of Science will be a vibrant and diverse 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, discoveries, and 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 members, staff members, 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 students, both in the college and 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 of Pennsylvania, the nation, and the world to improve appreciation and comprehension of science and to bring the benefits of science to society.

GOAL

Our goal is to enrich lives, improve society, and address global challenges by producing a diverse population of scientifically trained leaders and innovators, advancing the frontiers of science, translating our discoveries for the common good, and enhancing the public understanding of science.
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I. INTRODUCTION

In the six years since the Eberly College of Science’s last strategic plan was prepared, a number of significant changes—locally, nationally and internationally—have occurred.

We have had very substantial confirmation of the growing excellence of our research and graduate programs since our 2008 strategic plan was released. A National Research Council (NRC) report, titled “A Data-Based Assessment of Research-Doctorate Programs in the United States” and issued in 2010 with some revisions in 2011, showed a dramatic rise in the quality of research-doctorate programs across the Eberly College of Science.

A CONSERVATIVE ANALYSIS OF THE NRC DATA FOR BASIC SCIENCE PROGRAMS AT RESEARCH UNIVERSITIES NATIONWIDE SHOWS THAT THE EXCELLENCE ACROSS THE COLLEGE PLACES PENN STATE SCIENCE CLEARLY IN THE TOP TEN IN THE COUNTRY.

The NRC report clearly placed three of our departmental programs in the top ten in the nation, with three more close behind. All departmental programs showed dramatic improvements in ranking, with physics perhaps having the most dramatic change, moving from 55th in the previous (1995) NRC evaluation to 13th in 2011. A conservative analysis of the NRC data for basic science programs at research universities nationwide shows that the excellence across the college places Penn State Science clearly in the top ten in the country.

Another measure of the quality and a direct measure of the impact of Eberly College of Science research is the number of times papers by faculty, students, postdocs, and staff of the college are cited in other scientific publications. As shown in Figure 1, this number has been rising dramatically, and in 2013 alone, the work published by members of the college was cited over 83,000 times.

Figure 1. Eberly College of Science citations/year in thousands.
We are now in a time of increasing concern across the nation about the cost of higher education, and many editorials, op-ed pieces, and reports have begun to examine and question the cost versus value of a college education, sometimes in thoughtful and productive ways. A number of analyses of return on investment focusing primarily or exclusively on financial return have been conducted. Both cost and value are very significant issues for Penn State students. In the Eberly College of Science, one of our priorities over the next decade is to increase the value of an already fine undergraduate program. The NRC rankings put our research-doctorate programs among the elite in the nation, and we are committed to putting the undergraduate educational experience at the same level.

Among the challenges facing the Eberly College of Science is that of serving the needs of students from across the University. Despite no explicit University plans to increase the numbers of undergraduate students at University Park, the past several years have seen an almost monotonic increase in the numbers of students applying and in the numbers enrolled. In the six years between fall 2006 and fall 2012, the number of undergraduates at University Park (UP) increased by 2,807, from 35,648 to 38,455. This increase in UP undergraduates was due to an increase of 2,875 students (from 10,946 to 13,821) in the four core STEM colleges (Agricultural Sciences, Engineering, Earth and Mineral Sciences, and Science). Since the Eberly College of Science provides foundational courses for majors in all STEM disciplines, as well as courses to fulfill the general education requirements and/or academic interests of large numbers of students in non-STEM disciplines, the student credit hours taught by faculty members in the Eberly College of Science also went up, increasing from 225,000 in 2006-07 to 264,000 in 2012-13, an increase of over 17 percent.

In addition to the increasing numbers of applications, there has been a significant change in the diversity of the applicant pool, driven largely by international applications. Between 2001 and 2014, international applications to

![Figure 2. Applications to the Eberly College of Science for 2014.](image)
the Eberly College of Science rose from 146 to 1579, corresponding to an increase from 4.4 percent to 21.1 percent of the total applications. Much of the increase in international applications occurred in the last six years, with international applications to the Eberly College of Science increasing by nearly a factor of five over that period. As a percentage of domestic applications, the applications from underrepresented minorities increased from 15.7 percent in 2001 to 22.3 percent in 2014.

The net result is that in 2014, applications from white Americans comprised only 40.2 percent of the total applications to the college—well less than a majority. This number makes it emphatically clear that the nation and world have changed in ways that we knew were coming, but it still seems surprising. The future is now!

Some of the changes in Penn State applicants, and certainly the rising numbers of applications overall and the dramatic increase in international applications, result from the University’s increasing national and international visibility and stature. The measures of academic programs, including the NRC evaluation and others, show an institution rapidly increasing in quality. Reputation is a lagging indicator of quality—the quality must be there before it gets recognized—so it was very gratifying to see the 2014 Times (London) Higher Education World Reputation Rankings. In those rankings, which are based on the “considered expert judgment of senior, published academics,” Penn State jumped up to 39th among world universities (Penn State was ranked in the 51 to 60 range in 2013). This ranking is further confirmation that Penn State has become and is recognized as one of the world’s great research universities.

THE FUTURE IS NOW!
II. PLAN OVERVIEW

This plan builds on the progress in the Eberly College of Science over the last two decades and includes six themes:

• Advance world-class science.
• Transform the Penn State Science undergraduate educational experience.
• Elevate the quality of educational experiences for all students.
• Improve the diversity and gender balance of the faculty.
• Increase job satisfaction and professional development of the staff.
• Expand our impact on society.

We will continue to build the quality of the faculty and research programs by pursuing our fundamental strategy of focusing on excellence, recruiting outstanding people from diverse backgrounds and providing excellent facilities and a productive environment. Although we have made excellent progress in increasing the diversity of our faculty in the last few years by adding eight Hispanic faculty members to our ranks since 2011, we still have a long way to go and will intensify our efforts to achieve greater gender balance and diversity.

Our highest priority for a research initiative is the establishment of a University-wide institute to address the issue of evolutionary adaptation that leads to problems with antibiotics, cancer therapy, insecticides, and herbicides. Evolutionary adaptation now leads to over half a million deaths annually in the United States alone. Penn State is positioned to become the worldwide leader in evolutionary risk assessment and management, and an institute is the vehicle for making it happen.

Students who enroll in or take courses in a college with world-class scientists and research programs should have world-class educational experiences. In a major initiative, we are working to enhance teaching and learning in courses across the college for the benefit of all Penn State students. Among all colleges at the University, the Eberly College of Science delivers the second-largest number of student credit hours to Penn State students as part of their major degree and general education requirements and/or to fulfill their academic interests. We are committed to improve and enhance mathematics, statistics, and science courses for all students. A key part of this multifaceted initiative is supporting faculty to incorporate research-proven pedagogical techniques into their courses.

Another key part of the plan is the enhancement and indeed, transformation, of the undergraduate major experience in the college of science. This transformation is built on a continuing and growing process of improving teaching and learning in the classrooms and instructional labora-
tories along with a suite of initiatives, underway and planned, which embed learning and support for success in many aspects of student life, ranging from co-curricular experiences to learning communities to expanded advising, and more. An underlying theme is building a stronger sense of identity and community for students in the college.

The Eberly College of Science is fortunate to be supported by a very talented and dedicated cadre of staff in the departments and college. Despite increasing workloads, unfunded mandates requiring yet more work, and decreasing budgets, our staff is committed to the college and to excellence. In turn, the college is committed to working to increase staff members’ job satisfaction and productivity through additional training and professional development opportunities.

Great science and great educational experiences require excellent laboratories and excellent learning environments. Some of our laboratory facilities and learning environments are great and some are woefully inadequate. The college’s number-one infrastructure priority is to address the critical need for a new physics building to provide world-class research facilities while simultaneously creating modern, flexible STEM education instructional spaces.

The research programs of our faculty members and the graduate programs in the Eberly College of Science rank among the very best in the world. Yet, the impact of our research on society is not commensurate with the quality and quantity of our research findings. This state of affairs means we are not fulfilling all parts of our mission and also limits our public reputation and, therefore, can impact our ability to recruit the very best people to the college. Thus, a key goal of the college is to improve the communication of our research activities and research results to the public and to greatly enhance intellectual property development and technology transfer. We, and all of Penn State, should be playing a more significant role in scientific literacy of the public and in the economic development of our region, the state and the nation. Several initiatives to enhance intellectual property education and processes are underway or planned.
Penn State is among the top 10 institutions nationwide in the basic sciences.

The number of science professionals who have graduated from the college.

The number of undergraduate students enrolled in the college in fall 2013.

The number of student credit hours taught per year; the college is second only to the College of Liberal Arts in this arena.

The number of credit hours taught online in 2013-2014.

In life sciences ranking of the college’s first MOOC by coursetalk.org.

The percentage of the 2014 graduating seniors in the college who did research, an internship, or study abroad while at Penn State.

The percentage of undergraduate matriculants who persist to graduation from the college.

The number of faculty holding membership in the National Academy of Sciences, the American Academy of Arts and Sciences, or the Royal Society (UK).

The number of times papers published by ECOS scientists were cited in 2013.

College research expenditures in USD in fiscal year 2013.

The percentage of the University’s postdocs that are in the college.

The percentage of female tenure-line faculty.

The percentage of African-American and Hispanic tenure-line faculty.

The percentage of 2014 undergraduate applicants to the college who are white Americans.
IV. THE SPECIFICS

The Eberly College of Science will continue basic research of the highest quality to advance the frontiers of knowledge, including research that seeks sustainable solutions to society’s most significant challenges related to human health, energy, and climate change. The college will transform the way we educate the next generation of scientists, leaders, and innovators. We will modernize learning spaces, update degree programs and co-curricular learning opportunities, and enrich pedagogy training of faculty and students to elevate the quality of the educational experience and success of our students. We will increase our efforts to achieve greater gender balance and diversity in the faculty and student populations. Finally, the college will increase efforts to translate our findings to the public and business sectors. We will enhance our engagement with the general public to foster a citizenry that is sufficiently knowledgeable about scientific issues to participate productively in policy discussion and development. At the same time, we will work with our faculty and students to translate our research findings to the commercial sector more effectively and implement better the solutions needed for a sustainable future in Pennsylvania, the nation, and the world. We will work to engage the full diversity of talent and cultures that comprise our global society in our research and educational missions.

A. ADVANCE WORLD-CLASS SCIENCE

Science, with its interplay of formal theory and rigorous experimentation, has been hugely successful in both advancing knowledge and improving the human condition. The past two decades, despite some challenges, have been a wonderful time for science, a golden era of scientific advancement. It has also been a time of truly remarkable growth in the quality and impact of Penn State science. Our faculty, students and postdocs have published an average of 1,000 papers a year for the past 10 years. And these publications are influential, with over 83,000 citations of papers published by
members of the college in 2013 alone. Every department in the college advanced in the most recent rankings of programs by the National Research Council and we currently rank among the top ten institutions in the country in the basic sciences.

As we look ahead, we will continue to increase the quality and impact of Penn State science by pursuing our fundamental strategy of focusing on excellence, recruiting outstanding people from diverse backgrounds and providing excellent facilities and a productive environment.

**EXTEND THE FRONTIERS OF KNOWLEDGE**

A central part of the mission of the Eberly College of Science is advancing the frontiers of knowledge in the basic sciences.

While we greatly value and support science that has application to solving global challenges and improving the human condition, and we see many wonderful opportunities in interdisciplinary work, we will also continue to promote and support the highest levels of intellectual endeavor in any area of science regardless of its perceived applicability or evident connection to other areas of research. This kind of grand intellectual adventure is fundamental to achievements in science and part of what defines us. For example, the study of the origin and development of the universe has led to pursuing an understanding of concepts like quantum gravity, dark energy and new states of matter under extreme conditions, things that are extremely unlikely to have any applicability to daily life other than helping answering the questions, “Where did the universe come from, and where is it going?” These concepts and the answers to these questions are among the things being explored and shaped by members of the Eberly College of Science.

**WHERE DID THE UNIVERSE COME FROM, AND WHERE IS IT GOING?**

Another grand pursuit, one with obvious potential for application, is the understanding of the human genome and fundamental mechanisms driving evolution. The power of genomics to illuminate all kinds of questions in the life sciences is well appreciated, but the genome—and life—are very complex, so a huge amount remains to be understood. In every area of science, the tools we have are key to making the measurements and carrying out the experiments. In genomics, the development of sequencing technology has proceeded at an astonishing pace over the last couple of decades—likely faster than any other technological development in the history of mankind—
making genomics and bioinformatics a thriving area of fundamental science and a strength of Penn State, in the Eberly College of Science and beyond.

Materials, starting with very basic natural materials, are an essential part of our lives. Increasingly, the technologies we now depend upon and the new technologies we seek in order to deal with challenges in information technology; energy production and conservation, storage and distribution; and many other areas depend upon the development and understanding of new materials. The college is fully engaged in the study of two dimensional materials including graphene and topological insulators. These materials are intellectually exciting because of their unforeseen emergent quantum properties; in addition, there is a strong indication that these materials will alter how we will live in the coming decades. Furthermore, biological and biology-inspired materials are anticipated to play an increasing role in our lives, particularly in medicine. Going forward, chemistry, physics, biology and mathematics will be increasingly important in advancing fundamental materials research and helping solve challenges for the benefit of society.

These and many other areas of research in science and mathematics are areas of strength in the college and areas of opportunity for important discoveries going forward.

BUILD OUR DIGITAL FUTURE

The ability to generate and analyze very large data sets is transforming all fields of science. It is apparent that faster computers and more efficient algorithms will enable new directions of research, new approaches to long-standing questions, and fundamental advances, ranging from nanoscience to the evolution of the universe. Scientists in the chemistry and physics departments are at the cutting edge of materials design for next-generation computing, while those in the statistics, mathematics, and life sciences departments are designing the algorithms and computational tools to analyze the biological and physical science data sets that are being generated and accessed by our faculty.

If Penn State is to continue to address the fundamental questions in science and to make significant contributions to the most pressing issues in health, the environment, and renewable energy, the college must stay at the forefront of the ever-changing and ever-expanding opportunities and challenges provided by “Big Data.” We will support this effort with targeted hires that will cross conventional disciplinary boundaries in areas such
as quantum information science, materialomics, astrostatistics, systems genomics, and through collaborations with researchers in the social and behavioral sciences.

The ability to probe and query the massive quantities of data now available in all disciplines of science requires expertise and skill sets that are not present in most research teams. This work can be daunting to many of our faculty members who are utilizing mega-data sets resulting from new technologies and which are now available in ever-growing national and international databases. As a result, we will establish a consulting center for processing, integration, analysis, and sharing of very large data sets. The center will provide information and support for using existing and new data resources and tools across disciplines and will identify and promote best practices. We anticipate that this consulting center would be led by faculty members in the college and include some technical staff members, as well as graduate student research assistants who are interested in cross-disciplinary training.

**IMPROVE HUMAN HEALTH**

Faculty members in the Eberly College of Science have highly productive, ongoing research programs in some of the most competitive areas of biomedical research, including cancer biology, neuroscience, molecular medicine, and medical genomics. Moreover, the college has assembled strong teams of investigators who conduct groundbreaking basic research in RNA biology, epigenetics, and infectious disease and are at the forefront of the next wave of biomedical research. Thus, the college is poised for leadership roles in multiple areas that will lead to innovations in health care and disease prevention and cures. We will continue to sup-

**THE COLLEGE IS POISED FOR LEADERSHIP ROLES IN MULTIPLE AREAS THAT WILL LEAD TO INNOVATIONS IN HEALTH CARE AND DISEASE PREVENTION AND CURES.**

port productive collaborative research across colleges, continue to reduce the barriers to collaboration with scientists and physicians in Hershey, and actively encourage the growing number of graduate students with advisers on both campuses to strengthen these collaborations.

Maintaining our leadership in these areas requires that our scientists have access to the newest sequencing, imaging, and other innovative technologies that drive these rapidly advancing fields. The college will partner with the appropriate centers and institutes to acquire and maintain the
newest technologies as common-use instruments as they become available. Investing in the latest sequencing technologies will be obsolete without investing in the analysis of sequence data. Eberly College of Science faculty are the leaders in developing such analytical tools, and the college will continue to support this work. These facilities also will allow Penn State to partner with large health systems that maintain electronic medical records for large numbers of patients and, therefore, enter the new field of predictive medicine. Analyzing these massive databases in conjunction with genomic data will allow quantitative analysis of a wide variety of potential causes and predictors for disease risk. A targeted hire to provide leadership in this enterprise will open the door for many of our faculty members to generate new data, access complementary data, and develop the tools to analyze data, resulting in a high probability of making discoveries that will change the face of health care.

Penn State is uniquely positioned to become the worldwide leader in the newly developing area of evolutionary risk assessment and management. Much of modern medicine and public health is about attacking the life forms that harm us; however, these life forms are extremely good at evolving, and this counter adaptation is generating some of the most significant crop, animal, and human health challenges of the 21st century. Emergent infectious diseases, insecticide-resistant disease vectors, drug-resistant cancers, herbicide-resistant weeds, and insecticide-resistant crop pests all are examples of the evolutionary battle, which, when lost, is responsible for over half a million deaths annually and billions of dollars in agricultural losses in the United States alone. We propose to partner with other colleges and with institutes to establish a Center for Applied Evolution. We anticipate that the center will include scientists and physicians from across the University Park and Hershey campuses with expertise in evolutionary biology; infectious disease; cancer; ecology; and herbicide, insecticide, and pathogen resistance. We will energize the center with targeted hires at the interface of evolution and public health to create the critical mass for this research focus, which is not currently present at any major research institution in the country.
STEWARD EARTH’S RESOURCES

Our planet is facing a crisis with regard to energy and the environment. The ever-increasing energy demand of our growing populations and economies cannot be met using conventional resources without inflicting irreparable harm on the planet. The research programs of many in the Eberly College of Science are at the forefront of addressing both basic and applied questions applicable to the production and use of renewable energy, energy storage, and the effects of energy extraction and consumption on the environment.

Eberly College of Science faculty members were awarded 39 grants from the U.S. Department of Energy (DOE) between 2012 and 2014, and lead a DOE Energy Frontier Research Center, which studies the structure and genesis of plant cell walls and the conversion of this non-food biomass into biofuels. In addition, the college’s faculty members are conducting basic research on the biochemistry and molecular biology of photosynthesis, with the aim of improving its efficiency, while others are researching electrochemical energy storage and more efficient storage materials. Other teams are working to bioengineer microbes to produce acetate (a plastics precursor) from methane generated from biomass. Thin film photovoltaics, biophotovoltaics, photocatalysis and photoelectrochemistry are all under study by scientists in the college to help move away from the use of fossil fuels and to enable alternative energy generation and the necessary, more-efficient storage capabilities that will accompany this shift.

We will continue to encourage and support research in these areas with targeted interdepartmental hires and direct support of centers and faculty members who can lead these research initiatives. When these research initiatives are coupled with our plans to streamline and improve the translation of our science to the public arena (Section F), our impact on the health of the human race and the planet will increase dramatically.

PROVIDE INFRASTRUCTURE FOR SUSTAINED EXCELLENCE IN RESEARCH

Although the recent National Research Council rankings place Penn State science departments among the top in the country, this has occurred, in many cases, despite the fact that many of our laboratories and facilities are outdated, failing, and often an impediment to high-quality research and teaching. Recent and ongoing renovations and new construction have had major positive impacts on facilities in math, life sciences, and chemistry. However, other faculty, postdocs and students, especially those in our physics and astronomy departments,
are conducting world-class research in buildings that are woefully out of date. Failing HVAC systems, unreliable heat and air conditioning, serious water and sewage leakages, limited access to freight docks or freight elevators, and a lack of vibration control and other shielding are all issues that will impede our ability to retain top faculty members, recruit new leaders and the best graduate students, and conduct world-class research.

The college’s number-one infrastructure priority is to address the critical need for a new physics building to provide world-class research facilities while simultaneously creating modern, flexible STEM education instructional spaces. Over the past two decades, the Department of Physics has taken dramatic strides toward academic excellence, rising from a National Research Council ranking of 55 in 1995 to 13 in 2010. The department resides in part in a 75-year-old building that is in dire need of mechanical and space upgrades and remains hugely inferior to facilities at peer institutions that directly compete with us for faculty members and graduate students. Additionally, although plant sciences at Penn State is ranked 8th in the country, we do not have modern greenhouse facilities that allow our faculty members to grow invasive species, research many types of transgenic plants, or conduct the large-scale phenotype scoring necessary to receive competitive grants. The college fully supports the initiatives by the College of Agricultural Sciences to revive the Greenhouse Complex program that will help address the importance of plant biology.

B. TRANSFORM THE SCIENCE UNDERGRADUATE EDUCATIONAL EXPERIENCE

Students who enroll in or take courses in a college with world-class scientists and research programs should have world-class educational experiences. In a major initiative, as described in section C below, we are working to enhance teaching and learning in courses across the college. Additionally, with a series of initiatives extending beyond the classroom, we have set out to transform the undergraduate educational experience in the college.
A CATALYST FOR INSTITUTIONAL CHANGE

The makeup of the Eberly College of Science population has shifted in the last ten years, in ways that reflect increasingly diverse participation in science at all levels. But we can do better. Among our undergraduates at University Park, about 50 percent of students who join the college graduate with a degree from the college. However, for underrepresented minorities, the national persistence and graduation rates lag those of majority students, and the rates at Penn State are no different. And while there is near parity for enrollment of women in some of our majors, the percentage of women is far below 50 percent in mathematics and the physical sciences.

To help address these issues, the Millennium Scholars Program, a cooperative program between the Eberly College of Science and the College of Engineering, began in 2013 as an adaptation of the highly successful Meyerhoff Scholars Program at the University of Maryland Baltimore County. The Millennium Scholars program is focused on recruiting and supporting diverse cohorts of outstanding students and developing a shared expectation for excellence and attainment of a graduate degree in science. We view the core program components of the Millennium Scholars program (e.g., cohorts, living/learning communities, developing intercultural competence, intensive advising, and early engagement in research) as opportunities for scale-up to include all Eberly College of Science undergraduates. In addition to fostering the intellectual growth and development of future leaders in science research, the Millennium Scholars program is, therefore, a catalyst for institutional change in the ways in which we welcome and support all students, and in how we define and demand excellence within the college.
FACILITATE LEARNING COMMUNITIES

Learning communities reinforce the classroom experience, provide networking opportunities, and facilitate peer mentoring. Our goal is to include all students in the college in disciplinary or interdisciplinary learning communities, following lessons learned from the Millennium Scholars program. Expanding the learning environment to include informal spaces that promote interactions, team-based problem solving, and community outside of the classroom is key to this initiative, and we will work to formalize the creation of disciplinary cohorts in our undergraduate student population. We will expand the college’s Welcome Day program by partnering with the newly formed undergraduate club NEXUS, and we will begin to cohort incoming undergraduates by major and match students with a peer mentor on their first day at University Park. Our goal is to establish a robust peer-mentoring network that extends beyond Welcome Day through the first semester by pairing mentors, and their student groups, with faculty members who are teaching First-Year Seminars.

EXPAND INQUIRY-BASED INSTRUCTIONAL LABS AND FRESHMAN RESEARCH

Studies show that early exposure to research is a powerful tool for training and retaining undergraduate students in science. We will provide inquiry-based instructional laboratories for undergraduate students in their first year as the foundation for a Freshman Research Initiative, beginning with a pilot in 2015. This approach will
teach students the scholarly practice of scientific inquiry and promote curiosity and ownership, while establishing the fundamental skills necessary to conduct experimental science. This program will build from, extend, and enhance our research mission, while increasing students’ mastery of the material through application of knowledge. New and expanded educational facilities will be needed to support scale-up from the pilot phase to offering the experiences to large numbers of students.

**REQUIRE CO-CURRICULAR EXPERIENCES**

Co-curricular experiences can be as important for student learning as traditional classroom experiences. Engaging in research, study-abroad opportunities, internships, and peer-led teaching experiences motivates and stimulates students, allows them to apply and practice what they learn in the classroom, exposes them to new perspectives, and builds community and support networks, significantly enriching their education experience and contributing to increased persistence and success.

The correlation between co-curricular experiences and persistence is evident in our students. Currently, about 45 percent of our students leave the college before their junior year, but in the most recent graduating class,
74 percent of those who persisted to graduation engaged in co-curricular experiences. Also, in programs and studies at some other institutions, early engagement in research and other co-curricular experiences has been shown to motivate students and increase retention in science. We intend to engage, and eventually require the engagement, of 100 percent of our students in at least one significant co-curricular experience, and to do this at an early stage in their education. To accomplish this goal, we need to increase the visibility of these opportunities through a user-friendly website, communicate the importance of these experiences to our students at regular stages (including before they arrive at Penn State, when they first arrive at Penn State, and in the semesters that follow), and lower the barriers to participation. In addition, we will update and propose several undergraduate certificates, including the International Science and the Science Teaching certificates, to enable students to have formal recognition of their co-curricular participation on their transcripts.

We also will establish a dedicated director of undergraduate research, who will be charged with increasing the availability and impact of undergraduate research opportunities in faculty research laboratories. The director will coordinate these opportunities, write undergraduate research training grants, and acquire and distribute resources to encourage and facilitate participation of undergraduates in research labs.

So that research opportunities can be provided for all undergraduates in the Eberly College of Science, it will be critical that we increase faculty participation in undergraduate research. Mentoring undergraduate learning by supervising research projects is an important form of teaching, and we will identify mechanisms to recognize and reward faculty members who train undergraduates in their research labs. We will, in turn, complement these activities by increasing the visibility of undergraduate research on websites and digital signage, in newsletters, and with a college-wide poster session, and we will promote engagement of undergraduates in research with a formal science research distinction certification program (SCIRES) for students who pursue this option and produce a thesis.

**EXPAND ADVISING SERVICES**

We will expand our college academic advising center so that additional trained advisers will be on the front line helping students navigate the personal and academic challenges of college life. Beyond simply advising on schedules, courses, and co-curricular choices, academic advisers help students develop strong study and metacognitive skills to train them how to learn. Professional development opportunities for advisers will be pro-
vided so that they can cross-train for multiple programs in the college and also recognize the changing needs of undergraduates from a range of backgrounds, including students in the 2+2 program from the Commonwealth campuses (a group with historically very low retention rates in the college), students typically underrepresented in STEM, international students, and students who are the first in their families to attend college. This advising team will be complemented by research mentors and faculty members in the student’s major, who can provide career and/or graduate school guidance.

**INCREASE EARLY RETENTION EFFORTS**

We anticipate that the above efforts will have a positive impact on the retention of students in the college and University. However, we need to ensure that we can retain students long enough for the above-described efforts to have an effect. To do this, we will expand our toolbox of early intervention tools to identify students who are at risk and that then allow us to better match modes of instruction and resources that will allow these students to succeed. We will experiment with “drop-down” courses that allow students who are failing a required course midway through a semester to remain in full-time status while becoming better prepared by entering a course that provides greater opportunity for preparatory learning. To complement this, we will expand our current use of early progress reports, seek additional early indicators of academic concerns, and continue to use the practice of placing students who are identified as having met academic difficulties on “academic hold” until they meet with an adviser. We will collect data on the impact of these initiatives on student persistence and success, present these data at national advising meetings and in publications, and continue to explore other early intervention approaches that may significantly impact our retention rates.

**UPDATE DEGREE PROGRAM CURRICULA**

Reaching higher levels of excellence in undergraduate education will require us to examine and modernize our degree program curricula. All undergraduate program heads in the college are active participants in annual program assessment, and in using these data for evaluation and improvement of our programs. Two
of our non-departmental undergraduate majors—the Premedicine and Science baccalaureate programs—are well positioned to be among the top in the country, and the college will work to achieve this status. We propose to increase the national stature of the Premedicine program by creating a faculty specific to this program, which will considerably extend and formalize valuable curricular and co-curricular opportunities for these students. In addition to identifying faculty members at University Park, we will offer courtesy or adjunct appointments to Penn State Hershey Medical School physicians and appropriate alumni. Further, we will expand the numbers of early assurance partnerships both locally and with top medical schools in the country.

We also will work to elevate the status of our Bachelor of Science degree, while maintaining the flexibility in the program that enables many students to complete a degree in the college. Our goal is to modernize the curriculum to include integrated courses from multiple disciplinary perspectives, making this a program of choice for the next generation of interdisciplinary thinkers. We, therefore, propose to refframe our general science undergraduate program as a Bachelor of Science in Interdisciplinary Science degree. As part of this, we will provide support for faculty members who are interested in developing interdisciplinary courses in emerging areas and topics.

In addition, we will foster the development of new interdisciplinary writing and communication courses to prepare our students for careers that straddle science and communication with society. We currently are in the process of developing content in this area, focusing on three different modes of communication: written, oral, and video.

We will also continue our program of workshops and support for faculty members who seek to integrate ethics in the science curriculum, and we will support increased integration of ethics in general education curricula as well.

PROVIDE INFRASTRUCTURE FOR ENHANCED EDUCATIONAL CAPABILITIES

Elevating the quality of the educational and learning experience of students in the college will require us to improve and redesign learning, advising, and living spaces. Additionally, expanding enrollments in introductory classes and the transformation of the undergraduate experience to include the Freshman Research Initiative emphasize the need for additional and reconfigured instructional space. It is critical that we create effective teaching spaces that encourage participation and interaction and that allow for free movement of instructors, assistants, and students.

Additional space in the Ritenour Building for the college is needed to
complete the Academic Support Center. We are moving forward with renovation of the east wing of Ritenour for the Eberly College of Science Academic Support Center, which co-locates many undergraduate student services for the college, including life sciences advising, the Center for Excellence in Science Education, the Office of Digital Learning, director for undergraduate research, Career and International Education, and an open student collaborative learning and meeting space. However, there is not sufficient space to house advisers from the math and physical sciences, the office of the associate dean for undergraduate students, or the University’s Millennium Scholars program staff. These essential offices for undergraduate student initiatives are needed to complete the Academic Support Center as a home destination for undergraduates in the Eberly College of Science.

C. ELEVATE THE QUALITY OF THE EDUCATIONAL EXPERIENCE FOR ALL STUDENTS

First and foremost, we will enhance the learning experience for all Penn State students with improvements in science courses. Among all colleges at the University, the Eberly College of Science delivers the second-highest number of student credit hours—behind only the College of Liberal Arts—to Penn State students as part of their major degree and general education requirements. We are committed to improve and enhance mathematics, statistics, and science courses for all Penn State students. We will also continue to play an important role in the University-wide review and revision of the general education curriculum.

SUPPORT FACULTY MEMBERS IN INCREASING EXCELLENCE IN TEACHING

We must transform the classroom experience by rewarding, training, and inspiring all of our faculty members to incorporate research-proven pedagogical techniques into their courses. We will provide pedagogical training for new faculty members as they begin their teaching careers and on a continuing basis in the form of workshops that will be offered annually by the Center for Excellence in Science Edu-
cation (CESE). The establishment of the CESE in 2010 was an important step in improving teaching and learning; our early efforts have established a community of science educators who are changing the ways that we teach and built a network of faculty committed to improving STEM education that extends beyond the college. Our departments and many faculty members are engaged in the development of learning outcomes for academic programs. We will continue this effort and develop course-level learning outcomes consistent with program objectives. We have also developed a learning assistant program that benefits both the undergraduate learning assistants and the students in courses served by them. We will build on these early accomplishments and accelerate change by providing additional support to expand the center’s activities both to serve all faculty members in the college and to build a national reputation for innovation, research in science pedagogy, and implementation of education reform.

We will support educational innovation with faculty fellowships for educational development, together with a process that recognizes and rewards faculty members, including in the promotion and tenure process, who undertake serious innovation efforts in their courses. Assessing the impacts of these projects will be essential. We will encourage and facilitate disciplinary science educa-

tion research by the college’s faculty members and work to develop a culture of assessment. In this effort we will seek to partner with the College of Education as appropriate, including exploring co-hires between the colleges. These steps, effectively carried out, will enable Penn State to become a significant force in science education research.

**EXPAND AND IMPROVE ONLINE OFFERINGS**

While we remain convinced that the on-campus experience is essential for rigorous education and training of the next generation of scientists and a scientifically literate population, online offerings can expand our reach and provide learning opportunities for students who are not able to spend four years on campus. High-quality online courses and digital media can enrich the educational experience of all—for both resident and online learners at University Park and across the commonwealth—and play a meaningful role in departmental budgets.

We propose to expand the impact and scope of the Eberly College of Science Office of Online Education—as the Office of Digital Learning—by providing and developing mechanisms for expanding the use of digital components, instruments, and materials for our residential and web-based classes. The Office of Digital Learning will
work in partnership with the CESE to identify the most promising digital technologies to enhance our resident instruction courses and support faculty members who wish to use them. We will make available resources such as a one-button studio where faculty members can record content for online delivery of material, flipping the classroom, and other course delivery strategies. We will continue to encourage and partner with faculty members who are interested in new opportunities to develop online courses and materials that provide high-quality educational experiences for our students.

In addition, MOOCs (Massive Open Online Courses) of the highest caliber can serve several functions for the college as a result of their potentially wide reach and impact. We will continue to support faculty members who seek to develop high-quality MOOCs for broad delivery that will reach out to and impact learners around the world. Of particular interest is supporting the use of the material developed for MOOCs in innovative ways such that they positively impact, engage, and augment student learning in resident instruction.

Finally, increasing the number of professional master’s degree programs offered through the World Campus can expand our reach and impact, as well as generate new revenue streams for departments. The Masters in Applied Statistics program has been highly enrolled, and a Master of Science program in Bioinformatics is currently under development. Additional opportunities, driven by faculty interest, will be encouraged and supported.

Furthermore, with the new budget model being put into place, we will look to expand current residential professional science masters programs and seek opportunities for professional masters programs in new areas.
ENRICH THE TRAINING EXPERIENCE OF OUR GRADUATE STUDENTS

Education and training of our graduate students is inherently different from training of undergraduate students, and is accomplished primarily by one-on-one mentoring by the dissertation adviser, the dissertation committee members, and the interdisciplinary collaborators of the adviser. We will continue to encourage and facilitate interdisciplinary training of our graduate students. We also will enrich and expand the training experience of graduate students to better prepare them for the diversity of job opportunities available to students with advanced degrees.

We will develop and introduce courses for all graduate students in the Eberly College of Science that will supplement the skills and training they will obtain in their research groups. A one-semester course will target training in a variety of “soft skills” that are important for scientists in both academia and industry, with specific attention to the development and transfer of intellectual property, ethics in research and the workplace, cultural awareness and sensitivity, and communication to the media and policy makers. We will partner with alumni, other STEM colleges, and the Graduate School to provide the content for these courses, as appropriate.

WE ALSO WILL ENRICH AND EXPAND THE TRAINING EXPERIENCE OF GRADUATE STUDENTS TO BETTER PREPARE THEM FOR THE DIVERSITY OF JOB OPPORTUNITIES AVAILABLE TO STUDENTS WITH ADVANCED DEGREES.

as well as continue to pursue student exposure to science careers in industry, government, start-ups, and foundations via internships, alumni mentors, and on-campus alumni speaking engagements. All graduate students will be taught modern pedagogical techniques as part of their first-year training, and upon completion of the training and success as a teaching assistant will be promoted from teaching assistants to teaching fellows.

INSTITUTE BEST PRACTICES FOR GRADUATE STUDENT MENTORING

We also see areas in our graduate programs where a college-wide initiative can improve retention and graduate student success. Over the past few years, we have implemented new guidelines and best practices for the mentoring of postdoctoral scholars in the college. Review of our recent climate survey and discussion with
graduate student groups has made it clear that a similar activity would be beneficial to our graduate student population. We are in the process of reviewing current graduate student mentoring guidelines used across the country and will develop guidelines that can be tailored for implementation in every department in the college. As part of this process, we will identify best practices in graduate student mentoring and support, and we will work to implement these across the college. We also recognize the importance of training and mentoring postdoctoral fellows, and will maintain our recent initiatives to ensure that this remains a priority in the college.

**INCREASE THE QUALITY AND DIVERSITY OF OUR GRADUATE STUDENTS**

Although the research programs of our faculty members and our departmental and intercollege graduate programs rank among the very best in the world, we must continue to improve our ability to attract the best, the brightest, and the most motivated students from around the world to our graduate programs. To do this, we must be able to make offers of financial support that are competitive with top graduate programs in the Big 10, the Ivy League, and the top programs on the West Coast. It is, therefore, imperative that we increase the number of Eberly College of Science fellowships (Distinguished Graduate Fellowships) available to recruit the most outstanding prospective graduate students.

In addition, we propose to significantly increase the number of national graduate fellowships won by our first- and second-year graduate students by initiating an incentive program for new graduate students and their faculty mentors. For example, incoming graduate students will be given an incentive to submit a proposal for an NSF Graduate Research Fellowship during their first semester in residence and will be provided with a faculty mentor to assist in the development of a competitive proposal during the summer prior to matriculating to Penn State.

To increase the diversity of our graduate student population, we partnered with other STEM colleges and the Graduate School in 2013 to host a fall
HOSTING A FALL OPEN HOUSE RECRUITING WEEKEND IN 2013 CONTRIBUTED TO A COLLEGE RECORD IN NUMBER OF APPLICATIONS FROM STUDENTS OF COLOR AND A RECORD NUMBER OF ACCEPTED OFFERS TO OUR GRADUATE PROGRAMS.

open house recruiting weekend for prospective students from underrepresented groups. Thirty outstanding juniors and seniors were brought to campus and introduced to our faculty, graduate programs, and research facilities. This program contributed to a college record in number of applications from students of color and a record number of accepted offers to our graduate programs. We propose to continue to support, enhance, and expand (to 50 students) our fall recruiting weekend. To financially support the expanding number of minority graduate students in the college, we propose to develop an Eberly College of Science Graduate Fellowship program that would be matched by graduate school minority fellowship funds, and thereby double the number of prestigious awards that we could offer to the very best minority applicants.

ENHANCE POSTDOCTORAL TRAINING AND PREPARATION FOR A DIVERSITY OF JOBS

The NSF, NIH, and many professional societies are emphasizing the importance of more effective mentoring and development of a wide range of skills to prepare postdoctoral scholars for the highly competitive workplace they are facing. More than laboratory bench skills are needed by our postdocs to compete for the jobs they want in industry and in a diversity of university and college settings. Over the last few years, the Eberly College of Science has drawn from the best practices from around the country and developed a self-assessment and Individual Development Plan (IDP) rubric (https://elements.science.psu.edu/faculty-staff/postdoctoral-information/IDPfillable.pdf) that all postdocs, in collaboration with their faculty mentors, should complete yearly as an avenue toward more effective mentoring and to assist postdocs in achieving their training goals. We propose to fully implement and monitor the use of the IDPs by all postdocs (and their mentors) in the college.

To provide the additional training that has not historically been available to all postdocs, we will expand and enhance the postdoc orientation program to include IP awareness and technology transfer training; encourage, facilitate, and monitor postdoc training in
ethics; provide expanded opportunities for training in pedagogy; and provide opportunities to obtain both online and residential teaching experience. We will invite interested postdocs to attend and participate in the professional development modules that will be developed for the graduate student course if they wish to receive additional training in tech transfer, soft skills, or communication with the media. Finally, we will supplement the mentoring/workshops currently offered by the University for postdocs in areas such as job applications, interviewing skills, effective mentoring, and setting up a laboratory, with lunch-hour open houses following the model already practiced by several of our departments.

D. INCREASE THE DIVERSITY AND GENDER BALANCE AMONG THE FACULTY

As we continue to increase the diversity in both our undergraduate and graduate student populations it is becoming critical that we increase the diversity of our faculty. Although we have made excellent progress in increasing the racial and ethnic diversity of our faculty in the last few years by adding eight Hispanic faculty members to our ranks since 2011, we still have a long way to go if we hope to have our faculty demographics reflect that of the U.S. student population.

Similarly, although increasing the proportions of women among our faculty was one of the objectives in our last strategic plan, we succeeded only in increasing the numbers of women in the higher ranks of our faculty. Women continue to constitute only nineteen percent of the total population of our tenure-track faculty. We recognize that this must change, and we will aggressively work toward increasing the proportions of our female faculty members and faculty members from underrepresented groups in the college. We will continue to focus on excellence and recruit only outstanding researchers and educators to our faculty, but with the awareness that the gender, race, and ethnicity representation among our faculty must increase and continue to approach that of the population at large.

We note that with faculty from around the world and with increasing numbers of international undergraduate students (the continuing increase is a very good trend), there is significant country-of-origin diversity in the college. At this point, 40 percent of the faculty members in the Eberly College of Science were born in a country other than the United States, and they represent 34 different countries. This international perspective serves our students well as they prepare for life in our increasingly connected global society.
To accelerate the progress in diversifying the faculty, we propose to establish a standing faculty search for Eberly College of Science.

To accelerate the progress in diversifying the faculty, we propose to establish a standing faculty search. This standing search will foster hires of outstanding faculty members of any rank, will facilitate hires of potential faculty members for whom we must aggressively compete against the other top institutions in the world, and will champion hires who are committed to increasing the diversity of faculty members in science disciplines. In order to widely encourage receipt of applications from a diverse pool, all of our departmental searches will be broad, follow Penn State Guidelines for Recruiting a Diverse Workforce, and have input from the college’s associate heads for equity and diversity. In addition, we will again host a Strategies and Tactics for Recruiting to Improve Diversity (STRIDE) workshop to educate more of our faculty members on the scientific literature on implicit bias and why hiring a diverse workforce requires affirmative action. In addition we will specifically encourage applicants to report their activities that foster diversity and an inclusive climate.

In town hall meetings with our faculty members, it became clear that in order to attract and retain outstanding faculty members we must continue to make the college as family friendly as possible. This begins with the communication that we strongly encourage our faculty members to take parental leave and to extend their tenure clocks following the birth or adoption of a child. We also will maintain three lactation rooms spread among the college’s facilities. In addition, we will work toward guaranteeing new faculty members excellent childcare services for their children ages 5 and under.

E. INCREASE JOB SATISFACTION AND PROFESSIONAL DEVELOPMENT OF THE STAFF

The Eberly College of Science is fortunate to be supported by a very talented and dedicated cadre of personnel that comprise the support staff for the departments and college. Despite increasing workloads, unfunded mandates requiring yet more work, and decreasing budgets, our staff is committed to the college and to excellence. In turn, the college is committed to retaining these people, fostering this attitude, and working to increase staff members’ job satisfaction and productivity.
The staff subcommittee of the college Climate and Diversity Committee recently proposed best practices in the areas of dress code and flex-time work hours, based on those used successfully in some departments. We will work to have these adopted by all departments in the college.

Focus group meetings to discuss college-wide changes that would result in greater job satisfaction have consistently revealed frustration that changing policies, moving targets (report content and deadlines), and personnel changes make it difficult for the staff to perform at the level they desire and of which they are capable. Potential solutions identified by staff subcommittees and focus groups include access to better training for new hires, more training for new policies and protocols, mentoring programs across departments, and improved vehicles to share best practices across departments. We will address the first two potential solutions at the college level by offering IT training specific to a range of departmental staff positions, and with training specific to all new policies, databases, and protocols. The staff subcommittee of the college Climate and Diversity Committee will be charged to work with our college Staff Advisory Committee to follow a model developed in our math and chemistry departments of training new hires using an apprenticeship model for particular positions and to reinstate quarterly meetings of personnel sharing the same job title in different departments for sharing of best practices.

**F. EXPAND OUR IMPACT ON SOCIETY**

The research programs of our faculty members and the graduate programs in the Eberly College of Science rank among the very best in the world. Our faculty includes numerous members of the National Academies and counterpart academies in other countries; our publication record, citation statistics, and federal grant support for research rank among the best universities in the world; our work is often prominently displayed on the covers of scientific journals; our faculty members are well represented on the editorial boards of scientific journals, and serve on numerous advisory and funding panels in the United States and abroad; and we have a large impact on society through the excellent undergraduate and graduate students who work and learn in the college and move on to successful careers of their own.

**THE IMPACT OF OUR RESEARCH ON SOCIETY IS NOT COMMENSURATE WITH THE QUALITY AND QUANTITY OF OUR RESEARCH FINDINGS.**
Yet, the impact of our research on society is not commensurate with the quality and quantity of our research findings. This state of affairs means we are not fulfilling all parts of our mission and also limits our public reputation and, therefore, can impact our ability to recruit the very best undergraduate students, graduate students, postdoctoral scholars, and faculty members.

Thus, one of our goals is to improve the communication of our research activities and research results to the general public and to policy makers. Better communication will enhance our impact on the public understanding of science and the important issues that face the planet, as well as enhance our impact on legislators and other decision makers. Better translation of our research findings from the lab bench to the public sector will greatly and positively increase our impact on the region, our state, the nation, and the world. Furthermore, successful translation of many of our research findings has the potential to generate a revenue stream that can alleviate pressures on tuition and fees, enhance our ability to attract world-class students and faculty members, enrich our educational capabilities, allow internal funding for high-risk and potentially high-reward basic science, and provide major instrumentation for the college.

ENHANCE VISIBILITY

Our faculty members consistently produce significant advances to the frontiers of knowledge and communicate these advances to their peers through seminars, symposia, workshops, and publications. They provide training to their postdocs and graduate students in science communication through these venues. However, communicating to the general public; media; policy makers; and Penn State constituencies, including alumni and industry representatives, requires a different set of skills. In fact, depending on the audience and even the type of communication media (e.g., radio versus print), different approaches are needed to produce the most impact. Many of our faculty members have learned to do this through experience, but many others have not, and some avoid these opportunities.

We propose to provide all faculty members, as well as postdocs and graduate students, with training on how to speak to the public, the media, and public policy makers. We will proactively encourage our faculty members and students to take advantage of communication training opportunities provided by other units in the University, but also will provide specific training in these skills during new faculty and new postdoc orientation, and as part of our professional development course for new graduate students.
TAKE ADVANTAGE OF NEW MEDIA AND STREAMLINE COMMUNICATIONS

More recently, the college has added social media—such as Twitter, YouTube, and Facebook—to rapidly reach far larger audiences and to have a more immediate impact. In addition, the college has begun to add Massive Open Online Courses (MOOCs) to our educational offerings. The first MOOC to come from our college, Epidemics, reached 28,000 people from 50 states (plus D.C. and armed services in Asia and Europe), 150 countries, and six continents, including high school students, college students, professional health care workers, academics, and public officials. It generated chat rooms that debated the mathematics of epidemiology, public health policy, and tips for practical care of patients suffering from transmitted pathogens.

We recognize that the impact of our science on society can be even greater if we coordinate and dovetail our uses of traditional and new media with the college’s outreach and science education initiatives. We will coordinate the efforts in all offices in the college that are involved in both internal and external science communication and outreach to increase efficiency and streamline our communication efforts.

BROADEN THE IMPACT OF RESEARCH PROPOSALS

The National Science Foundation, and increasingly other granting agencies, evaluates research proposals both on their scientific merit and their broader impact. Developing effective plans to broaden the impact of research proposals is often outside the expertise of our faculty members and can be very time consuming. Our outreach office has assisted many of our faculty members with this, primarily by partnering with them in conducting summer camp or other experiences aimed at K-12 children.

We will task our Office of Outreach and Science Engagement to develop broader impact activities aimed at a larger cross-section of the general public that our faculty members can easily adapt for their grant proposals. These activities will be advertised to our
faculty members, who will have the option to include appropriate funds and personnel time in their grants to support these activities. Our goal will be to have much more compelling broader impact sections in grant proposals that benefit from linkage with an established infrastructure and reduce demands on faculty time, both for grant preparation and execution of the proposed work.

**TRANSFER RESEARCH TO THE PUBLIC GOOD**

Federal granting agencies increasingly expect researchers to develop and commercialize intellectual property (IP) and its transfer to the public as discernible impacts from the grant funds they provide. The college cannot ignore this responsibility. Moreover, the generation of intellectual property and its transfer to society are entirely consistent with the research, education, and outreach missions of our college. Yet, the performance of our college in the area of IP development and technology transfer greatly lags behind that of our peer research institutions. While there are pockets of IP activity within the college, there is a general lack of IP awareness throughout the college that is preventing the research enterprise of the college from fully capitalizing on the economic, educational, and societal benefits of IP development and tech transfer. We will work to increase the general level of IP awareness and interest in the college and to facilitate transfer of our IP to beneficial use by society.

Knowledge, awareness, and enthusiasm for IP and tech transfer activities will be considered in the faculty hiring process. In addition, all new faculty members, graduate students, and postdocs will receive instruction in IP awareness to enable the recognition of potential IP and the steps required to develop and protect it. For faculty members and postdocs this will be provided during the orientation process. Graduate students will receive more extensive training in IP development and tech transfer as a portion of their first-year professional development course. Postdoctoral scholars also will be invited to attend all or portions of this first-year course. We will increase faculty, postdoc, and graduate student awareness and encourage their partic-
ipation in tech transfer workshops and programs offered through the Office of Technology Management (OTM), and we will partner with the OTM to develop IP awareness and patenting strategies within the research centers supported by the college where industry collaborations and tech transfer opportunities are appropriate. Reporting on development of IP will be requested in yearly faculty and student activity reports, and the college will celebrate the issuing of patents and the formation of licensing agreements through a variety of internal and external media outlets.

With appropriate training and encouragement in the generation of IP, we envision there will be a need for increased mentoring and resources to nurture and facilitate technology transfer from the college’s research labs to the public arena. We propose to further develop and support our newly formed alumni biotechnology board and use this model to develop a materials science alumni board (perhaps in collaboration with other STEM colleges) to provide our inventors with access to expertise in IP commercialization and tech transfer.

Our biotechnology board was formed in 2013 and consists of alumni with strong backgrounds in the patenting process, tech transfer, biotechnology, and start-ups. The board works with the college’s inventors, the OTM, and the associate dean for research.

A graduate student IP intern coordinates the activities of the board, works with an inventor to provide the board with an abstract and brief presentation of the invention, arranges an online meeting, and provides the inventors with written feedback from the board. During the first (pilot) year, the board has provided six inventors with suggested experiments that would enhance the attractiveness of the IP to industry, discovered possible funding sources and marketing strategies for the IP, and provided real-world evaluation of the potential value of the IP. The board already has had a positive impact on the research of the inventors and de-mystified the process of tech transfer for them. In addition to the positive effects of the IP intern on college IP activities, this internship provides valuable training, experience, and contacts for the intern.

Translating the discoveries of our faculty members to successful business enterprises requires expertise outside of the Eberly College of Science. We will partner with OTM and other colleges (the Smeal College of Business in particular) to develop programs, courses, and workshops to both train our inventors and to partner our inventors with Penn State entrepreneurs with business expertise. The college also will work closely with the OTM as they develop alumni mentoring programs for faculty members, graduate students, and postdocs who wish to form start-up companies.
A major hurdle in the transfer of new technologies and inventions to the public sector concerns the lack of funding sources to enhance the attractiveness of new IP to the commercial sector. Consequently, we will develop a commercialization enhancement fund for translational research (the Laboratory for Translational Research) with the goal of further enhancing the IP generated by the college. In addition to enhancing the commercial value of the IP in the college, these funds also can be used to leverage internal (e.g., the Penn State Fund for Innovation) and external translational research funding opportunities. We envision that the fund will be fueled by donations from alumni who wish to see the research enterprise of the college fully capitalize on the economic, educational, and societal benefits of IP development and tech transfer.
APPENDIX 1. PROGRESS AND ONGOING EFFORTS TO MEETING THE CHALLENGES OF THE FRAMEWORK TO FOSTER DIVERSITY

CHALLENGE 1: DEVELOPING A SHARED AND INCLUSIVE UNDERSTANDING OF DIVERSITY

With the production of the new strategic plan, we have revised our vision and goal statements to explicitly state our commitment to a more inclusive and diverse Eberly College of Science. We are using a multipronged approach to address this challenge, important components of which are our departmental and college climate and diversity committees. The college committee includes members from every departmental committee, as well as undergraduate students, graduate students, postdoctoral scholars, staff members, faculty members, and members of the college’s administration (including the director of the college’s human relations office, our multicultural officer, and an associate dean). All members, except the administrators who have ongoing appointments, serve three-year terms. This committee addresses issues of climate and diversity, and communicates ideas and potential solutions to the college and departmental committees through e-mail, the website, and, most recently, digital signage. We have eight digital displays located in key locations in the college’s buildings chosen for widespread visibility and impact that are used to advertise climate- and diversity-oriented events and more generally provide content aimed to promote a positive climate and an appreciation for diversity.

Every four years, the college-wide committee oversees a climate survey and uses the results to gauge progress and to identify problems that require increased attention by the committee and the college (2008 and 2012 climate survey report, available upon request). For example, as a result of the 2012 survey, the committee added a subcommittee on graduate student issues and is producing guidelines on best practices in graduate student mentoring to be implemented college-wide. Additionally, a standing subcommittee, the Climate and Diversity Awards Committee, solicits nominations of groups and individuals that have had a positive impact on climate and diversity in the college. The dean presents the awards at an annual ceremony celebrating the college’s efforts to improve the climate and increase diversity in the college.

Our college’s Multicultural Coordinator has the dual titles of Executive Assistant to the Dean and Director of Science Diversity Initiatives. The Multicultural Coordinator reports directly to the dean and sits on the college’s
Executive Committee. In addition, we created the positions of Associate Heads for Equity and Diversity in each department. These associate department heads have been charged with informing hiring and recruiting best practices and with participating in all searches and recruitment efforts to assure an active effort to diversify the membership of the college.

Comparison of the results from the 2008 and 2012 climate surveys indicates an increasing recognition by the faculty of visible leadership to foster diversity through the dean’s office, the departmental climate and diversity committees, and the college Climate and Diversity Committee (Figure 1). There were polarized views from undergraduates on this question, with general increases in both the percent of respondents who agreed and in those who disagreed, although only 10 percent reported that they do not recognize leadership in fostering diversity from their units (Figure 2). These responses also show a clear increase in the perception among instructional faculty members and staff members that the college values involvement in diversity initiatives. The changes in undergraduate and postdoc perception of the value the college places on involvement in diversity initiatives was mixed. Overall, a relatively small percentage of the college does not believe that the college values involvement in diversity initiatives; however, the graduate student response to this question (and several others, in the 2008 and 2012 climate survey report, available upon request) indicates a need to specifically address graduate student concerns (Figure 3).

Figure 1. The faculty response to the statement, “There is visible leadership to foster diversity in the college.” Among the faculty, there is an increased recognition of leadership to foster diversity in the dean’s office and the college and departmental culture and diversity committees.

source: 2008 and 2012 ECO5 Climate Survey
Figure 2. The undergraduate response to the statement, “There is visible leadership to foster diversity in the college.” The responses to this question were more polarized in 2012, with increases in the percentage of respondents who agreed and in those who disagreed in most cases.

Figure 3. Response to the statement, “Involvement in diversity initiatives is valued by the college.” Among the staff and instructional faculty there is an increased recognition of the value the college places on involvement in diversity initiatives. Fewer undergraduates and postdocs disagreed with this statement in 2012. However, among graduate students and other faculty members there is no increased recognition of the value the college places on involvement in diversity initiatives.
CHALLENGE 2: CREATING A WELCOMING CAMPUS CLIMATE

This is another challenge in which the college Climate and Diversity Committee has had a positive effect on the college. One example came from the postdoctoral subcommittee, which recommended college-wide adoption of best practices in postdoctoral mentoring, and produced a rubric to be used by postdoctoral scholars and their mentors to foster communication and training that is appropriate to their personal development needs and goals. This example was based on personal development plan approaches created by national postdoctoral organizations, but fine-tuned to better fit the needs and desires of postdoctoral scholars in the Eberly College of Science. As noted above, the graduate student subcommittee currently is working on a similar approach to improve the mentoring of graduate students college-wide in response to issues brought to light through our climate survey and subsequent discussions with graduate students at the departmental level.

Also influenced by the college Climate and Diversity Committee, we have proactively changed our policies on maternity issues, and are working to provide more lactation rooms and unisex bathrooms. This already has had an effect on the perception of the college’s attitude toward families as evidenced by the dramatic changes in response to the statement, “I feel that faculty/staff in the college who have children are considered less committed to their careers,” (Figure 4). In addition, the staff subcommittee of the college climate committee has just forwarded a recommendation of adoption of best practices for an adjusted work schedule (flex-time) to provide a more family-friendly workplace.
In addition to the establishment of anonymous suggestion boxes and the anonymous survey in 2012, at the recommendation of the Climate and Diversity Committee, we instituted the practice of having two ombudspersons in each department. The ombudspersons are charged with providing an anonymous outlet for concerns and the discussion of issues related to inappropriate behavior, harassment, and general climate. The ombudspersons in each department are nominated by the departments and approved by the dean’s office to ensure that they are approachable (one male and one female, one from the faculty and one from the staff populations). The ombudspersons were trained by the college’s human relations office in how to deal with situations internally versus when to seek outside assistance.

The 2012 climate survey motivated most of these initiatives and, as noted above, also increased attention to graduate student issues. Although most of the small changes noted in the undergraduate perception of the climate in the survey (2008 and 2012 climate survey report, available upon request) were not statistically significant, it is important to note that the overwhelming majority of our undergraduates remain comfortable in their unit (Figure 5).

When the undergraduate responses concerning comfort level in the classroom are disaggregated by race/ethnicity and gender, three trends are important to note. First, most students in all groups are comfortable in the classroom. Second, there is a clear general increase in the classroom comfort level in all groups except the URM students (Hispanic, African American, Native American, and Pacific Islanders). Third, women remain less comfortable than men in their classrooms and URM students remain less comfortable than majority or international students (Figure 6).
Figure 6. Undergraduate comfort level with the climate in their classes. Although we see a general improvement in the comfort level in the classroom and most students are comfortable in their classes, differences among groups indicate we must continue to address the classroom climate.

Figure 7. The undergraduate response to the statement, “The classroom climate in the Eberly College of Science is welcoming for students based on their...” With the exception of learning disability status, where there was increased polarization in the responses in 2012, the college has made excellent progress in promoting a welcoming climate for students with a wide range of individual attributes.

Figure 8. The faculty and staff response to the statement, “The Eberly College of Science proactively addresses discrimination based upon...” The largest changes are in the recognition of our sensitivity to discrimination based upon sexual orientation, learning disabilities, and parental status. Clearly, we have work to do in several other categories, including visibly addressing discrimination based on level of education and status as a non-native English speaker.
Improvements over the last five years were especially clear, with a closer look at the perception of how welcoming the classroom climate was for students with a variety of individual attributes (Figure 7).

Faculty and staff responses to the question, “Does the Eberly College of Science proactively address discrimination?” (toward a number of human attributes), indicate a consistent improvement between 2008 and 2012. However, there still exists a number of responses that indicate we are not perceived as doing enough, especially in the areas of various “isms” (e.g. sexism and racism); tolerance; and discrimination towards non-native, English-as-a-second-language speakers and people with differing levels of education (Figure 8).

**CHALLENGE 3: RECRUITING AND RETAINING A DIVERSE STUDENT BODY**

The Eberly College of Science is committed to recruiting and retaining a diverse student body and has launched a number of initiatives to accomplish this goal. Although there have not been significant changes in our recruitment success over the last five years (Figure 9), we expect to see improvements resulting from the new initiatives described below.

Recruitment strategies to provide student access to higher education in science, technology, engineering, and mathematics (STEM) disciplines begin with our participation in K-12 initiatives, such as the Pennsylvania (PA) Junior Academy of Science, Philadelphia Awards Convocation, and Upward Bound Math and Science. Building upon these existing efforts, we now offer the Millennium Scholars program for undergraduates, in which underrepresented students and women are recruited, financially supported, and mentored into STEM disciplines as they pursue their long-range objective of a Ph.D. degree and research career in STEM. In addition, the college annually participates in activities—including public and private school district partnerships with Penn’s State’s Community Recruitment Centers in Philadelphia and Pittsburgh—to identify prospective students with an interest in STEM disciplinary programs. We continue to engage new applicants and families through Penn State Office of Admissions programs, which includes outreach to these pre-college communities and bringing potential high school student applicants to campus for overnight visits.

Beginning in fall 2014, the Penny-packer Experience program for undergraduates, which is coordinated by the college and has an emphasis on science and inclusiveness, will move from East Halls to Pollock Hall. By partnering with several other science and engineering special living options, we
have coordinated a significant increase in capacity to accommodate first-year students. We also have expanded the number of scholarships awarded to participants in these programs, thus reducing the financial burden on parents and encouraging the best students to choose Penn State and the Eberly College of Science. Achieving yearly increases in the number of students from underserved groups that matriculate in the Eberly College of Science will remain a priority over the duration of the strategic plan.

Despite our efforts, addressing intergroup disparities in retention of students in the college—including underrepresented minorities and women in science—remains a challenge; however, we are active in identifying solutions. It is too early to see the results of our most recent efforts because these will not be evident until the most recent cohorts graduate. However, the historical data clearly show two aspects we are addressing (Figures 10a,b). First, although students admitted to the Eberly College of Science have a high graduation rate from Penn State, only half stay in the college. Second, we lose higher proportions of students from underrepresented groups than majority students (Figure 10a) and higher proportions of women than men (Figure 10b). To combat these trends, once students are admitted into the college, retention practices are immediately implement-

Figure 9. Recruitment statistics for undergraduate students from underrepresented minorities since 2008. There is no clear trend in recent years in applications, paid accept, or the ratios of these two.
Figure 10a. Six-year graduation rate of students entering the Eberly College of Science upon matriculation to the University, disaggregated by minority/majority status.

Figure 10b. Six-year graduation rate of students entering the Eberly College of Science upon matriculation to the University, disaggregated by gender.
Students participate in a multifaceted new-student orientation in which they interact with faculty members in collaborative exercises designed to engage students in addressing and providing solutions to global challenges. To augment this, we provide students with an early introduction and exposure to diversity through the World in Conversation project (a first-year seminar requirement). In addition, we promote student involvement in collaborative learning environments through offering cluster courses in math and science; on-campus, science-based, special-living housing options; mentoring programs; and the creation of the new Student Academic Achievement Center, where advising, tutoring, career and international education, and other student support services are housed in a centralized location. New students entering the college from diverse backgrounds now have the opportunity to participate in Pre-First Year in Engineering and Science (PREF) or the new Millennium Scholars summer bridge programs. The college also recently received funding from the National Science Foundation to support creating a new academic adviser position and scholarships for science students who transfer from a commonwealth campus to University Park. College surveys are used to get a pulse on student climate, identify disparities, and target retention initiatives. For example, the new student exit survey for students who decide to leave the college has been instrumental in identifying the need to foster a stronger sense of community among Eberly College of Science undergraduates. Planned expansions of these and related retention initiatives are described more fully in the body of the college’s strategic plan.

We also are aggressively working to increase the diversity and gender balance in our graduate student population. We have made steady progress in increasing the diversity in our graduate student population since 2008 (Figure 11). The number of accepts to our graduate programs from students of color in 2014 (15) has broken all previous records, and we will work to continue this trend. The Research Experiences for Undergraduates programs within the chemistry, physics, and math departments continue to expand institutional partnerships with Historically Black Colleges and Universities (HBCUs) and Hispanic-Serving Institutions (HSI) through the recruitment of students into our summer research programs. We also sponsored a fall open house recruiting activity for prospective graduate students in 2014 that will be continued and expanded in 2015 and beyond. In 2014, our physics department hosted its first Women in Physics Conference, which brought 150 prospective female graduate students from the northeastern United States to Penn State to network and learn about graduate programs in physics. In addition, the college continues to provide support
to increase the number of students in University-funded programs (i.e. Sloan, Bunton-Waller, and the Graduate School STEM Award).

Despite our efforts, the overall gender balance in our college graduate student population has not changed significantly over the last five years. Our biggest challenge remains to be gender balance in the physical sciences and math, although we note that the astronomy department has been quite proactive and successful in recruiting female graduate students in recent years (Figure 12).
CHALLENGE 4: RECRUITING AND RETAINING A DIVERSE WORKFORCE

The Eberly College of Science approaches hiring as an opportunity to augment the diversity profile of the college and considers diversity expertise and credentials as an important job criterion for potential workforce applicants. To this end, the college, through the executive leadership of the departments and college, uses the Affirmative Action Office and the Office of Human Resources to facilitate appropriate staff search and hiring processes aimed at attracting talented and diverse individuals for staff positions at all levels. The college also continues to develop professional networks, community connections, targeted advertising, and recruitment strategies to facilitate the recruitment of diverse applicants.

To complement the workforce recruitment initiatives, the college emphasizes the value of diversity expertise, activities to foster diversity, and diversity awareness professional development within the staff annual review process and student and faculty activity reports. Supervisors are directed to actively encourage staff members to develop and make available professional growth and advancement opportunities for all faculty and staff members.

The college ensures that employees, new hires, and job candidates are made aware of work-life benefits available for staff members, including leave policies, child care resources, and options for flexible/modified duties to further foster a nurturing climate for all the college’s staff members. The college also created new positions in each department, the Associate Heads for Equity and Diversity, who are charged with staying abreast of best practices to recruit a diverse workforce and student body and to monitor and assist with the recruitment of a diverse pool of students, staff members, and faculty members in each department. At least one of these senior faculty members works with each Eberly College of Science search committee and relevant hiring officers to ensure that efforts are made to foster applications from candidates from underrepresented groups in order to attract the best candidates to the college. The Associate Heads for Equity and Diversity meet at least once per semester to share best practices, discuss challenges, and consider college-wide actions.

To accelerate our efforts to increase diversity in the college, we have provided a STRIDE Committee on Strategies and Tactics for Recruiting to Improve Diversity and Excellence workshop for faculty members, all department heads, and Associate Heads for Equity and Diversity. We encourage and support efforts to identify and recruit
exceptional “targets of opportunity” from underrepresented groups (including women in the physical sciences) and work with the provost to provide outstanding startup packages and salary offers to support these efforts. Over the last three years, we have successfully recruited eight faculty members of color to the college. Although this is only a modest increase in absolute numbers or in the percent of total faculty, we currently have a larger number and higher proportion of faculty members from underrepresented groups than ever before (Figure 13).

An additional avenue for ongoing recruitment is the dean’s support of inviting scientists from underrepresented groups (including women in physics, math, and astronomy) to present departmental seminars, both to provide more role models for graduate students and postdoctoral scholars, and to introduce potential future hires to the college.

Unfortunately, there has been minimal progress toward achieving gender balance in the faculty, despite identifying this as a priority in our last strategic plan. However, the number of tenured female faculty members has increased (along with a concomitant decrease in the number of untenured female faculty members) (Figure 14). This is an area of focus for the next five years.

Because of our location in rural Pennsylvania and the historical lack of diversity in the local population, increasing the diversity of the support staff in the college has long been a challenge. However, we have dramatically increased the numbers of staff members from underrepresented groups in the

Figure 13. Diversity of faculty in the Eberly College of Science represented by the percentage from underrepresented minority groups. Although we still have a long way to go to meet our goals, our recent initiatives and efforts have had a marked effect in the last two years.
Figure 14. Gender balance in the tenure-line faculty of the Eberly College of Science. Although the overall gender balance in our faculty has not changed significantly over the last decade, the numbers of tenured women faculty members in the college is steadily increasing and will continue to be an area of focus for the next decade.

Figure 15. Diversity of support staff in the Eberly College of Science. We are making steady progress in increasing the diversity of the staff in the college, and we continue to make this a priority.
college since 2008 (Figure 15).

**CHALLENGE 5: DEVELOPING A CURRICULUM THAT FOSTERS UNITED STATES AND INTERNATIONAL CULTURAL COMPETENCIES**

We use several approaches to integrate intercultural and international competencies into the science curriculum. Our World in Conversation course requirement for all first-year students provides early exposure to cultural diversity for incoming undergraduate students. The Career and International Education Office (CIE) is a vital resource that provides students with international and intercultural experiences. The CIE offers advising and financial support in the form of travel grants to students who are interested in short-term (summer) and long-term (semester to a year) embedded courses in over 49 countries as well as international research experiences. The Euro Scholars program provides students with a full semester of research experience available with 12 partnering institutions throughout Europe. We recently revised the college’s International Science Undergraduate Certificate program to better reflect the options available to our students while providing meaningful international experiences. We anticipate that this will increase the number of Eberly College of Science students who incorporate an international experience with their undergraduate degree. The number of Penn State courses with international components was expanded and can be used either as part of this certificate program or as a stand-alone experience. These new courses include Coastal Biology taught in Curaçao, Eco-Health taught in Tanzania, Math and Cell Development and Cancer courses taught at Peking University in China, a Molecular Biology summer course taught at Fudan University in China, and the CHANCE field program taught in Panama. In the next few years, we hope to further expand our course offerings with our partners in China and explore other opportunities for global partnerships and experiences.

Exposure of our students to a diversity of successful scientists is critical to expanding their cultural awareness and provides role models for students from underrepresented groups. In addition to, and linked with, our initiatives to recruit a diverse workforce, the college support of at least two seminar speakers from underrepresented groups in each department each year offers a more gender-balanced and diverse cohort of seminar speakers as potential role models for our students. We have also begun a new research colloquium for freshmen (250 students in fall 2013), with presentations from a diverse group of faculty and alumni.

Additionally, we actively support a number of programs created to increase the diversity of our student
populations and to foster cultural competencies through direct interactions. One example of this is the new Millennium Scholars program. A second example involves our partnership with the Space Grant Consortium, which provides funding support for minority, student-engaged research during students’ first two semesters in the college through the Minority Undergraduate Research Experience (MURE) program. We support summer experiences for URM students to come to Penn State through the Summer Research Opportunities (SROP) and Research Experience for Undergraduates (REU) programs. The Hershey Medical School partnership provides summer internships for minority students who are interested in medical school. Lastly, the college provides support for students from underrepresented groups by providing matching funds for the Sloan Foundation program through a donation from Bayer Corporation.

**CHALLENGE 6: DIVERSIFYING COLLEGE LEADERSHIP AND MANAGEMENT**

The Eberly College of Science has made progress in building diverse representation in the executive leadership positions in the college. This is a slow process, generally requiring vacancies to become available at top levels; however, the college now has two female associate deans. The college also has created and supported the new positions of Associate Heads for Equity and Diversity, two of which are held by women, and a third by an African-American male. These associate head positions were formed to strengthen the articulation between unit-level and department-level diversity planning, implementation, and reporting and to enhance department-level participation. In addition to meeting regularly and advising the dean on various actions, the group is charged with participating in all departmental searches to ensure that the search committees consider expertise in fostering a diverse, inclusive, and equitable environment as a particularly desirable characteristic for leaders and that all appropriate efforts are made to ensure a diverse candidate pool. In fact, all deans, department heads, Associate Heads for Equity and Diversity, and faculty members chairing search committees attended a STRIDE workshop (http://sitemaker.umich.edu/advance/stride_committee) to obtain expertise in how to run an inclusive search that fosters diversity. Appreciation of the value of diversity and an inclusive environment were specifically addressed during the searches for new deans in the college.

The Eberly College of Science continues to seek pathways and create opportunities for individuals from diverse and underrepresented groups to demonstrate and increase their leadership abilities. In addition to the
Associate Heads for Equity and Diversity, each department also supports associate head positions for graduate programs, undergraduate affairs, and facilities. Our Administrative Fellow position in the dean’s office (a Tombras Fellow) and the directors for the Millennium Scholars Program and The Center for Excellence in Science Education all currently are held by women.

**CHALLENGE 7: COORDINATING ORGANIZATIONAL CHANGE TO SUPPORT OUR COLLEGE’S DIVERSITY GOALS**

Over time, the Eberly College of Science has had a marked success in the reorganization of the college’s hierarchy to promote both core and disaggregated personnel and protocols to promote much-needed diversity initiatives. These initiatives include pre-college outreach programs, the vigorous recruitment and retention of previously underrepresented undergraduate and graduate student cohort groups, and the appointment and promotion of diverse faculty members. To facilitate these efforts we have expanded our partnerships with Historically Black Colleges and Universities (HBCU) and Hispanic-Serving Institutions (HSI) and added strong linkages with the Meyerhoff Program at the University of Maryland, Baltimore County (UMBC) and the Minority Access to Research Careers (MARC) scholar program at Temple University. Important contributions to increasing diversity within the college include the work of the Executive Assistant to the Dean, who serves on the College Executive Committee, and who works as a team member at the departmental level and participates in all planning and decision-making venues at the executive level. One example is working with other STEM colleges at Penn State to promote mentoring opportunities for URM graduate students. Recently, the Eberly College of Science, along with other STEM colleges at the University, was recognized by the Sloan Foundation as a center of excellence for mentoring of graduate students.

In addition, the college believes that it is critical to promote the involvement of faculty members, particularly senior faculty members, in championing practices that ensure an inclusive environment. To this end, as previously noted, the college has instituted the position of Associate Head for Equity and Diversity in each department, drawing from senior influential faculty members. Associate Heads for Equity and Diversity in each of the college’s departments continue the college’s diversity objectives and initiatives by informing their departments about the college’s diversity goals. Such college diversity goals include devoting periodic executive committee meetings to the discussion of diversity, reviewing progress toward strategic planning.
goals, and asking what upcoming decisions will be impacted by seeking guidance from the unit diversity strategic plan.

The college, however, seeks to foster further synergies in its mission to promote excellence through diversity. Therefore, promoting the college’s strategic diversity goals’ visibility, vision, viability, and vitality in our mission and goal statements helps ensure that these elements are continuously highlighted in practice, by policy, and through protocols.

The college also consistently disaggregates data across diverse demographics in all aspects of unit decision making to reveal areas of disparity that can be addressed and to identify and address intergroup disparities between underrepresented/underserved populations within the college and within the University population.

Substantial progress requires continuous improvement and refinements of strategic approaches. Even though we are very pleased with the progress noted above, there is still much work to be done to support the college’s diversity goal planning and implementation. One pressing goal that needs to be addressed is to increase the yield of students—more specifically those populations that are underrepresented in the demographics—who enroll in the college.