CASE WESTERN RESERVE UNIVERSITY EST. 1826

CASE SCHOOL OF ENGINEERING

# Strategic Academic Plan 2008-20013

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## Introduction

As Case Western Reserve University embarks on a new strategic planning process in the 2007-2008 academic year, the members of the Case School of Engineering (CSE) have much of which they can be proud. For example:

- The School has a history of conducting multi-disciplinary and innovative research across a diverse spectrum of disciplines. A factor in this success, that must be nurtured, is the ease with which faculty can form interdisciplinary research teams in response to new research challenges and directions.

- CSE undergraduates, representing about one-third of the University's undergraduate enrollment, continue to be self-selecting, ambitious, engaged in their professional and educational development, and of the highest caliber as evidenced by receipt of the many fellowships and awards.

- CSE graduates are found in leadership positions in industry, education, government and professional societies. A significant number of our graduates have gone on to graduate degrees in the sciences, law, engineering and medicine. Our graduates have also developed startup companies, have become leaders in corporate affairs, and have taken government positions of responsibility.

In spite of these historic strengths and reasons for being, there are many challenges.

- While maintaining our reputation demands that we excel, our small size dictates that we must strategically select those areas of education and research in which to distinguish ourselves, and nurture them wisely.

- The cost of attracting and retaining the best-qualified faculty continues to climb. Moreover, the high cost of even maintaining a world class infrastructure for teaching and especially for research is a continuing problem.

- Our facilities for teaching and research must keep pace with the ever-advancing sophistication of the technological landscape that our graduates enter and help to shape. For example, Case was a leader in distance learning in the decade from about 1975. However, we did not invest in the technology or the salesmanship necessary to retain that leadership.

- Financial constraints underscore all of these critical issues. We continue to seek, both within the School and at the University level, a budgeting process that accurately reflects the fiscal realities of a research-intensive engineering school, encourages interdisciplinary collaborations, and enables continuous progress toward achieving our mission consistent with financial stability for our School and for the University.

Despite the many constants that have marked our existence, the landscape of 2008 is not the same one that confronted the newly federated Case Western Reserve University in 1967 or the Case School of Engineering that defined itself as a separate entity within that University in 1992. University Circle and our stellar neighboring cultural institutions are experiencing vigorous growth, renovation, and development. Meanwhile, inner-city Cleveland's status as one of the poorest cities in the nation heavily impacts the physical, economic, and educational health of the region and its population. Our nation is witnessing an increasing shift in its economic base away from primary manufacturing and towards the service and health-care industries.

A broad consensus persists among policymakers and the public that retaining technological competitiveness is crucial for the economic viability of our region and our nation, and societal needs that lend themselves at least in part to technological solutions continue to present important opportunities for the engineering profession. Technological leadership remains vital to the long-term health of the nation in at least two respects. First, technological innovation remains an important engine for economic prosperity. New energy solutions, medical breakthroughs, nanotechnology, advanced materials, biotechnology, telecommunications, informatics and high-performance computing offer exciting new opportunities for engineering to address the problems faced by society and to determine the future direction of industries worldwide. While the U.S. has paced the world in the development of such advanced, value-added technologies, global competition is fierce, and our continued dominance is by no means assured. Second, world events have underscored how vulnerable our interdependent, global, technology-reliant society has become to challenges that threaten national and world stability. These challenges include environmental and energy issues; deteriorating infrastructure for power, transportation, communication, housing, and commerce; growing demands for water, food, natural resources, and health care; and catastrophes caused by nature, human action, or both. The mission of the Case School of Engineering demands that we continue to prepare our graduates to anticipate these challenges and contribute to their solutions.

Our School continues to have an impact on engineering research and education that far exceeds its size of 110 faculty members. Indeed, there are world–recognized accomplishments from many of our faculty in areas such as Biomedical Engineering and Advanced Materials. For example, our Macromolecular Science and Engineering department blazed a trail mimicked at other world class universities. Our Biomedical Engineering program is one of the top-ranked such programs in the nation. A number of the school's faculty have been recognized for their leadership in service to the nation by election to membership in the National Academy of Engineering (NAE), which is the highest professional distinction accorded to an engineer. However, we recognize that our small size will not allow CSE to become a world leader in every field of modern research. Moreover, our size limits the number of educational programs that we can provide both to our undergraduate and graduate student population. However, there are opportunities to develop continuing and enhanced education programs using distance learning to address regional needs. The greater Cleveland area has a high concentration of both large and small engineering companies that will benefit from our continuing education programs, and Northeast Ohio can boast of a high concentration of strong undergraduate institutions that can serve as sources of excellent graduate students.

Consider what we can learn from the history of our University, Case Western Reserve University, and its management:

The first management organization of CWRU was based on the federated set of colleges and the Case Institute of Technology (CIT). This structure was transformed to that of the colleges (1987 – 1992) wherein CIT and Western Reserve College were merged into a single management center managed by a dean and two associate deans. A vocal stakeholder was The Case Alumni Association. There was a concern that CIT was no longer well recognized as a world class institution. In response the faculty of engineering negotiated to form the Case School of Engineering in 1992 as a cost center managed by a Dean. The sciences and mathematics chose to be a part of the College of Arts and Science, which formed a cost center and is managed by a Dean.

Actually, the CWRU "cost center" method of budgeting was developed during the presidency of Louis Toepfer. There resulted about twenty years of a balanced budget for CWRU as a whole. However, the engineering budget was in deficit from the start and is in deficit to this day. This fact is both a weakness and a threat that is addressed as part of the planning process.

Fortunately, as in the past, we have attracted excellent undergraduate students. We have the opportunity to provide superior major and minor programs for a yet even larger entering class of very talented students, who are important stakeholders in our school. The graduate program requires special attention since it is a key factor in maintaining and advancing the University's reputation for excellence in engineering. We have several challenges: funding the high cost of supporting graduate student tuition and stipend, recruiting sufficient numbers of excellent domestic and foreign students, and providing the infrastructure necessary for modern research. A further challenge involves funding new faculty positions, which includes the cost of assembling attractive start-up packages. There are issues to be discussed involving faculty development over professional careers that may extend over forty or more years; retirement at the classical three score and five years of age is likely to become increasingly rare.

Our stakeholders consist of our students, our faculty and staff, our alumni, the engineering profession, and society as a whole. All of these constituencies benefit from continued vitality of the school. Unique among these stakeholders are the alumni. The Case Alumni Association (CAA), which represents a majority of the alumni, has been one of the strongest advocates of the Case School of Engineering. It is of the utmost importance that we along with CAA continue to recognize and celebrate the professional successes of our alumni and nurture our relationships further.

In summary, CSE is one of the cornerstones of the university's reputation, a microcosm with strengths in all three key components of the university's mission: undergraduate education, graduate education and research. In May 2004, CSE convened a "blue ribbon panel" of members of the National Academy of Engineering. The panel's campus visit and analysis resulted in the following observations:

> *"There is much that is very 'right' with CSE. The faculty includes many distinguished scholars, there are a number of areas of excellence in research, and the principal product — its students — are well regarded.*

*If CSE wishes to advance to the next level of excellence it must recognize the importance of its graduate school and research enterprise, and invest in the necessary areas mentioned above. Failure to do so will lead to further departure of the best faculty to universities where the environment is more conducive to research."*

Thus while many of the challenges that face the University and the Case School of Engineering are longstanding, much has changed. Accordingly, our approaches and plans must recognize that which is the same, and that which is different, in the environment in which we carry out our three-fold mission of education, research, and service. Here we set out a dynamic road map for the Case School of Engineering (CSE). We set goals and action items for success in our mission.

# Mission of the Case School of Engineering

Case Western Reserve University's Case School of Engineering is a dynamic scholarly community that plays a central role in our research-intensive University. The School's educational and research mission is to:

- Provide students with a broad but technically intensive education that prepares them as future leaders in their professions and as enlightened citizen-leaders in an increasingly complex global society;
- Produce graduates who will be recognized for their commitment to excellence in engineering, their enthusiasm for learning, their ethical behavior and their professional integrity;
- Provide responsive and creative technical leadership for the collaborative pursuit and creation of new knowledge, inventions and enabling technologies;
- Actively contribute toward the creation of a better future for all people, through research innovation, stewardship, and the development of solutions to society's most pressing challenges.

# Vision

Case Western Reserve University's Case School of Engineering will continue to provide leadership and excellence in the areas of engineering education, scholarly research and technology transfer. This vision will be achieved by fostering a challenging, enlightened, and collaborative academic environment that demands excellence, encourages innovation and supports ground-breaking discovery and invention. The Case School of Engineering will be recognized for creative scholarship, innovative teaching and a multi-disciplinary approach to fundamental and society-needs-driven research and problem solving.

# Values

The Case School of Engineering's core values support its vision and mission to be committed to engineering education, research and problem solving through its commitment to:

- Promote critical thinking, impartial judgment and fair debate.
- Embrace Creativity as a hallmark of the School's activities.
- Embrace change and innovation, and to be willing to take risks.
- Provide leadership with purpose and responsibility.
- Value ethical behavior, integrity and transparency in all aspects of school life.
- Embrace diversity and respect the dignity and culture of all people.
- Promote collaboration with mutual respect and support.
- Promote the technical and societal contributions of engineers.
- Facilitate the development, dissemination and application of engineering knowledge.
- Promote economic development for the well being of the society.

## Goal 1: Grow research by creating high-impact multi-disciplinary Centers of Excellence in targeted themes that serve a global society.

**Strategy 1: Develop multidisciplinary faculty groups to create internationally recognized institutes in (a) Energy, (b) Engineering in Bio-Systems and Human Health, (c) Advanced Materials, and (d) Design.**

**Action Items**

- Develop and secure resources and incentive packages to attract distinguished faculty to develop multidisciplinary research groups in the proposed institutes.
- Identify campus space for the two institutes. Create new state-of-the-art laboratory facilities and provide dedicated staff to maintain these facilities.
- Develop significant University-Industry-Government demonstration projects.

**Strategy 2: Nurture and grow faculty research and scholarship in areas that support the institutes, and also in School's other key strategic initiatives.**

**Action Steps**

- Grow the following multi-disciplinary research thrusts which build on existing research strengths and synergies:
  - Multi-scale Engineered Systems (MEMS/NEMS, bio-inspired engineered systems, sensors & controls, fluidics, energy-related multi-scale systems).
  - Bio-Systems (bio-imaging, neural engineering, systems biology, bio-materials, cell and tissue engineering).
  - Advanced Materials (materials for harsh/extreme environments, organic-inorganic hybrids, hierarchical material systems, functional materials, structural materials).
  - Informatics (medical informatics, bio-informatics, power informatics).
- Leverage the unique local environment of Northeast Ohio (e.g. other CWRU schools, world-renowned medical centers, local industry, cultural institution) to create a global nexus of research strength.
- Facilitate turning new research discoveries into technological products and encourage their transfer to commercial markets. Develop an intellectual property policy acceptable to all stakeholders.
- Enhance national and international visibility of CSE research by effective marketing, a strong web presence, hosting conferences and summer schools at CWRU. Include involvement in Cleveland and the region-as well as nationally and internationally-resulting in greater visibility, recognition, and impact.

## Goal 2: Enrich and Advance Graduate Education: Grow High-Quality Graduate Programs in Research Thrust Areas and Create High-Demand Professional Degrees

**Strategy 1: Grow and sustain high-quality graduate research programs.**

**Action Steps**

- Ensure financial support for all PhD graduate students. Employ fellowships and scholarships as a strategic tool to raise academic selectivity and diversity.
- Develop an active national and international recruitment program, e.g. Case faculty visit select universities and colleges in the US and overseas.
- Innovate graduate curricula to support multidisciplinary research themes of the two institutes.
- Improve graduate student mentoring and professional development.
- Improve physical work environment for all students.
- Increase visibility of world-class research at CSE.

**Strategy 2: Create and provide high-impact professional programs (non-Ph.D. students).**

**Action Steps**

- Reinvigorate the Master of Engineering degree program.
- Use technology to offer distance education, including short courses and other continuing-education programs in support of the two institutes.
- Strengthen ties to undergraduate programs by offering an integrated B.S./M.Eng. program and B.S./Global-MEM programs.
- Periodically survey industry, students and alumni on business, professional and global trends, and on technology advances for inclusion into the graduate curricula.
- Generate supportive environment for off-campus/professional students.
- Selectively market professional-degree programs.

## Goal 3: Provide a distinctive and forward-looking 21st century undergraduate education that will prepare leaders and innovators of tomorrow

**Strategy 1: Provide an exceptional undergraduate student environment.**

**Action Steps**

- Provide a distinctive and forward-looking curriculum
  - Create a *Freshman Experience* that explains engineering and its opportunities.
  - Innovate the curriculum with a focus on active/experiential learning and renovating the engineering core.
  - Institute a framework for integrating multidisciplinary research and undergraduate education. Develop minors in CSE's research themes, e.g., Energy and Engineering in Bio-systems and Human Health.
  - Promote entrepreneurship mindset.
- Enhance instructional infrastructure
  - Create endowed undergraduate instructional (student teaching assistants, staff and faculty) positions. Hire non-tenure track faculty who can lead innovation in instructional methodology throughout the school.
  - Build interactive hi-tech classroom laboratory and 'sandbox' spaces.
- Provide effective mentoring and advising
  - Promote faculty-student and student-student interactions by creating student lounges and events.
  - Promote global engagement through international study, co-op and internships.
  - Provide incentives and resources for students to participate in professional society events.

**Strategy 2: Recruit high-ability undergraduates with creative and leadership potential.**

**Action Steps**

- Market distinctive characteristics
  - Multidisciplinary undergraduate education, experiential learning, research experience, and international initiatives.
  - Local and programmatic access to world-class research and educational partnerships.
  - Multicultural aspects of University Circle.
- Initiate special programs
  - Develop and offer attractive B.S./M.Eng. and B.S./Global-MEM programs.
  - Increase Case awareness by working with high-school teachers and student counselors.
- Create new undergraduate fellowship programs to support multidisciplinary initiatives and international programs.

## Goal 4: Establish a program that supports Recruitment and Retention of Faculty and Staff.

**Strategy 1: Expand opportunities for recruiting and retaining a diverse faculty and staff**

**Action Steps**

- Recognize and reward with strong financial incentives departments that seek, hire and retain under-represented faculty and staff.
- Establish a well-funded, university level program that provides significant career opportunities for spouses and partners.
- Provide salary benefits and retirement plans commensurate with other research universities.
- Increase number of endowed chairs for strategic junior and distinguished faculty.
- Develop a child-care facility to meet the needs of faculty and staff.

**Strategy 2: Promote Faculty and Staff Recognition and Excellence**

**Action Steps**

- Strengthen support for faculty development, mentoring and research by creating an office of faculty development.
- Identify and encourage faculty and staff for leadership roles in their disciplines and in other arenas.
- Provide discretionary funds for faculty initiatives from overhead recovery.
- Encourage nomination of faculty and Staff members for major awards. Actively promote faculty for fellow status in professional societies and membership in NAE.

## Goal 5: Strengthen Stakeholders Relationships by Actively Engaging Alumni, Donors, Corporations, and Foundations as partners.

**Strategy 1: Strengthen interactions between the alumni and the School.**

**Action Steps**

- Work with CAA to encourage and facilitate an active role of the alumni in undergraduate and graduate admissions.
- Identify and involve alumni interested in recruiting CSE graduates for permanent jobs, internships, or co-op assignments.
- Engage alumni as lifelong learners and active participants with the School community in mutually beneficial relationships.
- Recognize and celebrate alumni accomplishments.

**Strategy 2: Build strategic relationships to increase philanthropic support and fulfill the School's educational and research goals.**

**Action Steps**

- Educate, mentor and engage appropriate faculty and staff in donor cultivation and solicitation.
- Build strong relationships with key corporations in research, technology transfer, recruitment, workforce education and diversity programs.
- Appoint industry and community leaders to CSE and department advisory boards.
- Develop a professional communications program to enhance the image and reputation of the School.
- Actively pursue support from foundations and corporations for educational and research programs.

## Goal 6: Optimize Operations and Develop a Sustainable Infrastructure for the School.

**Strategy 1: Promote greater effectiveness and efficiencies and adopt best practices.**

**Action Steps**

- Develop a financial model for a sustainable School. Research *Finance & Budgeting* and *Resource Allocation Models* of peer engineering schools.
- Implement a resource allocation process to support strategic investment while promoting transparency and ensuring accountability.
- Reduce budgetary and other barriers to collaborative research and policy innovation. Adopt a university-wide research proposal budgeting process which uniformly addresses research costs and streamlines the administrative process for multi-school proposals.
- Create a culture that celebrates success and ensures a high quality of life and personal satisfaction for all members of the School community.

**Strategy 2: Generate new revenue sources.**

**Action Steps**

- Increase undergraduate tuition income (review undergraduate student admission discount rates; revisit the existing tuition allocation formula(s)).
- Develop new sources for graduate tuition income (professional degrees; certificate programs; and short courses).
- Increase research income (facilitate and grow multidisciplinary research activity; increased licensing for CSE developed technology).
- Embark a capital campaign to implement the CSE strategic plan in conjunction with the university capital campaign. Focus on student support, faculty and staff development, and the key priorities enumerated in this plan.

**Strategy 3: Develop a School-wide "continuous" review and assessment process to respond to changes in needs and opportunities.**

**Action Steps**

- Develop and adopt a formal process to review performance towards the School's goals and key priorities and provide feedback.
- Continuously monitor and redefine performance metrics.