STRATEGIC PLAN 2011-2016

TEXAS A&M UNIVERSITY
DEPARTMENT OF BIOMEDICAL ENGINEERING
Improving lives through engineering & innovation
I. Foreword

The strategic planning process for the Department of Biomedical Engineering at Texas A&M is the first since the program became a department in 2002, coincides in time with the College of Engineering Strategic Plan, and comes on the heels of the final phase of the faculty reinvestment process which provided for a more than doubling of the faculty within the department. This planning process began with an initial planning retreat of all faculty and staff within the department on August 24, 2009, that was focused primarily on the research areas within the department. That retreat was followed up with a second retreat of all faculty and the academic advising staff on June 2, 2010 that focused more on the academic side of the departmental activities. From these retreats a strategic planning committee was formed that represented the faculty including an assistant professor, full professor, and two associate professors from each of the three departmental strength areas of Biomedical Imaging and Sensing, Biomechanics and Mechanobiology, and Biomaterials. The committee started meeting monthly in August of 2010 and outlined a plan including a new vision statement, new mission statement, and new set of goals for the department. This strategic plan document is a result of that planning process and was vetted with the faculty, advisory board, and Dean and is meant to serve as a living document for use in implementing the plan.

II. Introduction

The Biomedical Engineering field has truly grown in the past few decades and there are a number of reasons for this growth and interest nationally. Health technologies, in general, were recognized by the National Academy of Engineering as one of the areas of greatest achievement in the 20th century, and this is likely to continue into the 21st. There is also rapidly growing federal research support for biomedical engineering including targeted funding from the National Institutes of Health with the formation of the National Institute for Biomedical Imaging and Bioengineering, the long standing Chemical, Bioengineering, Environmental, and Transport Systems (CBET) Division within the Directorate for Engineering (ENG) of the National Science Foundation (NSF), and the relatively new Biomechanics and Mechanobiology (BMMB) unit within the Civil, Mechanical, and Manufacturing Innovation Division of the NSF’s Directorate for Engineering. The private Whitaker Foundation also provided substantial grants for biomedical engineering with a strong emphasis on improving academic departments. Consequently, there has been a substantial increase in the number of biomedical engineering departments nationwide. Lastly, students have found it to be a very popular major and it has continually drawn diverse students into engineering including up to 50% females in many Departments across the country.

In some ways, the long standing, nearly 40 year program (began in 1972), in Biomedical Engineering at Texas A&M is ahead of the curve in terms of providing both accredited undergraduate and graduate education in this field. The Department has traditionally been well known for its undergraduate program (5th ABET accredited program in the country), which attracts excellent and diverse students and places them in leading medical and graduate schools, biomedical engineering companies, and government laboratories. The graduate program, however, has traditionally been much smaller than the undergraduate program and the research interests of the faculty diverse due in-part
to the small faculty size and need for coverage of the BME field at the undergraduate level. These factors and the fact that it was housed in Industrial Engineering from 1972 to 2002 have in large part hindered Biomedical Engineering at Texas A&M from becoming a nationally recognized program.

Over the last 8 years, we have seen Biomedical Engineering go from a small, mostly isolated, Program within Industrial Engineering to a growing Department. With the creation of the new Department of Biomedical Engineering, its designation as a signature program, and the commitment to initially expand its core faculty from 7 to 17 members, the addition of 3 research faculty, and increased joint appointments from 3 to 12 members, we now see biomedical engineering at Texas A&M being able to not only become one of the many strong departments in the College but also to compete for national recognition, in particular in the defined thrust areas of biomedical optics and imaging, cardiovascular biomechanics, and biomaterials. Indeed, since forming the Department in 2002 we went from unranked to roughly 30th in the country according to US News and we believe that with continued strong faculty selection and the help of strong existing faculty that we can continue this trend. Along with the proposed establishment of the new Department, across the University System and within the College of Engineering, biomedical research has been identified as a growth area at Texas A&M through interactive biomedical research initiatives. In particular, many of the new faculty lines across the University and in the College of Engineering include positions dedicated to not only the BME Department but in the complimentary areas of biomedical imaging in Electrical Engineering, biochemical engineering within Chemical Engineering, biomechanics in Mechanical Engineering, and positions such as those within the Veterinary College that emphasize bioengineering. Indeed, the College of Engineering has listed “Engineering an Improved Quality of Life (Health Care)” as one of their five signature areas in the latest 2011-2015 strategic plan.

Beyond the College we see the University and State investment in biomedical research with the creation of the Texas A&M Institute for Pre-clinical Studies (TIPS) that includes a new building for doing large animal research under good laboratory practices(GLP), an essential capability for translating (from the bench) and commercializing most new medical technologies. TIPS also houses the University’s technology commercialization offices, an excellent imaging suite, and incubator space for biomedical companies. In addition, construction has just been completed on a new building that will house the National Center for Therapeutic Manufacturing (NCTM) that will provide resources for developing new drugs and vaccines. Lastly, the entire Department of Biomedical Engineering has moved to a new state-of-the-art Emerging Technologies building in July 2011. These outstanding resources position us to now be an international leader in the development, testing and commercialization of cutting-edge technologies.

We now see not only the emphasis on biomedical research but also new synergy and a spirit of cooperation within the Department, College, and across the University. It is this spirit and synergy that needs to be nurtured in order to allow the Department to be a central focus for biomedical engineering research on campus and establish it as a nationally recognized program while continuing the Department’s core vision and mission. Below we have outlined what we see as the opportunities and challenges, progress that is under way, and future plans for the department to undertake in order to
maintain this synergy, to uphold the Departments core vision and mission, and to bring about local and national recognition.

The primary motivation for the department is to truly work toward solving the world’s greatest health problems through engineering and innovation including research, patents and commercialization, teaching, and service while also contributing to the body of knowledge in BME through publications, presentations, service, teaching, and mentoring.

III. Vision & Mission Statements

A. Vision Statement

The Departmental vision is to be a global leader in biomedical engineering by working to solve the world’s greatest health problems and engineering innovative research solutions that advance health, by providing quality teaching, mentoring, and experiential learning, and by excelling in professional and public service.

B. Mission Statement

The fundamental mission of the Department is to advance health through pioneering discoveries and translation of cutting edge research, education and leadership development of our students as well as service to the State of Texas, society, and the profession. Our approach is to engage faculty and students in an integrated research and education environment that includes experiential learning, entrepreneurship, and development of innovative technologies from concept to clinic with consideration of regulatory affairs.

IV. Program Educational Objectives

In addition to the vision and mission of the department we have defined our program objectives (ABET objectives) as a set of three broad statements that describe the career and professional accomplishments that our program is preparing our graduates to achieve namely, the educational objectives of the biomedical engineering program are to produce:

1. High-quality graduates who are well prepared for further graduate studies, careers in the biomedical or biotechnology industries, or entry into professional schools.
2. Graduates who will make significant contributions in biomedical industries and/or other sectors.
3. Graduates who will apply acquired knowledge appropriately, work professionally with others, effectively communicate ideas and technical information, and continue to learn and improve their knowledge base and skills.

V. Program Goals

Within BME at Texas A&M we will perform basic research to understand biomedical systems and processes and will develop translational research and innovation toward novel medical breakthroughs and technologies including materials and medical devices to diagnose, treat, and/or prevent disease. This theme will be integrated in the
education with a focus on experiential learning, entrepreneurship, and development of medical technologies in regulated laboratory and manufacturing health technology environments.

To realize the vision, mission and motivation of the department we have formulated the following four goals.

1. Promote excellence in scholarship and experiential learning
2. Enhance excellence in core research areas and promote broad multidisciplinary opportunities toward global recognition in one or more of these areas
3. Promote and enhance faculty careers
4. Leverage and enhance departmental resources and visibility to facilitate achievement of the vision, mission, and goals

**Goal 1. Promote excellence in scholarship and experiential learning**

The overarching goal of the Departmental strategic plan mirrors that of the College plan in that we wish to transform the Department of Biomedical Engineering at Texas A&M University into the “biomedical engineering department of choice” for those striving for innovations and breakthroughs that address the biomedical engineering challenges of the 21st Century. Our engineering graduates must be able to meet contemporary challenges, create innovations and produce breakthroughs. They must be ready to create, recognize, identify, pose, formulate and refine future solutions, innovations and breakthroughs that address extensive sets of contextual opportunities and not simply solve problems that other parties present.

To meet the challenges of the 21st Century we need to enrich both our graduate and undergraduate programs by promoting excellence and experiential learning. We need to ensure that our students learn to appreciate and embrace basic research and research that makes a direct impact on healthcare. We need to grow our graduate program while promoting excellence. We need to promote experiential learning at the undergraduate student level. We need to enhance and focus our undergraduate and graduate curriculum and we need to retain our excellent undergraduate and graduate staff advising.

Work will need to be performed on many fronts to achieve this goal and we have specifically outlined 7 tasks along with their milestones to accomplish this goal.

1.1 *Proactively recruit the best graduate students in the U.S. and increase high quality graduate student enrollment*

Ph.D. enrollment has increased slightly over the last few years as new faculty begin to receive funding and take on more students. Progress has also been made in the area of recruiting domestic graduate students over the last five years (from 44% domestic in 2005 to currently 59% in 2010 with 16% minority students). Further, there has been an increase in the ratio of Ph.D. to master’s students. For instance, as of Fall 2010 we had 86 graduate students with 79% Ph.D. candidates which is up from an average of 38% in Fall 2005. Of these graduate students 38% were female, 6% Black, and 10% Hispanic. In addition, roughly 83% were funded (69%
assistantships, 14% fellowships). We, however, need to continue to be active in recruiting the top applicants to the program and getting them to enroll at Texas A&M.

The average number of graduate students over five years from 2001-2005 was 70 graduate students with roughly 35% domestic and 38% Ph.D. candidates. As of the Fall of 2005, we had 75 graduate students total with 44% domestic candidates and 43% Ph.D. candidates. Of these students enrolled in 2005, 76% were funded (67% assistantships, 9% fellowships). Note that the 2005 NRC data for top peer Biomedical Engineering programs shows an average for public schools of (9% minority, 43% female, 69% domestic) and for private schools (11% minority, 35% female, 70% domestic).* Further, note that the percent of students with assistantships in 2005 according to the NRC survey is for public schools (39% RA, 3% TA) and for private schools (42% RA, 1% TA).*

The high quality Ph.D. student enrollment should continue to grow in conjunction with our faculty size and our ability to provide research support for the students. Our ratio of high quality domestic graduate students should also increase. The department also needs to increase the number of TAs particularly for graduate students in their first year.

- The target milestones for this task are:
  o 70% domestic students in 5 years comparable to the public and private programs mentioned in the NRC survey above
  o Continue to be highly selective in recruiting graduate students, demanding demonstrated quality and diversity (20% minority in 5 years) of backgrounds/perspectives over quantity by
    ▪ using the COE graduate student recruiting program,
    ▪ using the Sloan Program as a more effective recruiting tool,
    ▪ participating in recruiting events sponsored by underrepresented population professional organizations like the National Society of Black Engineers, Society of Hispanic Professional Engineers, and Society of Mexican American Engineers and Scientists
    ▪ recruiting high profile, influential, individuals for graduate student seminar and encouraging joint seminars with other campus units
    ▪ developing an endowment for recruiting with a target of $150,000 in 5 years and $300,000 in 10 years,
    ▪ providing funds for faculty reciprocal seminars and recruitment trips
    ▪ documenting average quantitative and verbal GRE scores that show consistent trending upwards over the next 5 years from the values recorded in fall 2010 (V513, Q753 enrolled: V528, Q757 admitted)

* PUBLIC: Georgia Tech, U. Texas, UCSD, U. Pitt., Penn State, Purdue
Have on average 6 graduate students per faculty member (given we at least maintain the current faculty numbers, this would be 17 faculty*6=102 students) with 85% or more of the students being Ph.D.’s in 5 years and, further, to support the proposed student increases with a target of at least 85% funded students in 5 years including funding all Ph.D. students by
- increasing grant funding,
- increasing external and internal fellowships,
- increasing TA’s,
- increasing endowments

1.2 Enhance the research and experiential learning experience for Ph.D. students

Mirroring the COE plan at Texas A&M, our longstanding and overarching objective is to be among the top biomedical engineering graduate programs in the country. This objective will focus our energies on making a necessary and substantial enhancement in our culture and approach to advancing the academic excellence and national perceptions of our graduate program. The key element in any strategy for attaining such recognition is the compelling relevance of the research undertaken by the department and its impact upon the biomedical engineering grand challenges of our time.

To propel the biomedical engineering department’s graduate program into an excellent peer group in national and international arenas, it is important that the constituent programs: be the choice of prospective graduate students; our graduates be the choice of hire by industry, academia, and national laboratories; and our graduate students and faculty be the choice resource for industry and government to address their mission-relevant technology challenges. In fact, contemporary engineering challenges, innovations, and breakthroughs also frame the objective of uncompromised excellence in graduate education. Such challenges are trans-disciplinary, and the department needs to recruit and train students who have the passion, knowledge, and abilities to address these challenges. Correspondingly, the department needs to provide the interdisciplinary intellectual environment in which these emerging scholars can flourish and eventually build a reputation as nationally and internationally-recognized leaders of thought and action in industry, government and academia.

The goals and strategies collectively address the challenge of attracting, inspiring, preparing and promoting the most dedicated graduate students in the nation. The main vehicle for achieving this level of excellence will be the research program that will engage their intellects and passion.

- The target milestones include:
  - reduce Ph.D. student course load to no more than the equivalent of the M.S. program so that the focus can be on experiential learning
through research
  o require Ph.D. preliminary examinations on a timeline not to exceed two and a half years
  o provide funding for the first year Ph.D. students in the form of TA’s, fellowships, or departmental endowment support,
  o provide for a teaching option for students in order to give them this experience if preparing for a future faculty position
  o allow graduate students to participate in one semester internships with industry, TIPS, or NCTM or in a one semester study abroad program
  o develop a system to help prepare more students to apply for national fellowships
  o benchmark assistantship rates to remain competitive among our academic peers
  o encourage Texas A&M undergraduates to seek graduate studies here with the overarching emphasis on excellence. We should strive to ensure that our very top students consider themselves welcomed and recruited here, just as we recruit the very best students from other national undergraduate programs.

1.3 Proactively recruit the best UG students while managing UG student enrollment

Today, as one of the oldest biomedical engineering UG programs (5th ABET accredited program) the department of biomedical engineering at Texas A&M is solidly positioned to lead in engineering education. However, resources, particularly faculty time and effort, are limited; therefore, the department must focus on continuing to recruit and matriculate the best students while providing a conducive environment for learning through enrollment management so as to control the number of students per class.

Overall UG enrollment has increased slightly over the last 5 years. The UG enrollment should mirror our faculty size and our ability to provide a quality experience for our UG students. To date we have about 450 UG students with roughly 180 freshman, 75 sophomores, as well as 60-65 juniors, seniors, and 5th year students. We would like to increase the number of upper classmen and lower the freshman while reducing the faculty/student ratio to those envisioned in the Texas A&M vision 2020 plan.

- The target milestones include:
  o in 5 years target 125 freshman and 75 upper level students per class (~425 total UG students) leading to 150 freshman and 100 upper level per year in 10 years (~550 total UG students)
  o increase the faculty size to provide for 20 UG students per FTE faculty (21 faculty in 5 years and 27 faculty in 10 years) mirroring the University vision 20/20 plan.
  o To increase to these UG student numbers we would need to open up new lab sections which requires more TA’s. We currently have 4 TA’s and thus we need at least 4 more TA’s just to cover the current labs
and 13 more TA’s to cover the increase course sizes and increased experiential lab opportunities such as additional biomechanics and biomaterials labs (ideally targeting 1 TA/FTE: 21 in 5 years/ 27 in 10 years)

1.4 Develop proactive experiential learning opportunities for undergraduates

The long-standing (started in 1972) biomedical engineering program at Texas A&M is and has been strong. However, we need to continue to strive to maintain excellence by continuing on many fronts to develop undergraduate programs that are responsive and agile and prepare students for the socio-technological challenges of the 21st century. In addition to the standard classroom, we need to encourage experiential learning from the freshman through the senior years.

- The target milestones include:
  o Provide students with experiential learning from freshman to senior year with hands-on experiments in the current instrumentation and bioinstrumentation labs
  o Increase UG lab experiences through the addition of biomechanics and biomaterials labs
  o Enhance senior design with more real-world sponsored projects from industry and clinical centers
  o Require UG students to do at least one experiential learning activity such as
    ▪ REU or other research lab experience
    ▪ co-op
    ▪ internship
    ▪ study abroad
    ▪ medical shadowing
  o continue to work with industry and medical schools toward hiring our students for internships and co-ops
  o work with Engineering Scholars Program within the College and with faculty to promote research experiences
  o develop an endowment of $100,000 over 10 years to provide five $1000 scholarships for study abroad
  o Actively track alumni and current student co-ops/internships/etc. as well as where they go after graduation

1.5 Enhance and focus the UG curriculum

Although debate will continue about the nature of learning environments and teaching approaches that develop the broader set of abilities required of future biomedical engineers, research on expertise and learning has concluded that these abilities are developed through practice with feedback within supportive communities. To mirror the COE plan, this integrated “spine” of courses and experiences would be aligned from the first year through the senior year and the capstone design courses. The implementation objective would be to combine experiential (adaptive, creative, experimental, entrepreneurial, societal, global)
and design work running throughout the entire four-year undergraduate curriculum. A common comment among faculty members who teach capstone design courses is that students need to be adequately prepared for the mindset, thought processes, and skill sets needed in such design-focused courses. A thick spine of courses would address development of many of the thought processes and skills sets that are vital to success both as students and graduates. The courses that comprise the “spine” may not be all new courses that are added to existing curricula. Instead, some of the existing courses in the department’s curriculum could be adapted to support the strategic intent of the “experiential spine”. Such courses at all levels would help students build more accurate mental models of engineering thought processes and how what is learned in an undergraduate curriculum can be applied after graduation. Further, they would provide real-world contexts for the concepts and approaches taught in engineering curricula. The strategic intent may impact engineering retention: students early in their college careers might be more inspired to continue in a challenging engineering curriculum (through graduation) if exposed to the real-world skills and the professional rewards that accrue in contemporary engineering application and practice.

- The target milestones include:
  - Develop an UG strategic curriculum committee to look at the entire curriculum and implement an experiential “spine” throughout the curriculum while defining the critical content oriented courses required for our Biomedical Engineering undergraduates to provide the depth and breadth for industry, grad school, etc. Ideas for the committee to consider include:
    - providing focus by reducing the multiple tracks
    - allow for flexibility within the tracks or curriculum so as to include some of the certification courses and experiences (internships, co-ops, etc.) in regulatory (GLP,GMP,FDA, etc.) or entrepreneurism
    - develop more experiential labs such as biomaterials and biomechanics
Goal 2. Enhance excellence in core research areas and promote broad multidisciplinary opportunities toward global recognition in one or more of these areas

The department currently has three core areas of research namely, biomaterials, biomechanics and mechanobiology (focused on cardiovascular biomechanics with an emerging area in orthopedic biomechanics), and biomedical sensing and imaging (focused on biomedical optics and magnetic resonance imaging). We need to continue to enhance these three core areas within the department with an initial emphasis on the biomaterials core area since this is the one that lacks more senior faculty leadership. The department also has a strong core of faculty that are involved with translational research toward commercialization and we need to capitalize on this strength in a coordinated, meaningful way to make a bigger impact in the department and in the field.

As part of the College strategic plan one of the defined research signature areas is, "Engineering an Improved Quality of Life". Advances made in this signature area will contribute most significantly to improving health care, and thus quality of life, while also advancing basic science and technology and providing a significant economic impact at local, state, and national levels. Great potential exists within the department and across campus to unravel the mysteries of life by gaining insight into the normal genetic, molecular, and cellular mechanisms that underlie biological processes as well as by better understanding disease progression, responses to injury and clinical treatment, drug effectiveness, and device-tissue interactions. Indeed, biomedical engineering will be fundamental to achieving the goal of advances in this area that must occur across scales – from molecular to organ-level to the entire human– and there are will be opportunities to build a multi-scale understanding. The three pillars of scholarship that are recommended College wide for this area include: Systems biology, computational biology, and medicine; Biomedical imaging and biosensing; and biomaterials and biomedical devices. Clearly, our department of biomedical engineering is poised to make an impact and already has significant expertise to lead the biosensing and imaging, biomechanics, and biomaterials and biomedical devices areas.

Beyond expanding and enhancing existing core biomedical engineering areas within the department and College, the department needs to also continue to explore and exploit emerging multidisciplinary opportunities across campus and world-wide toward making an impact in the grand challenges in medicine and engineering facing the world today. The key emerging resources on campus include the new Emerging Technologies Building (new $104M building that is the home of the Department of Biomedical Engineering), the Texas Institute for Preclinical Studies (TIPS), and the National Center for Therapeutic Manufacturing (NCTM). The department needs to exploit and increase interaction with more entities across campus, particularly with TIPS and NCTM. The University also has a new interdisciplinary life sciences facility and is creating an
expanded facility for the Texas A&M Health Science Center in College Station, and the Research Valley Partnership (RVP) has plans with the University and two cities of Bryan and College Station to create a “Bio-corridor” along route 47. The department needs to continue to collaborate with and exploit further the opportunities with these entities.

2.1 Capitalize on multi-investigator emerging research opportunities

The department has participated in several multi-investigator research proposals in the areas of shape memory therapeutics, biosensors, and cardiovascular biomechanics. The department has had success with attracting large multi-investigator projects including two $1M Whitaker awards in biomedical optics and cardiovascular biomechanics as well as two NIH-Bioengineering Research Partnerships in Biosensing and Shape Memory Polymers. Other larger efforts including an NIH-Training grant, NSF-ERC, NSF-IGERT, and Coulter Foundation Award have so far been unsuccessful. However, we need to capitalize on internal and multidisciplinary expertise and strengths across campus as well as the department’s strong focus on translational research.

- The target milestones include:
  - have senior faculty (associate and full professors) embrace a culture of submitting at least one programmatic grant each year ideally forming working groups in the three defined research areas until successful that may include:
    - NIH-P series, T-series, U-series,
    - NIH-BRP
    - NSF-ERC
    - NSF-IGERT,
    - Private Foundation such as Coulter Programmatic grant
  - Ideally the department should, on average, be involved with at least five programmatic grants such as these in any given year, with at least two of them being lead from the department
  - The department should also target at least one international grant that is active in any given year

2.2 Facilitate continued multi-disciplinary interactions and possibly create interdisciplinary collaborations in emerging areas

A number of multidisciplinary activities are underway as mentioned above with the TAMU-HSC, TIPS, NCTM, Life Sciences, and RVP. In addition, departmental faculty have worked to develop proposals with colleagues internal to the University in chemical engineering, electrical engineering, mechanical engineering, material science, the college of veterinary medicine, the health science center, biology, TIPS, as well as external domestic and foreign collaborations.

- The target milestones include:
  - facilitate continued multi-disciplinary collaborations and strive to create
interdisciplinary collaborations through programmatic grant funding as mentioned above and
  - capitalize on biology/engineering faculty forum
  - develop new joint seminars with other departments/centers/institutes on/off campus
  - increase interactions with TIPS and NCTM
  - develop a more formal relationship with one or more research hospitals, such as Texas Heart, Methodist, and other entities in Houston’s world-renowned Texas Medical Center

2.3 Establish centers or institutes to highlight collaborative efforts

To interface better with the College signature area in engineering better health and campus initiatives such as TIPS, NCTM, and RVP, the department has an opportunity, in the next 5 years, to create at least one BME lead Center or Institute that capitalizes on current strengths.

- The target milestones include:
  o create a departmental lead center or institute such as
    - the Health Engineering Research Institute (HERI), similar to the Engineering Energy Institute focused on Engineering an Improved Quality of Life, in collaboration with TIPS and NCTM that would include an engineering prototyping facility and medical device testing facility
    - the Center for Advanced Biophotonics Research
    - other Centers that capitalize on our strengths in biomechanics and biomaterials
  o develop a proposal for the center or institute that can be submitted for various funding mechanisms such as
    - NSF-ERC
    - Private foundation
    - Other State or Federal funding
Goal 3. Promote and enhance faculty careers

For the department to be productive it all starts with creative and productive faculty. The department has an emerging set of mostly young faculty and needs to increase its faculty size with an emphasis on more senior faculty. Further, the department needs to create a solid environment for faculty that emphasizes strength in all forms of education including research, teaching, and service. The department needs to enable faculty to grow and enhance their careers with accountability that provides for measurable milestones for success.

3.1. Increase faculty size.

The department has been successful in hiring 13 new faculty members in the last seven years bringing us up to 20 faculty at one point. However, we have lost 3 faculty during that same time frame that have not been replaced. We will likely have two more faculty separate from the department within the next year (Full and Associate) and we have only been promised to retain one of those positions.

- The target milestones include:
  o increase the faculty size to 21 in five years and 27 in 10 years. This will provide for
    ▪ adequate resources for mirroring the Texas A&M vision 20/20 plan with 20 UG students per FTE faculty
    ▪ enable us to become competitive with peer institutions (e.g. Georgia Tech., U. Texas, UCSD, U. Pitt., Penn State, Purdue) that range in faculty from 25-30
    ▪ allow for critical mass in the three focus areas and possibly expand into a new area such as neuroengineering or systems biology to mirror College and University initiatives
  o focus initial hiring to enhance biomaterials and biomechanics areas for next 5 years. We need a senior and junior biomaterials person and a senior biomechanics person. Specifically we need to target,
    ▪ the hire of one senior faculty in biomaterials/biomechanics immediately,
    ▪ 4 more in these areas over 5 years to reach the 21 faculty milestone

3.2. Increase faculty productivity and recognition

Most of the department’s new hires have been at the junior faculty level but there is some indication that faculty productivity is on the increase. The number of proposals submitted for external funding is on the rise and the number of awards is also beginning to increase. The total number of publications within the department has gone up but the pubs/FTE has gone down and the Ph.D. students per FTE needs to go up in order to increase the number of Ph.D.’s graduated. In addition, over the last three years the current average per year per faculty award is $215K/year and expenditures of $117K per faculty/year. These numbers need to increase in order for us to position ourselves to be more
competitive to our peer institutions.

- The target milestones include:
  o provide adequate resources including
    ▪ faculty mentoring
    ▪ lab space
    ▪ mid-career funds
    ▪ sabbaticals
    ▪ travel funds to start new initiatives
    ▪ continue return of IDC
    ▪ continue to solicit funding for chairs, professorships, developmental professors
    ▪ provide graduate student institutional support (particularly in the first year or two)
  o advance faculty research with the following 5 year targets
    ▪ an average of 4 quality publications/faculty/year
    ▪ $250K in expenditures/faculty/year
    ▪ increase the number of peer reviewed awards submitted per faculty
    ▪ promote those faculty that excel in research by putting them forward for internal research awards
  o advance faculty teaching
    ▪ providing every faculty member with a peer review at least once per year
    ▪ providing feedback to individual faculty from the senior exit interviews and former student surveys
    ▪ strive to have student teaching reviews of 4.0 or better
    ▪ promote those faculty that excel in teaching by putting them forward for internal teaching awards
    ▪ reward faculty with buy-out to do new course development, particularly lab or experiential learning courses
  o advance faculty nationally by
    ▪ putting them forward for national awards within their societies
    ▪ recommend that they consider becoming society officers
    ▪ recommend that they consider being editors or associate editors for journals
    ▪ recommend that they lead conferences, tracks, or sessions
    ▪ putting them forward for senior membership, fellow, or NAE
    ▪ publicize any research including translational research that has a direct impact on healthcare
  o encourage other important faculty service locally including
    ▪ university service with a focus on increased influential service roles within the University
    ▪ college and department service
    ▪ outreach to K-12 teachers and students
Goal 4. Leverage and enhance departmental resources and visibility to facilitate achievement of the vision, mission, and goals

Overall, the department started as more of a small (7 faculty, 3 staff), mostly undergraduate educational activity. It has blossomed in the last 10 years into a reasonable sized (17 faculty, 8 staff) signature educational program within the College and University serving over 450 UG students, 85+ graduate students, and performing over $4,200,000 in research in FY 2010. It has also gone from a small $20,000 endowment to currently over $200,000 in endowments. However, even with these gains the department is still strapped financially and will need to look at ways both to cut spending and enhance income, in particular, in order to implement the strategic plans outlined. Budget savings should include an analysis of the expenses, for instance, for IT and desk phones as well as ink cartridges, copier paper, and other supplies. On the income side we need to work with the Dean and University to try to increase the departmental base of funds that did not originally include the resources and academic funds needed when the department split off from Industrial Engineering. We also need to engage alumni even more in order to seek out large endowments for naming opportunities for the building, new labs, or naming the department, as well as for chairs, professorships, development professorships, graduate student support, undergraduate scholarships, and seed money for new research projects.

4.1. Increase in the department’s endowment level

Our efforts in this area are limited by the newness of the department. Although one of the oldest BME programs in the country, the development foundation typically targets graduates that are 40-60 years post-graduation (currently from the 1950’s to 1970’s) and our department formed in 1972 (with very few graduates in the 1970’s). However, our development activities are beginning to bear fruit after 6 years of visiting former students and companies from around the State and Country. Also, the Advisory Board is focused on this objective and is helping with the development activities.

- The target milestones include:
  - achieve an increase in general endowment of at least $500K in 5 years and $1M in ten years through
    - continue to visit former students and companies
    - better track former students and companies (we have a database of about 800 students out of 1700)
    - update and promote the departmental Linked-in account and create a departmental facebook account
    - provide more updates with a semi-annual newsletter in 3 years and quarterly newsletter by 5 years
    - enhance the web site with more frequent news and a better jobs database
    - Annual BBQ where former students and advisory board are invited
    - heavily promote the new building opening
once a year in the newsletter pitch an idea for fund-raising
make a concerted effort to get exposure in the COE newsletter/magazine, TAMU magazine, 12th man letter

4.2 Establish a funding mechanism for Senior Design

The senior design experience has traditionally included a few projects from NASA and some entrepreneurial physicians along with faculty sponsored design projects. Although this was adequate we recently decided that reaching out to companies for more real-world designs would provide a better experiential learning environment for our students. Thus, we started to solicit sponsored projects with a cost of $5000/year/design team of 3-4 students. We were somewhat successful in our first year (2010) by garnering over $20K in sponsored projects but now we need to continue and solidify this activity.

- The target milestone includes
  o Enhance the company sponsorship endowment & internal center funds with a target of growing the endowment to $125K in 5 years and $250K in 10 years
  ▪ visit more companies in and out of the State
  ▪ promote the program with testimonials from successful senior designs
  ▪ solicit the advisory board to participate more and encourage colleagues in other companies that they know to participate
  ▪ build relationships with the research hospitals in Temple and Houston to get ideas

4.3 Establish Cost Centers and Advertise them

Several faculty have begun to set up their labs as cost centers in which they are permitted to charge internal and external user fees for unique services their labs provide. The department also set up a cost center for senior design for those entities (i.e. non-profit health facilities) to participate in sponsored design without having to donate to the endowment fund. Along with providing specialized services to customers, this activity also provides opportunities for short-term research projects for the department and faculty and could be expanded.

- The target milestone includes
  o develop a central fabrication facility and set it up as a cost center
  o develop a central test and measurement facility and set it up as a cost center
  o increase support staff (technicians/graduate students) to support these central facilities

4.4 Retain competent advising staff

The department needs to continue to foster a sense of shared commitment amongst faculty, staff, and students toward implementation of the department’s
vision, mission, and strategic plan.

- The target milestones include:
  o Continue to provide adequate salary and draw from the Colleges merit pools as appropriate
  o Provide funding for the staff to attend professional meetings to enhance their careers, and for the advising staff to visit industry partners to secure experiential opportunities for students
  o Continue to put staff forward for awards available through the College and University