# 3. RESEARCH

## *3.1. Introduction*

Research in the College of Engineering at UIC is done by 114 faculty in six departments. We outline below the strengths of our research in various departments:

***Bioengineering:*** Bio-informatics, Bio-mechanics, Biomedical Imaging, Cell and Tissue Engineering, Neural Engineering, Rehabilitation Engineering.

***Chemical Engineering****:* Continuum and Molecular transport phenomenon, Macroscopic and microscopic thermodynamics, Chemical Kinetics, Process Systems Engineering and Analysis, Chemical Engineering Applications to Biomedical problems.

***Civil and Materials Engineering:*** Structural Design, Transportation, Environmental Engineering, Materials Engineering

***Computer Science:*** Bioinformatics, Databases and Datamining, Artificial Intelligence and Learning Technologies, Electronic Visualization, Networking, Software Engineering, Theory, Formal Methods, Kernel Security, Electronic Design Automation.

***Electrical and Computer Engineering:*** Bioelectronics and Bio-mimetics, Information Systems including Signal and Image Processing, Device Electronics and Physics, Computer Engineering

***Mechanical and Industrial Engineering:*** Combustion, Biomechanical Technology, Vehicular Technology, Manufacturing, Virtual Engineering.

Our faculty have strong ties between the College of Engineering and the College of Medicine, College of Business, College of Liberal Arts and Sciences, College of Urban Planning and Public Affairs, School of Public Health, and College of Dentistry.

Our College of Engineering faculty are very active in their research. We report their research productivity through three metrics:

- Publications in journals and conferences
- Ph.D. students graduated
- Research funding

### 3.1.1. Publications

Table 3.1 describes the publication data in journals and conferences during 1999 to 2003 in the College overall, and in each of the six departments.

**Table 3.1. College and department faculty publication data in from 1999 to 2003. The table shows the total journal and conference paper count as well as the per faculty journal and conference count.**

| | COE<br>J/C Count<br>J/C per Fac. | BioE<br>J/C Count<br>J/C per Fac. | CME<br>J/C Count<br>J/C per Fac. | CS<br>J/C Count<br>J/C per Fac. | ChE<br>J/C Count<br>J/C per Fac. | ECE<br>J/C Count<br>J/C per Fac. | MIE<br>J/C Count<br>J/C per Fac. |
|---|---|---|---|---|---|---|---|
| 1999 | 261/320<br>3.1/3.8 | | | | | | |
| 2000 | 389/391<br>4.0/4.0 | | | | | | |
| 2001 | 409/346<br>3.9/3.3 | | | | | | |
| 2002 | 321/382<br>3.2/3.8 | 52/26<br>4.3/2.2 | 48/58<br>3.7/4.5 | 42/72<br>1.6/2.8 | 27/25<br>2.7/2.5 | 49/61<br>2.7/3.4 | 97/137<br>4.6/6.5 |
| 2003 | 365/373<br>3.6/3.7 | 24/30<br>2.4/3.0 | 41/56<br>3.2/4.3 | 35/74<br>1.5/3.1 | 57/14<br>5.7/1.4 | 107/82<br>5.1/3.9 | 101/116<br>5.0/5.8 |

J: Journal articles
C: Conference articles

### 3.1.2. Ph.D. Graduates

Table 3.2 shows the number of Ph.D. students graduated by the faculty in the College of Engineering during 1999 to 2004.

**Table 3.2. Department and per faculty PhD production data during 1999 to 2004. The table shows the total number of Ph.D. graduates and the per faculty Ph.D. graduation data.**

| | COE<br>PhD \| PhD/Fac. | BioE<br>PhD \| PhD/Fac. | CME<br>PhD \| PhD/Fac. | CS<br>PhD \| PhD/Fac. | ChE<br>PhD \| PhD/Fac. | ECE<br>PhD \| PhD/Fac. | MIE<br>PhD \| PhD/Fac. |
|---|---|---|---|---|---|---|---|
| 1999 | | 1 \| .2 | 5 \| .4 | | 1 \| .1 | | 11 \| .4 |
| 2000 | | 1 \| .1 | 3 \| .2 | | 3 \| .3 | | 8 \| .3 |
| 2001 | 28 \| .3 | 5 \| .4 | 6 \| .5 | 1 \| .03 | 4 \| .3 | 4 \| .2 | 8 \| .3 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2002 | 26 \| .2 | 2 \| .1 | 5 \| .4 | 7 \| .2 | 1 \| .1 | 1 \| .04 | 10 \| .4 |
| 2003 | 42 \| .4 | 10 \| .7 | 4 \| .3 | 7 \| .2 | 3 \| .4 | 6 \| .2 | 12 \| .6 |
| 2004 | 35 \| .3 | | | | | | |

### 3.1.3. Research Funding

Table 3.3 shows the research funding data for 1999-2004 for the faculty in various departments.

**Table 3.3. Department and per faculty grants and contracts funding data. The College used to have a combined EECS department prior to 2001 when it was split into ECE and CS departments.**

| | BioE<br>$<br>$/Fac. | CME<br>$<br>$/Fac. | CS<br>$<br>$/Fac. | ChE<br>$<br>$/Fac. | ECE<br>$<br>$/Fac. | MIE<br>$<br>$/Fac. | ERC<br>$<br>$/Fac. | EECS<br>$<br>$/Fac. |
|---|---|---|---|---|---|---|---|---|
| 1999 | $267,822<br>$51,014 | $1,665,383<br>$105,739 | | $759,701<br>$63,308 | | $2,296,586<br>$90,954 | $1,006,107 | $3,900,598<br>$83,435 |
| 2000 | $405,100<br>$64,816 | $1,768,241<br>$128,599 | | $732,948<br>$66,632 | | $2,760,548<br>$110,422 | $1,012,922 | $6,294,755<br>$136,842 |
| 2001 | $894,105<br>$107,336 | $1,768,631<br>$112,294 | | $828,502<br>$75,318 | | $3,235,865<br>$129,435 | $1,423,265 | $6,888,969<br>$155,683 |
| 2002 | $1,592,394<br>$124,115 | $1,628,204<br>$127,702 | $6,807,453<br>$266,959 | $795,308<br>$72,301 | $2,388,882<br>$107,365 | $3,143,440<br>$130,977 | $2,897,871 | |
| 2003 | $1,848,881<br>$133,686 | $1,586,089<br>$124,399 | $9,708,202<br>$380,714 | $694,854<br>$77,206 | $3,482,145<br>$156,501 | $2,951,012<br>$128,305 | $3,473,602 | |
| 2004 | $2,589,752<br>$187,256 | $1,899,482<br>$142,283 | $6,386,658<br>$241,006 | $712,563<br>$89,070 | $3,604,231<br>$155,021 | $3,003,560<br>$150,178 | $2,612,141 | |

Figures 3.1 through 3.8 show the research funding trends in the college and various departments. It is clear that the research funding in the College has doubled from 1999 to 2004 and has increased every year except 2004. The research funding in almost all the departments has also steadily increased in the past five years.

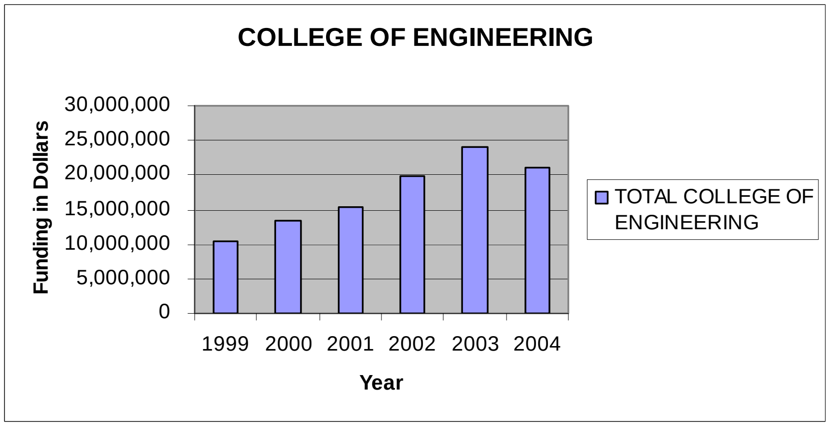


**Figure 3.1. Research Funding Trends in the College of Engineering.**

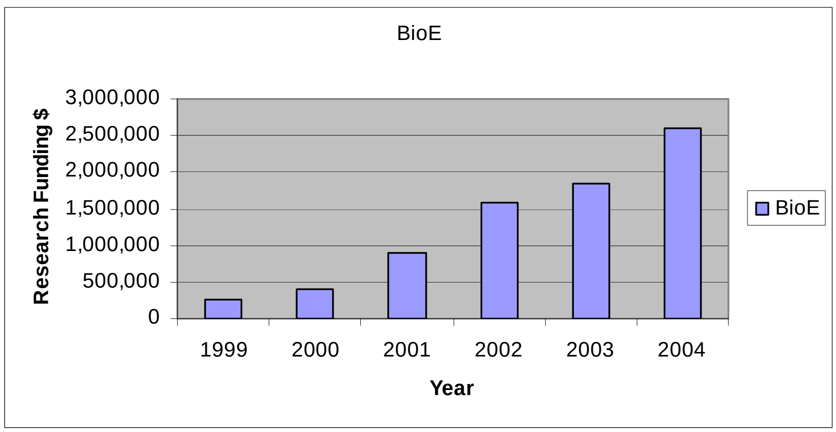


**Figure 3.2. Research Funding Trends in the Bioengineering Department.**

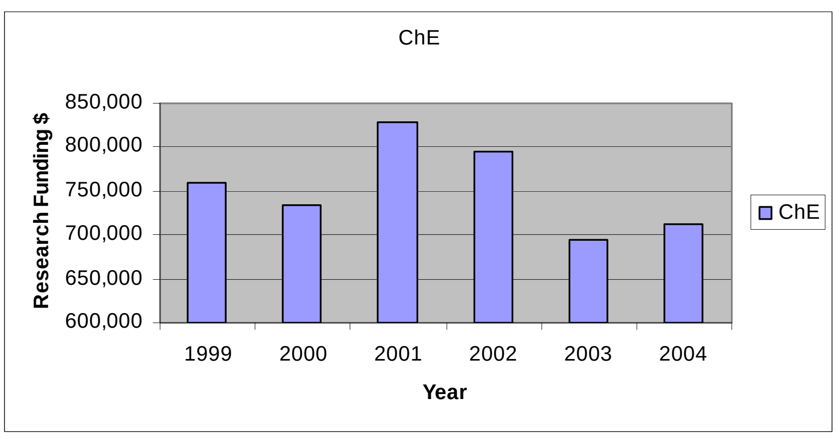


**Figure 3.3. Research Funding Trends in the Chemical Engineering Department.**

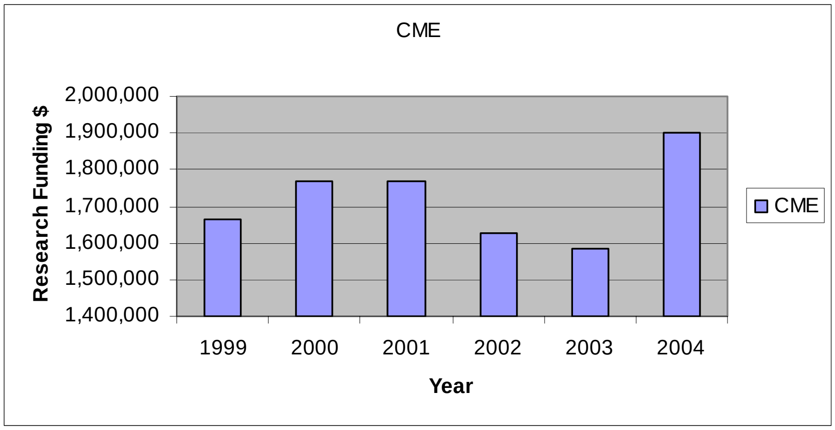


**Figure 3.4. Research Funding Trends in the Civil and Materials Engineering Department.**

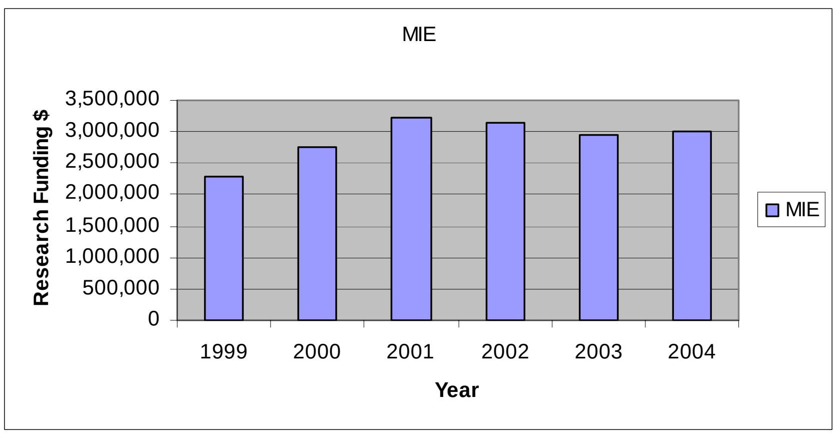


**Figure 3.5. Research Funding Trends in the Mechanical and Industrial Engineering Department.**

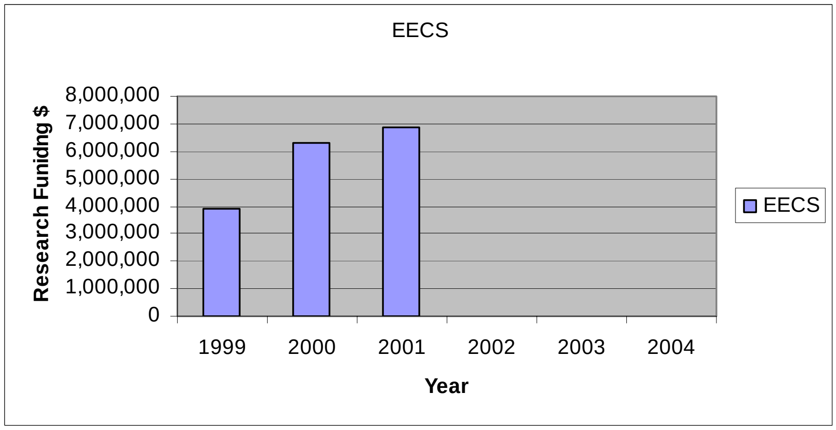


**Figure 3.6. Research Funding Trends in the Electrical Engineering and Computer Science Department. (The EECS department was split into ECE and CS department in 2001).**

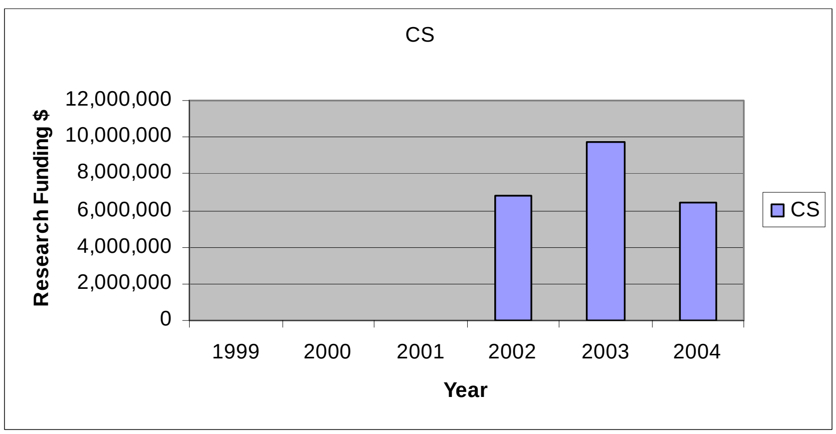


**Figure 3.7. Research Funding Trends in the Computer Science Department.**

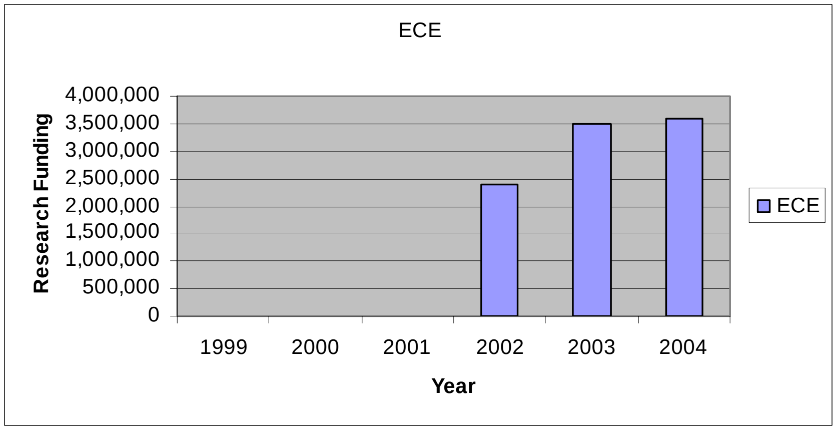


**Figure 3.8. Research Funding Trends in the Electrical and Computer Engineering Department.**

## *3.2. Specific Goals and Objectives for 2010*

- Our faculty (size 114 in 2004 growing to 130 in 2010) should publish 500 journal papers and 500 conference papers per year in prestigious journals and conferences, an average of four journal papers and four conference papers per faculty per year.
- Our faculty should publish their papers in the top-ranked journals and conferences in their fields in order to have high impact.
- Our faculty should transfer the technologies to industry by filing invention disclosures and patents.
- Our faculty (size 114 in 2004 growing to 130 in 2010) should collectively bring in $40 million in research funding by 2010, with an average of $300,000 per year per faculty.
- We will organize the research areas of the College into clusters of interdisciplinary research in the fields of Bio-technology, Materials and Nano-technology, Computing and Information Technology, and Infrastructure and Energy/Environmental Technology.
- We should submit at least five large interdisciplinary research proposals per year to agencies such as NSF, NIH, and DARPA at a funding level of greater than $1 million per year per project.
- We should get at least one large interdisciplinary research project funded per year by agencies such as NSF, NIH, and DARPA at a funding level of greater than $1 million per year per project.
- We should graduate 60 Ph.D.s per year at an average of 0.5 Ph.D. per faculty per year.

## *3.3. Action Plan*

### 3.3.1. Increase the Quality of Publications

Our faculty (size 114 in 2004 growing to 130 in 2010) should publish 500 journal papers and 500 conference papers per year in prestigious journals and conferences, an average of four journal papers and four conference papers per faculty per year in high quality journals and conferences. With input from their faculty, each department head will create a target publication list that identifies top-tier journals and conferences, and second ranked journals and conferences, in various research areas. Each year the faculty will be evaluated in terms of how many papers they published in these top journals and conferences. We will encourage our faculty to publish half as many papers in top-tier journals and conferences than twice as many papers in second-tier journals and conferences.

The motivation for this is to have higher quality and higher impact of our published work. In the future, we will start evaluating the impact of research publications by looking at citation indices for the publications on CITESEER.COM or ISI Web of Science.

### 3.3.2. Increasing Research Funding

It is well known that higher ranked universities generate a large amount of research funding per year. UIC College of Engineering has a total research funding of $21 million, but we plan to increase our funding about 14% each year and double our research funding to $40 million by 2010. We will increase our total research funding by several mechanisms:

1. Increasing our faculty size from its current 114 faculty to 130 faculty
2. Increasing the relative number of research active faculty from the current 85 research active faculty to 110 research active faculty
3. Increasing the research funding per faculty
4. Providing incentives to faculty to increase research by reducing teaching loads to two semester courses per year by making it easier to buy out of teaching
5. Providing some small portion of the Indirect Costs generated from research funds back to the Principal Investigators or Yearly Research Awards to the faculty
6. Providing seed funding for new collaborative projects
7. Writing large collaborative research project proposals
8. Exploring a wide range of federal agencies and industries to secure research funding.

### 3.3.3. Organize Research into Interdisciplinary Centers

One of the key observations that we would like to make is that the size of the College of Engineering matters in terms of its research reputation. It is well known that the top engineering schools are much larger in terms of faculty size, Ph.D. production, research publications, and research funding. For example top ranked MIT has 350 research active faculty, 1400 Ph.D. students, 200 Ph.D. graduates per year, and $241 million in research funding ($685,000 per faculty). Second ranked Stanford has 165 faculty, 825 Ph.D. students, 229 Ph.D. graduates per year, and $120 million in research funding ($730,000 per faculty). Third ranked UIUC has 360 research active faculty, 1500 Ph.D. students, 186 Ph.D. graduates per year, and $213 million in funding ($590,000 per faculty). Fourth ranked Berkeley has 212 research active faculty, 1200 Ph.D. students, 186 Ph.D. graduates per year, and $121 million in funding ($571,000 per faculty). Fifth ranked Georgia Tech has 477 research active faculty, 1900 Ph.D. students, 179 Ph.D. graduates per year, and $187 million in funding ($392,000 per faculty).

In comparison, UIC is quite small, and has 85 research active faculty, 422 Ph.D. students, 35 Ph.D. graduates per year, and $21 million in annual research funding ($240,000 per active research faculty). However, one does not always have to be large to be highly ranked. For example, Caltech has 96 research active faculty, 461 Ph.D. students, 57 Ph.D. graduates per year, and $48 million in funding ($500,000 of funding per faculty). Princeton has 127 faculty, 482 Ph.D. students, 51 Ph.D. graduates per year, and $56 million in funding ($442,000 in research funding per faculty). The key approach to improve in rankings and reputation is through growing selective areas of excellence.

In the future we will organize the research of the College into Centers of interdisciplinary research areas in:

(1) Bio-technology
(2) Materials and Nano-technology
(3) Computing and Information Technology
(4) Infrastructure and Energy/Environmental Technology

Table 3.4 shows how various departments plan to contribute to each of these areas.

**Table 3.4. A Possible Grouping of research area specialties within department into inter-disciplinary clusters**.

| **Interdisciplinary Clusters/ Departments** | **Bio-technology** | **Materials and Nano-technology** | **Computing and Information Technology** | **Infrastructure and Energy/Environmental Technologies** |
|---|---|---|---|---|
| **Bioengineering** | Neural Engineering, Tissue engineering, Bio-informatics | Nanotech for bio-materials<br>Cell and Tissue Eng.<br>Nanoscaffolds,<br>Integration of manmade nanostructures with biological structures including biomolecules | Bioinformatics,<br>Neural coding | Nanotech bioeffects |
| **Chemical Eng** | Biopharmaceuticals | | Computational methods for fluid flow | |
| **Computer Science** | Bioinformatics; Visualization; Data Mining | Computational Modeling; Design Automation | Networking and Security; Databases/Data Mining; Learning Technologies | Sensor Networks; Intelligent Transportation Systems |
| **Electrical and Comp. Engg.** | Biomedical Imaging<br>Biosensors | Novel Nanodevices for electronics and | VLSI/CAD and computer architectures | Wireless and Wired Networks |

| | | | | |
|---|---|---|---|---|
| | Molecular Electronics | optoelectronics, Nanomems and nanofabrication Spintronics and nanomagnetics | Signal and image processing including quantum information Parallel and quantum computing | Power and Sensor Networks Information Assurance |
| **Civil and Materials** | | Materials engineering | Computational structures | Infrastructure for bridges, environmental engineering |
| **Mechanical and Industrial Engineering** | Bio-sensors, bio-fluids, bio-mechanics, Bio-tech - self assembly | Nanofluidics, nanocatalysis, particle/fiber nanostructures, nanoscale transport phenomena, molecular manufacturing, bottom-up manufacturing | Computational fluid dynamics, computational solid mechanics, industrial virtual reality, prognostics and diagnostics, smart sensors | Distributed energy resources, combustion/emissions, plasma processing, heat and mass transfer processes, indoor environmental quality, energy efficient commercial and industrial technologies |

Our strategy will be to develop selective areas of excellence by picking a few areas and developing clusters of faculty working in each area. Each department will develop long term plans for recruiting faculty. We will develop plans to hire faculty in research clusters in order to develop **selective areas of excellence** instead of distributing our resources thinly to cover all areas. It is very difficult to have impact if in a department of 20 faculty, we have one faculty per sub-area. Instead, if we were to have 4-5 faculty in each cluster, we could have about 3-5 cluster areas per department; it would be easier to have impact (in terms of publications in key journals, publications in key conferences, program committee membership of conferences, editorships of journals, and research funds).

We also believe that a small number of large interdisciplinary research centers and projects are better than a large number of small projects. For example, one $2 million research project is better than five $400,000 individual projects from a visibility point of view. In addition, it is a very good experience for graduate students to be involved in large team projects.

The College of Engineering faculty have already started writing proposals for large collaborative interdisciplinary research centers. The National Science Foundation had its call for proposals for the next round of Engineering Research Centers (ERC) in 2004. Our faculty have submitted FIVE pre-proposals. Each of these proposals involved UIC as the lead institution and up to four other universities as partners.

1. TITLE: **Center for Engineering Design of Biotherapeutics**
Project Leader: Jie Liang
LEAD INSTITUTION: University of Illinois at Chicago
PARTNER INSTITUTIONS: Argonne National Lab, Boston University, University of California at San Diego, University of Illinois at Urbana-Champaign

2. TITLE: **Center for Global Multimedia Mobile Communications**
Project Leaders: Prith Banerjee and Dan Schonfeld
LEAD INSTITUTION: University of Illinois at Chicago

PARTNER INSTITUTIONS: Northwestern University, University of Illinois at Urbana Champaign, Purdue University, Chicago State University

3. TITLE: **Center for Distributed Alternative and Renewable Energy Systems (DARES)**
Project Leaders: William Worek and Sudip Mazumder
LEAD INSTITUTION: University of Illinois at Chicago
PARTNER INSTITUTIONS: University of Central Florida, University of Utah, Virginia Polytechnical Institute, University of Wisconsin-Madison

4. TITLE: **Cyber-Transportation by Ubiquitous Computing (CyTUC)**
Project Leaders: Sue McNeil and Ouri Wolfson
LEAD INSTITUTION: University of Illinois at Chicago
PARTNER INSTITUTIONS: Carnegie Mellon University, University of California-Irvine, University of California-Los Angeles, University of Illinois at Urbana Champaign

5. TITLE: **Engineering Center for Metropolitan Security**
Project Leader: John Regalbuto
LEAD INSTITUTION: University of Illinois at Chicago
PARTNER INSTITUTIONS: Northwestern University, Illinois Institute of Technology, Argonne National Lab

In addition, various DOD Multi-University Research Initiative (MURI) proposals, NSF Major Research Infrastructure (MRI) and NSF Integrated Graduate Education, Research and Training (IGERT) proposals involving multiple investigators within the College of Engineering are being planned for submission in the 2004-2005 academic year. The College faculty will be encouraged to participate in many more such center grant proposals.

### 3.3.4. Organizing Inter-Disciplinary Research Group Meetings

The College will appoint various committees in areas such as Bio-technology Research, Information Research, Nanotechnology Research, and Infrastructure Research. The task of these committees will be to meet on a regular basis to discuss possible opportunities to respond to requests for proposals from various funding agencies such as NSF, NIH, DOE, and DOD.

We will organize one or two day research retreats in these interdisciplinary areas at UIC. An example of such a one day workshop is a BIO-INFORMATICS Symposium that was organized at UIC in October 2004, where leading researchers from UIC and elsewhere presented their research results in front of UIC faculty and students. We are planning to have one day research retreats in January 2005 on each of the five NSF ERC Center proposal topics at UIC.

We will also host a Distinguished Lecture Series in these interdisciplinary areas where we will invite senior researchers from other universities to come and present their research results to UIC faculty and students.

### 3.3.5. Seed Funding for New Projects

The College of Engineering will develop plans to fund collaborative projects among faculty in the College of Engineering by having an internal competition for these projects. Funds for these projects will be generated by Indirect Cost Returns on current funded research projects. We will budget $500,000 per year as seed funding of up to 10 projects at $50,000 each per year.

### 3.3.6. Cost Sharing and Support of Research Staff

As the College faculty are asked to write large collaborative research center grants, the College will commit to cost sharing on these grants. Many funding agencies require 10-20% cost sharing on grants. We are planning to increase our research funding from $21 million to $40 million by 2010. Assuming that half the increase in funding will come from large collaborative center proposals, we will need to bring in $10 million of research funding of this type. Assuming 20% cost sharing on these grants, we will need to pay $2 million per year in cost sharing in 2010. This constitutes 5% of the $40 million total funds in 2010. We have therefore assumed that we will set aside 5% of the funds for cost sharing per year. A planned budget for cost sharing funding during 2006 to 2010 is shown in Chapter 11.

One of the ways that the College will help make large collaborative projects successful is to provide support for academic professionals (Research Staff) who can help write large center grant proposals and also manage these projects. The College will hire such technical professionals to help write proposals in interdisciplinary areas such as Bio-technology, Nanotechnology, Information Technology and Infrastructure Technology.

The College will also create faculty positions such as Research Assistant Professors, Research Associate Professors, and Research Professors. These faculty will be able to supervise M.S. and Ph.D. student theses, and serve on graduate committees. These untenured faculty members will support their salaries completely from the research funds. These faculty members will be asked to help write these large collaborative center grants with other faculty in the College.

### 3.3.7. Larger Startup Funding for New Faculty Hires

In the past, the College of Engineering has been somewhat constrained hiring new faculty due to limited startup funds. The funding mechanism for startup funds was as follows. 33% of the funds came from the departments, 33% came from the College, and 33% came from the Office of the Vice Chancellor for Research. Because the departments did not have substantial funds, this limited the total amount of startup funds that were available to give to new faculty. Startup funds have ranged from $50,000 to $100,000 per faculty.

In the future, we want to provide much larger startup funds to attract faculty (an average of $300,000 per faculty). The College will be hiring about 30 new faculty (15 additional and 15 replacement); each department will be asked to develop long run plans for faculty recruiting around such thematic clusters. We will provide startup funds of about $300,000 per new faculty hire. Hence we will need to have a budget of $1.8 million per year for startup funds. These new faculty who are hired will use these startup funds as seed funds to bring ten times as much research funding to the College in the future. We believe that one needs to invest in research resources to build a large research enterprise. We will pay for these increased funds through increases in our ICR overhead as described in Chapter 11.

### 3.3.8. Increase the Number of Ph.D. Students

As described in the section of graduate studies and students, our College has 860 graduate students; however, a majority of the students are M.S. students. We will increase the number of graduate students to 1,000 (400 M.S. and 600 Ph.D.). We will graduate 60 Ph.D. students per year. We will change the way we invest T.A. and Fellowship resources to increase the number of Ph.D. students in the College. This will lead to a larger research enterprise.

### 3.3.9. Research Lab Renovation

We will have a budget from the College to renovate some selected research labs of the faculty each year. We will budget $500,000 per year towards research lab renovation. Criteria for selecting labs for renovation funding will be established at a future date.

### 3.3.10. Incentives to the Faculty

We will provide incentives to the faculty for bringing in large research grants. One way would be to provide 2% of the research overhead costs back to the Principal Investigators as described in Chapter 2.

Another way is to generate a pool of funds from which yearly Research Awards can be provided to faculty as cash incentives as described in Chapter 2.

### 3.3.11. Interactions with Industry

We will encourage our faculty to have strong ties to industry. Given that UIC is located in the city of Chicago, one of the advantages that we have over other colleges of engineering is in the ability to have strong ties to industry that are located in the Chicago area. We describe our Corporate Relations strategy in a separate chapter.

### 3.3.12. Exploring a Variety of Government Funding Agencies

Faculty in the College of Engineering have typically obtained research funding primarily from the National Science Foundation. However, there are many other funding agencies that our faculty should be encouraged to get funding from. They include the National Institutes of Health (MIH), Department of Defense (DOD) agencies such as Office of Naval Research (ONR), Army Research Office (ARO), Air Force Office of Sponsored Research (AFOSR), Defense Advanced Research Projects Agency (DARPA), Department of Energy (DOE) Office of Science, Department of Health and Human Services DHS Office of Science and Technology, and others.

Figure 3.10 shows the relative distribution of research funding in various fields (Engineering, Physical Sciences, Life Sciences, Social Sciences) from various funding agencies (NSF, NIH, DHS, DOD, DOE, and others). It can be seen that only 33% of all funding in engineering is provided by NSF, another 33% is provided by the DOD, and 10% by NASA, and 5% by DHS.

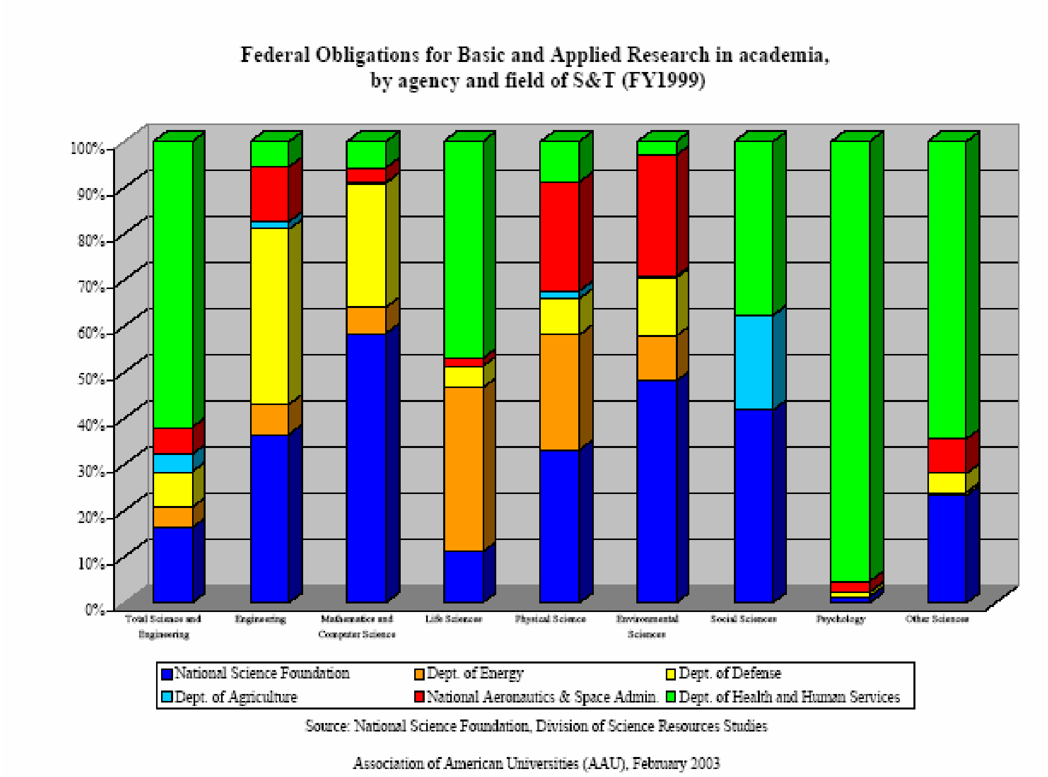


**Figure 3.10. Federal Obligations in Basic and Applied Research in academia by disciplines and fields.**

Figure 3.11 shows the distribution of funding by disciplines within the field of engineering (Bioengineering, Electrical Engineering, Mechanical Engineering, Civil Engineering, etc.).

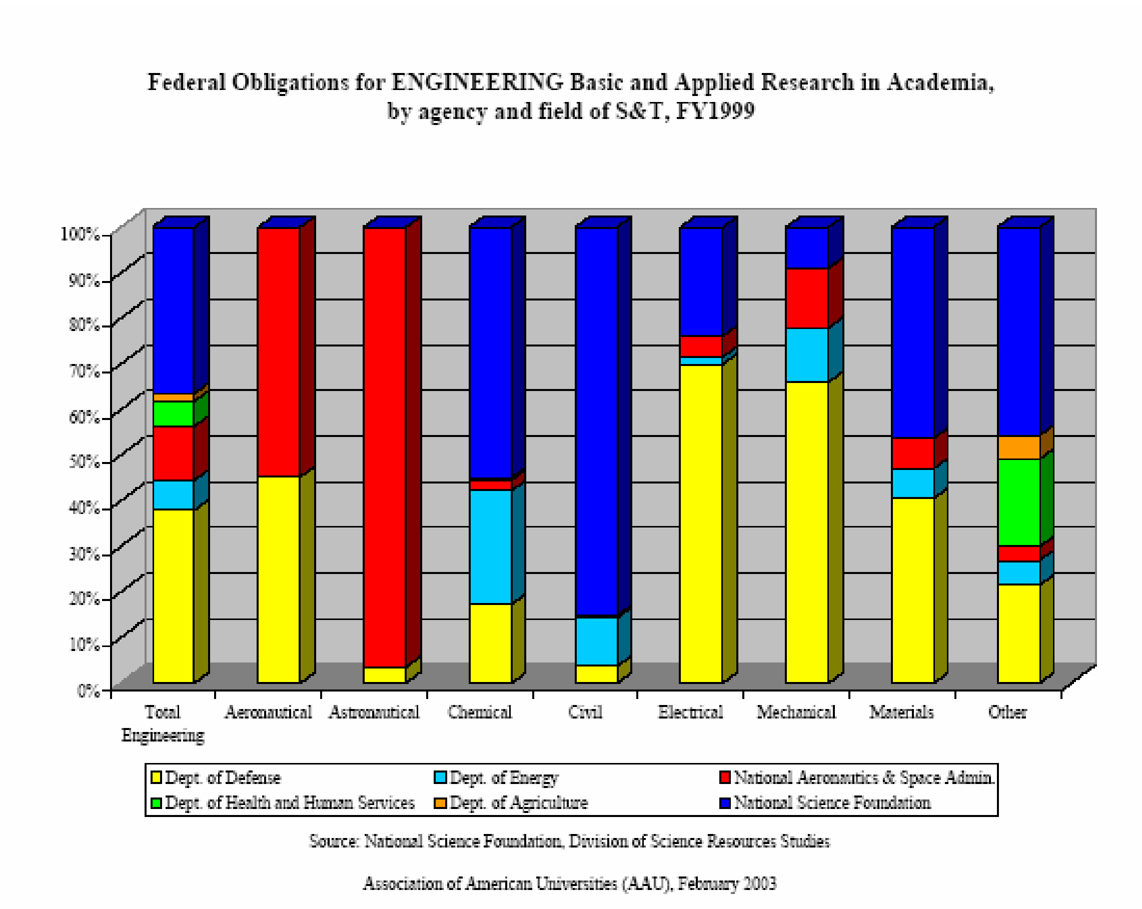


**Figure 3.11 Distribution of Federal funding by disciplines within the field of engineering.**

Table 3.5 shows the total federal appropriations for funding in these agencies in 2003, 2004, and 2005. It can be seen that while NSF funding level has gone down by 2% in 2005, the funding level for DOD and DHS has gone up.

**Table 3.5. Total Federal Funding (in millions) Levels in Various Agencies**.

| Agency | FY 2003 | FY 2004 | FY 2005 |
|---|---|---|---|
| National Institute of Health (NIH) | $27,067 | $27,659 | $28,280 |
| National Science Foundation (NSF) | $5,310 | $5,578 | $5,473 |
| Department of Energy (DOE) Office of Science | $3,285 | $3,500 | $3,600 |
| Department of Defense (DOD) Basic and Applied Research (ONR, ARO, ASOSR, DARPA) | $5,706 | 5,827 | $6,461 |
| DHS Science and Technology | $561 | $869 | $1,047 |
| US Department of Agriculture CSREES | $1,114 | $1,107 | $1,156 |
| Department of Commerce National Institute of Standards and Technology (NIST) | $840 | $858 | $900 |

The funding climate in many of these agencies is moving away from traditional isolated areas into interdisciplinary larger collaborative projects. Funding is also moving away from basic research to applied research. The emerging areas of growth in research funding are biotechnology, nanotechnology, information technology, advanced manufacturing, national and international security, and others.

### 3.3.13. Create some Technology Centers

Given that UIC is located in the heart of Chicago, it may be possible for the College to also create other Technology Centers that could be used as a resource by local companies and government agencies to bring in shorter term research and development contracts.

The College of Engineering has a very successful Energy Resources Center that employs several professional staff members in the Energy Industry who are engaged in research and development contract work for various agencies. It contributes to about $2 million of research contracts to the College each year.

For example, it may be possible to create an Information Technology Center (providing software and IT support services), or a Networking and Communications Design Center (providing networking and wireless and wired communication services), or an Application Specific Integrated Circuits (ASIC) Design Center (providing ASIC or FPGA design services). Faculty would be associated with these centers, and will work with academic professional research staff members on these technology development contracts. Researchers from industry can visit these centers for 6 months to a year while on leave from their companies. It would be possible for graduate students and undergraduate students in the College to work in these Centers to gain valuable industry relevant experience (almost like co-op or internship experiences) within the UIC campus. We will employ these students as graduate or undergraduate assistants in these Centers but the salaries would be much less than what regular full-time engineers make in the regular workforce. Hence, the cost structure of the research and development contracts performed in the Centers would be much more competitive than regular companies providing these services. Therefore, it may be possible to grow such Technology Centers in the UIC College of Engineering. In fact, companies and agencies in the Chicago area may be willing to "outsource" their projects to these UIC Centers instead of outsourcing them to companies in India, China, and Taiwan.

### 3.3.14. Increased ICR Funds

Currently, the College gets 30% of the ICR funds on research expenditures in the College. We are making a request to increase the ICR return to 60%. This will pay for the startup funds of faculty, cost sharing, seed funds, research labs renovations, and other operational costs. Chapter 11 discusses the detailed plan for the research budget.

## *3.4. Relationship to UIC 2010 Strategic Thinking*

We now relate our College plans for expanding our research to the UIC 2010 Campus Strategic Thinking Plan.

**"VALUES: Certain core values are so essential to educational life at UIC that they inform every element of individual and institutional practice. The very best of what UIC can become by 2010 will be imbued with the values of:**

- **Knowledge**
- **Access**
- **Openness**
- **Excellence**
- **Collaboration"**

***Knowledge* that leads to global as well as individual transformations**

Let there be no doubt: the central value of UIC is *knowledge* – the creation of knowledge through scholarship and research, and the sharing of knowledge through teaching, application and practice. We are especially committed to scholarship, research and teaching that reinforce the mission of UIC and add value to the city and the intellectual world – knowledge that can transform the global society just as it can the everyday lives of our students.

***Access* to excellence**

Our vision of a more egalitarian society requires an unstinting commitment to access to excellence. We have already noted the debate over our core mission – whether we will be a university of access or an institution of academic excellence. Many public research universities resolve this core dilemma by paying lip service to access and student diversity while celebrating loudly their goal of becoming an elite institution. Other institutions establish themselves as "urban universities" dedicated to providing access to diverse urban student populations, but without laying claim to the goals of a world-class research institution.

UIC will distinguish itself by the precept of access *to* excellence. We seek to be a leading urban public research university, providing a decidedly diverse student population with access to world-class academic study in one of the great urban institutions. "Access to excellence" will serve as a guiding principle for higher education at UIC and for many of our partnerships and research enterprises.

***Openness* to the world of ideas and urban and global change**

Some people view the university as an enclave where knowledge and wisdom can be pursued in an environment of isolated reflection. Others argue that the research university *cannot* be an ivory tower, and must be completely engaged in the world in which it is embedded. Neither view is entirely accurate.

Knowledge always has a context, and even in the most research-oriented universities, knowledge is not produced for students and faculty alone. At the same time, communities benefit from the scholarship pursued at universities in their midst, and they can contribute to the quality and significance of that scholarship. This is certainly the case at UIC, where we practice openness to all domains of knowledge and to the urban context and transformation that gives such knowledge its many meanings. Further, we believe that new knowledge, as never before, will require openness to crossing disciplinary and institutional boundaries where interdisciplinary, inter-institutional and cross cultural sites of discovery will be the platform for future invention, research and creativity.

***Excellence* in every facet of intellectual life and in the physical, cultural, developmental environment that sustains academic achievement**

For UIC, excellence is not so much a goal as a value that informs our every practice. The students we attract must display uncommon excellence, achieved not only through formal academic measures but through life experiences that give them the passion to succeed at UIC. Our faculty will seek excellence in their research and scholarly pursuits and in their teaching, producing the best undergraduate and graduate students. The university as a whole will seek excellence in its collaboration with peer institutions, new partnerships aimed at higher scholarly accomplishment. The university will seek unparalleled excellence in the planning, design, architecture, administration and development of a great urban institution. UIC will seek to be the leading example of the engaged university, working in partnership with the people, institutions and businesses of Chicago and the world to achieve excellence in human, community and urban development.

***Collaboration*** **in scholarship, problem-solving and innovation**

The culture of collaboration at UIC will lead each of us to seek out cooperative relationships, leading us to a fuller, more efficient and more supportive approach to creating knowledge and teaching students. The partnerships formed in a collaborative environment will create new levels of interdisciplinary scholarship, new avenues of problem-solving in administration, the classroom and the lab, and new approaches to institution-building. This culture will also contribute to new forms of collaboration with the city and the state, and to collaboration with other universities in other Great Cities of the world.