

*Transforming the University*

**Final Recommendations of the College Design:  
Science/Engineering Task Force**

**Submitted on behalf of the Task Force by:**

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## **Executive Summary**

*Mission:* Advances in the biological sciences will transform the physical sciences, engineering, biomedical research, agriculture, and the environmental sciences. Critical to this transformation are strong connections between biology and the physical sciences, mathematics, and engineering. The University of Minnesota seeks to be a leader in promoting these new connections among the sciences, engineering, and related disciplines.

### *Deliverables*

- 1) Recommendations regarding the optimal design, structure, and organization of the physical sciences, engineering, mathematics, biology and such related disciplines as biomedical research, agriculture, and the environmental sciences.
- 2) Recommendations regarding how to identify and take maximum academic advantage of important future directions at the interface of the core disciplines.
- 3) Recommendations regarding how to configure the sciences and engineering to best integrate and promote academic synergies, teaching, and research between academic units and across the Academic Health Center.
- 4) Recommendations for a plan to optimally position the University of Minnesota to achieve prominence in the sciences, engineering, and health-related disciplines, consistent with the University's goal to become one of the top three public research universities in the world.
- 5) Recommendations regarding how to promote strengths in the core disciplines of the Biological Sciences (CBS) and the Institute of Technology (IT) and basic science within the Medical School (MS).
- 6) Recommendations regarding how science and engineering on campus also can be a model for the promotion of public engagement.

### *Summary of Findings and Recommendations:*

This task force concluded that the sciences and engineering at the University of Minnesota have a unique structure that is progressive and ideally suited for greater collaboration across department boundaries. Therefore, we find no reason to recommend change to the current organizational structure of IT or CBS. The following is a summary of the recommendations:

- The University of Minnesota, in partnership with the State of Minnesota and the private sector, should seek funding for a Science and Technology Interdisciplinary Research (STIR) Institute based on research excellence, faculty competitiveness, and focused investments.
- Research collaborations among the sciences and engineering must be strengthened, in particular those between IT, CBS, and the AHC. The task force recommends focused investments in three intercollegiate areas: materials, energy, and environmental genomics. Faculty must take the lead in identifying research thrusts, organizing competitive teams, and orchestrating major proposals that draw on multi-disciplinary and, increasingly, multi-

institutional expertise. Disciplinary research must remain a priority with strategic initiatives providing continued support.

- The task force recommends maintaining strength in traditional departments, while encouraging greater interdisciplinary activities, especially among the physical and biological sciences, engineering and the medical sciences, through graduate education and the formation of research teams.
- The University of Minnesota must continue to establish and support centralized multi-user facilities based on competitive proposals that enhance the research infrastructure in the sciences and engineering.
- The University of Minnesota must take steps to increase research capacity through facilitating collaborative research and securing training grants, especially at the interface of engineering and biology. The University must develop more effective ways to establish institutionally sustainable, multi-disciplinary graduate training opportunities across the sciences and engineering.
- A key step towards integrating biology with the physical sciences and engineering is the creation of an undergraduate minor in biological engineering, jointly organized and administered by IT and CBS.
- The Office of the Vice President for Research should play a major role in articulating and implementing a vision for interdisciplinary research and facilitate associated funding initiatives. The Vice President for Research should actively participate in the development of research capabilities as part of the Office's responsibility for creating university-wide research strategies.

*Task Force Members:*

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## ***Introduction***

Our task force was charged to propose recommendations that will enable scientists and engineers at the University of Minnesota to propel our institution into the top tier of public research universities<sup>1</sup> and to strengthen the connections between biological and the physical sciences, mathematics, and engineering. The timing of this strategic positioning exercise is uniquely favorable as we have arrived at a critical juncture for the future of sciences and engineering. Biology is becoming a quantifiable science, with profound implications for the physical and engineering sciences<sup>2</sup>. We can expect to see much stronger collaborations among basic scientists in the physical and biological sciences, working together with engineers and medical researchers. Making the very most of these collaborations and scientific developments will be essential in addressing some of our most challenging problems in energy, health, and the environment.

This report will both convey this remarkable promise and point to critical shortcomings that, this task force concludes, have impaired the ability of the University of Minnesota to fulfill its potential as a top tier research university. Commitment to excellence in integrating research, teaching, and public engagement, combined with the highest aspirations and highest expectations must become the cultural norm at the University of Minnesota. The University of Minnesota can be one of the world's leading public research institutions only if we aggressively and strategically pursue research directions at the frontiers of our disciplines. The University must create a more collaborative culture with a commitment from University leadership to enable and facilitate research across departments and colleges, and must become a national model for attracting, retaining, and preparing the next generation of scientists and engineers. In addition, faculty must embrace the concept of collaboration across traditional boundaries and culturally adapt to an environment where interdisciplinary research is the norm rather than the exception.

**Strong core disciplines in the sciences and engineering are a *sine qua non* for the University to emerge as a leader in disciplinary and interdisciplinary research.** While our charge was to deal primarily with three colleges, the committee believes that the conclusions drawn from this study are applicable to all of sciences and engineering. Excellence in graduate education and postdoctoral training must become a top priority to attract the best and the brightest to our science and engineering faculty. Departments and graduate programs must strive to create intellectual communities for students and postdocs both within and across disciplines.

Several high-profile reports<sup>3</sup> underscore the need to better educate students in the physical and biological sciences and engineering, and Minnesota faces significant demographic changes that

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<sup>1</sup> See Appendix A for the charge letter to this committee.

<sup>2</sup> See Appendix J: Computational Biology.

<sup>3</sup> Roadmap For National Security; Imperative For Change. G. Hart and W.B. Rudman. 2001.

(<http://www.fas.org/man/docs/nwc/phaseiii.pdf>). Rising Above the Gathering Storm. 2006.

(<http://www.nap.edu/catalog/11463.html>). American Competitiveness Initiative, February 2006, Domestic Policy Council, Office of Science and Technology Policy (<http://www.whitehouse.gov/stateoftheunion/2006/aci/aci06-booklet.pdf>). Science and Engineering Indicators 2006 (<http://www.nsf.gov/statistics/seind06/>). America's Pressing Challenge: Building a Stronger Foundation. (<http://www.nsf.gov/statistics/nsb0602/nsb0602.pdf>).

might challenge its economic position<sup>4</sup>. A partnership among the State of Minnesota, its private sector, and all educational institutions is necessary to maintain the high standard of living and the high educational level of citizens in Minnesota, and the University of Minnesota as the state's public research university must take the lead. The task force has outlined a series of ideas to facilitate **public engagement** throughout the activities of faculty, staff, and students in the sciences and engineering<sup>5</sup>.

The first charge of this task force was to make “recommendations regarding the optimal design, structure, and organization” of the sciences and engineering<sup>6</sup>. Evaluation of the administrative structure of a large number of research universities in the U.S. reveals that no two universities are alike and that organizational structure is not a predictor of excellence (see Appendix B for full rationales and additional data). The Institute of Technology (IT) and the College of Biological Sciences (CBS) in their current forms were established in the mid 1960s, well before biology received such prominence. This structural organization has proven to be visionary and forward-looking. Other universities (such as UC Davis and UCLA) much later recognized the importance of providing a separate home to the biological sciences. No university has a college structured like IT, which has served to eliminate the artificial separation of the physical sciences, engineering, and mathematics. The recommendations in this report, therefore, are predicated on the following:

**This task force concluded that the sciences and engineering at the University of Minnesota have a unique structure that is progressive and ideally suited for greater collaboration across department boundaries. Therefore, we find no reason to recommend change to the current organizational structure of IT or CBS.**

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<sup>4</sup> Mind the Gap. Brookings Institution Metropolitan Policy Program. 2005.

<sup>5</sup> Action items are provided in Appendix L.

<sup>6</sup> The sciences and engineering include the physical sciences, engineering, mathematics, biology and such related disciplines as biomedical research, agriculture, and the environmental sciences.