

**Year Two Report^a - Institute for Combinatorial Discovery (ICD)^b
Breakthroughs at the Interface of Chemistry, Biology, Materials Science, & Engineering**

Overview: Combinatorial science (*CombiSci*) paradigmatically transforms the traditional one-sample-at-a-time processes used to create and probe structure-function relationships in new materials to one in which massive numbers of samples are probed concurrently. *CombiSci* techniques are invaluable for generating optimal solutions in solving complex problems with a vast search space. ISU's *ICD* (www.combi.iastate.edu) seeks to aggressively apply these concepts to new catalysts, biosystems, and other advanced materials. The *ICD* will also develop new methodologies for the design of libraries and in high throughput library characterization and screening. This report briefly summarizes the vision and Year Two accomplishments of the *ICD*.

Vision: Aggressively advance ISU to a dominant global position in *CombiSci* by forming cross-disciplinary research teams from top ISU departments and by establishing strategic partnerships with national laboratories and industry.

Year Two Accomplishments:

1. Further development of organizational structure and key committees

- *Executive Committee:* Porter, Hillier, Mallapragada, Narasimhan, and Woo
- *Institute Council:* Vice Provost Bloedel, Deans Melsa, Whiteford, and Woteki, and IPRT Director Barton
- *External Advisory Board:* Bates (U Minn, MRSEC), Peppas (U Texas, IGERT), Geysen (UVa; first *CombiSci* Dir at GlaxoSmithKline), Kuwana (KU, EPSCoR), Wankat (Purdue U, educ), Hagensen (Chevron; VP Research), Gray (Emory U, diversity), and Pocius (3M, Dir Adhesives Tech). Other candidates: IDIED President and IBC Exec Dir

2. Faculty search results

- Chemical Engineering: Andrew Hillier (Fall, 2003) – combinatorial design of electrocatalysts
- Mechanical Engineering: Qingze Zou (Fall, 2004) – nanopositioning control and robotics
- Chemistry: Hao Yan (declined – stronger position for spouse at Arizona St U) – analytical chemistry

3. Advancement of core research foci and related support areas

- *Core research areas* – catalysts, biomaterials, and nanomaterials, and the recent addition of informatics/statistics (Table 1)

Table 1. *CombiSci* methodology: focus areas and associated personnel.

METHODOLOGY	Research Foci ^c		
	CATALYSTS	BIOMATERIALS	NANOMATERIALS
Library design	Nilsen-Hamilton, Hillier , Larock, Kraus, Woo	Mallapragada, Narasimhan, Carpenter, Nilsen-Hamilton, Schnable, Lin	Narasimhan, Tsukruk, NEW2 , Hillier , Shinar
Library characterization	Schrader, Shanks	Sakaguchi, Porter, Pohl, Cornick, Woo, Lin, NEW1	Narasimhan, Porter, Shanks
High throughput screening	Yeung, Porter, Hillier	Salapaka, Olsen, Lin, Yeung, Porter, Zou	Porter, Salapaka, Tsukruk, Sundararajan, Zou , NEW2

^cInformatics and statistics (Morris, Wu, Hoffman, and Rollins) span all foci.

- *Industrial Partners Program (IPP):* Abbott (internships, seminar series), 3M (adhesives), Eastman (nanoparticle labels);
- Institutional research and diversity partnerships: LSU and RPI, along with Southern U and other HBCUs re NSF-STC
- Two years of support for D. Schmidt, W. M. Keck Laboratory Supervisor (Provost and Vice Provost Offices)

4. Strategies for attracting external research support and visibility

- NSF-IGERT: preproposal Fall '02; full proposal Spring '03. Rejected. Resubmitted preproposal 4-29-04; 5 yr, \$3.2M
- Co-organized *CombiSci*-focused symposium: Spring 2004 ACS meeting
- NSF-STC: preproposal Sum '03; full proposal Win '04, 5 yr, \$20M (~\$6M ISU match, *CombiSci* Foundry, 34 ISU faculty)

Plans for Year Three

- Faculty hires: Chemistry (NEW1) and possibilities with MS&E, BBMB, or Statistics (NEW2)
- *IPP* membership: visits being scheduled with Dow Corning, Gillette, and GE
- Multi-investigator proposals (e.g., NSF: IGERT, ERC, MRSEC; NIH-Biotech Research Partnerships)
- *CombiSci*-focused symposia in national meetings (ACS, AIChE, MRS)
- Support for *CombiSci* Foundry (key for NSF-STC - facility renovation)
- Course development: *Intro to CombiSci* (3 cr), *Library Fabrication & Screening* (2 cr), *Experimental Statistics for Screening Processes* (3 cr)

^aPrepared by: M. Porter, A. Hillier, S. Mallapragada, B. Narasimhan, S. Sundararajan, and K. Woo

^bNotification of launch by ISU: July 24, 2002; Institute status approved by the Iowa Board of Regents: March 13, 2003