

MEMORANDUM

To: Board of Regents
From: Board Office
Subject: New Institute for Combinatorial Discovery
Date: March 3, 2003

Recommended Action:

Approve Iowa State University's request to establish a new institute to be called the Institute for Combinatorial Discovery.

Executive Summary:

Combinatorial Sciences	The purpose of the proposed Institute for Combinatorial Discovery is to build a cross-disciplinary program that establishes Iowa State University as an internationally-recognized center for excellence in research, technology development, and technology transfer in the combinatorial sciences.
Allows Several Related Experiments to be Performed at One Time	Combinatorial science transforms the tradition of one sample-one experiment at a time processes used to create new materials by enabling scientists and engineers to perform a large number of experiments in parallel. In so doing, the rate in which new drugs, catalysts, adhesives, and other materials are discovered is markedly enhanced.
Accelerates Discovery Process	Traditionally, chemists in drug companies (the first area to take advantage of combinatorial concepts) would synthesize a new compound and then test its therapeutic potential as a new drug. After analyzing the results of such tests, the chemist would then tinker with the structure of the compound in an attempt to improve its performance and then repeat performance testing. While effective, this serial approach to drug discovery is costly and time consuming. In combinatorial chemistry, the discovery process is accelerated by the simultaneous synthesis and testing of a huge number of compounds that are structurally similar. As a consequence, the search for new drugs moves forward much more rapidly and at a much lower cost.
Institute Would Apply Concepts	ISU's proposed Institute for Combinatorial Sciences seeks to apply these concepts to the discovery of new catalysts, adhesives, and biocompatible materials (a few examples). The Institute will also focus on the methods used to construct and test these new materials.

Multidisciplinary The work of the Institute will involve many faculty and staff from the top ISU departments and from the following colleges:

- Agriculture
- Engineering
- Liberal Arts and Sciences
- Veterinary Medicine

These teams will tackle innovative projects aimed at:

- Library design and synthesis;
- The creation and adaptation of massively parallel methods of screening libraries; and
- Computational approaches for data extraction.

These activities will create:

- New, team-taught courses;
- Stimulate much needed economic opportunities and growth; and
- Strongly contribute to the expansion of the University's research enterprise.


The Director of the Institute will report to the Vice Provost for Research and Advanced Studies.

Funded by
President's
Office

The Institute for Combinatorial Discovery will be funded as an "Academic Initiative" from resources allocated for new, dynamic and interdisciplinary programs by the President's Office.

Regent Questions
for New Centers

The University's responses to the Regent Questions on new centers and institutes are attached.



Robert J. Barak

Approved: 

Gregory S. Nichols

Institute for Combinatorial Discovery

1. What is the title of the proposed center or institute?

Institute for Combinatorial Discovery (ICD)

2. What is the administrative relationship of the proposed unit to other entities on campus, such as departments or colleges?

It will be under the direction of the Vice Provost for Research & Advanced Studies.

3. To whom will the administrative director of the unit report?

Vice Provost for Research & Advanced Studies

4. Succinctly describe the basic purposes and objectives of the unit.

The integration of miniaturization technologies, robotics, and informatics is revolutionizing the discovery and development of new and/or advanced materials in areas ranging from pharmaceuticals to adhesives. This revolution reflects global market pressures on the chemical (petroleum and fine chemicals), biochemical (pharmaceutical and agrochemical), and advanced materials (catalysts and composites) industries to radically reduce the research and development costs necessary for improvement of product quality and performance. The response to these pressures has given birth to high throughput technologies, including “combinatorial chemistry” methodologies. This field of research embodies the application of massively parallel strategies to the discovery and high throughput testing/screening of literally thousands of new target materials (libraries) in time spans of hours-to-days, representing a paradigmatic compression in the weeks-to-years required by traditional “serial” (i.e., one sample at a time) approaches.

By far, the best-known successes in this arena have occurred in the pharmaceutical industry, which, in the search for new drugs, was the first market sector to apply combinatorial techniques to the discovery process. Breakthroughs are also beginning to emerge in the discovery of materials with enhanced luminescent, magnetorestrictive, and dielectric properties, and for heterogeneous, homogeneous, and bio-catalysis. Moreover, several federal funding agencies have announced major CombiChem initiatives, which, when coupled with the billions of dollars in recent infrastructure investments by industrial leaders (e.g., General Electric, Dow, Bristol-Myers Squibb, and DuPont), are forceful testimonies of perceived impact, challenges, and research opportunities in this area.

The purpose of the Institute is therefore to build a cross-disciplinary program that establishes Iowa State University as an internationally-recognized center for excellence in research, technology development, and technology transfer in the combinatorial sciences.

a. How will the activities of the unit relate to the general mission and teaching programs of the university?

The ICD is being established as part of the University's vision to enhance its international stature as an institution of scholarly research and education. The ICD draws on faculty and staff from many of its top departments (chemistry, chemical engineering, biochemistry, mechanical engineering, physics, materials science & engineering, veterinary microbiology, agronomy), spanning four (Liberal Arts & Sciences, Engineering, Agriculture, and Veterinary Medicine) of its nine colleges and several of its leading research units (Ames Laboratory and IPRT). These teams will tackle innovative projects aimed at: library design and synthesis, the creation and adaptation of massively parallel methods of screening libraries, and computational approaches for data extraction. These activities will create new, team-taught courses, stimulate much needed economic opportunities and growth, and strongly contribute to the expansion of the University's research enterprise. Thus, the objectives of the ICD are in strong resonance with the "learning-discovery-engagement" land grant missions of the University through a synergistic coupling of research, education, and technology transfer.

b. How do they relate to the strategic plan of the department and/or university?

The ICD addresses the strategic plans of its many stakeholders in the following specific ways: 1) Research - create the next and future generation technologies in the vital areas of robotics, sensors, micro/nanomachines, informatics, and nanostructured materials; 2) Education - develop learner-centered teaching for training students in leadership skills in areas critical to the growth of the U.S. economy with heightened awareness of the needs of our society; 3) Scholarship - achieve effective integration of innovative research, creative learning, outreach, and engagement with key constituents through synergistic partnerships of knowledge and expertise; and 4) Technology transfer - implement core technological advances positioned to move from the research laboratory to the commercial sector with high levels of economic value.

5. Do similar units exist at other public or private colleges or universities in Iowa? If so, how does the proposed unit relate to them?

No other unit exists at any public or private college/universities in the State of Iowa.

**6. What are the proposed sources and annual amounts of funding for the unit?
Please itemize. (Include faculty, staff, and clerical salaries; supplies;
equipment; travel; other costs)**

Funding is being made available for salary and benefits of two faculty positions, graduate assistants and program support. Base funding provided in FY03 is \$150,000 and base funding to be provided in FY04 is \$160,000 to cover these expenses.

**7. Which of the costs in item 6 represent new financial obligations to the
general fund of the university?**

All the funds listed above. This funding will be made available through the President's Academic Initiatives Program.