MEMORANDUM

To: Board of Regents

From: Board Office

Subject: Annual Report on Economic Development and Technology Transfer

Date: January 6, 2003

Recommended Actions:

1. Receive the report on economic development and technology transfer.
2. Encourage the universities to further promote the benefits and services they provide for economic development activities all across the state.
3. Direct the universities to continue successful efforts to create jobs, assist small businesses to grow and prosper, provide technological assistance to business, and create new high technology businesses that create jobs for Iowans all over the state.

Executive Summary:

The Regent universities play a key role in economic development activities for the benefit of the state. The universities assist faculty, staff, and students in obtaining both external and internal financial support for their projects, broker working relationships and support for research among various constituents involved in the research missions of the universities, and stimulate and manage the transfer of intellectual property to the private sector. They also contribute to the development of the state's workforce, create intellectual property, advance ideas to the stage of market readiness, support creation of new companies, and attract new companies to the state.

The recent significant state appropriation cuts of university economic development programs will severely hamper continued progress by the universities in contributing to Iowa's economic vitality.

During FY 2002, the Regent universities faculty, staff, and students competed for and received $587.1 million in gifts, grants and contracts from federal agencies, corporations, and foundations for designated research and development endeavors. This was a record year for sponsored funding, an increase of $72.1 million (14%).

The universities reported a total of 619 corporate-sponsored research contracts in FY 2002, compared to 791 in FY 2001.

The universities reported 189 disclosures of intellectual property in FY 2002, compared with 181 for the previous year. In FY 2002, 126 patent applications were filed compared to 134 in the preceding year. The number of patents issued in FY 2002 was 66, compared with 77 in FY 2001. The universities also executed 344 license and option agreements during the year.

The university reports contain numerous areas of economic activity successes. For instance, the Regent universities assisted with the creation of over 5,200 jobs in the private sector and saved countless other jobs.

The reports, included as Attachments A, B, and C, detail the specific economic development and technology transfer activities at the three universities for 2002.

Strategic Plan: This report is consistent with the Board of Regents' strategic plan. For example, Action Step 1.1.4.1 ("each university enhances its research efforts consistent with its mission") and Action Step 1.1.4.2 ("each university increases sponsored research consistent with its mission") reflect the commitment to partnerships with business and industry.

The reports reflect collaborative efforts with a range of public and private sector groups consistent with Action Step 2.2.1.2 ("explore collaboration with business, industry, Workforce Development, and other agencies and organizations and prepare a report with recommendations").

Background:

Reporting Requirement

The legislation appropriating state funding for economic development activities at the Regent universities requires a report be submitted to the legislative branch regarding the progress of technology transfer and economic development.

Universities Key in Economic Activities

The Regent universities play a key role in economic development activities for the benefit of the state. The primary functions of institutions of higher education — teaching, research, and service — uniquely qualify them to address emerging and complex issues.

Universities are where knowledge is systematically created, preserved, and translated. Through the intellectual capacity and technical expertise of the best and brightest faculty, staff and students, they create the future of unlimited possibilities.

People live and work in a rapidly changing environment. Increasingly, these people rely on — individually and collectively — institutions of higher education for knowledge, for guidance, and for help.

Although institutional achievements in generating new knowledge are invaluable, the new knowledge, intellectual property, must be applied and developed for the benefit all.

Intellectual Property

Intellectual property refers to intangible creations resulting from creative use of the intellect or "mental real estate" that has definable boundaries capable of being protected. Although ideas, per se, are not intellectual property, once practiced or tangibly expressed, they become intellectual property, protectable by patents, copyrights, trademarks, and trade secrets law.

Technology Transfer

The term “technology transfer” can mean many things. Universities “transfer technology” whenever graduates take their academic experiences away from campus and apply them in corporate or industry settings. Similarly, academic researchers “transfer technology” when they share research results through publication, consultation, or formal transactions that enable private companies to make use of intellectual property created at universities.

University Support Structures

The Regent universities support and foster research, scholarship, and creative activity throughout the campuses. More specifically, they assist faculty, staff, and students in obtaining both external and internal financial support for their projects; broker working relationships and support for research among various constituents involved in the research missions of the universities; and stimulate and manage the transfer of intellectual property to the private sector.

Leveraging of funds

A variety of funding sources are needed to realize the potential of successful commercialization of intellectual property.

Universities are able to leverage the intellectual capacity and technical expertise of faculty staff and students with funding from state support, gifts, grants, and contracts, to expand the resources available to researchers and businesses.

The universities provide assistance to the university community seeking external financial support for faculty, staff, and student research, training, and service activities. The external funding, in the form of gifts, federal and corporate grants and contracts are restricted for specific purposes.

They also provide institutional signature authority to applications, contracts, and material transfer agreements; negotiate terms and conditions acceptable to faculty/staff and funding sponsors; provide post award administration; and provide regulatory compliance.

Universities Economic Activity Services

Each Regent university has a unique mission, strengths, and resources. Although each campus handles the development of fundamental and applied research somewhat differently through myriad facilities, centers and services, they provide numerous forms of assistance, such as:

- Identify research with potential to produce new and useful knowledge which could be commercialized for public benefit.
- Match expertise and resources of the universities with existing and emerging needs of businesses and communities statewide to create value and strengthen economic vitality.
- Provide administrative assistance with strategic research initiatives to enhance research funding and technology transfer for targeted programs.
- Supply analytical instrumentation, sophisticated equipment, and computing facilities to researchers and businesses throughout the state.
- Conduct industrial, corporate, and market research/analysis and perform clinical trials.
- Create unique and valuable hands-on educational/entrepreneurial opportunities for undergraduate and graduate students with companies and research endeavors across Iowa.
- Study and solve various industrial and environmental problems of the state.
- Provide advisory and consulting services in areas such as management, marketing, finance, and sound business practices.

- Interact between faculty members and corporate clients to promote both corporate and university research and technology transfer from the lab to the marketplace.
- Build and facilitate innovative alliances among industrial, international, educational, federal, state, and community partners, local and regional economic development agencies, and industry trade associations to jointly promote Iowa's capabilities to enhance economic, community and social development statewide.
- Assist entrepreneurial ventures, technology development, business development as well as interact with venture firms, angel investors, and financial institutions.
- Offer businesses — specifically those engaged in basic and developmental research, product development, and production linked to research and development — the opportunity to locate near and benefit from close proximity to academic researchers and a wide array of well-equipped laboratories and research facilities.
- Serve entrepreneurs just starting up, as well as established companies eager to initiate new endeavors.
- Create a culture that encourages entrepreneurship and innovation, and provide the tools necessary for building and improving Iowa's businesses.
- Shorten the lead-time between discoveries and market place commercialization.
- Encourage and nurture economic development activities across the state through newsletters, websites, and presentations at literally hundreds of meetings.

Managing Intellectual Property

Transferring intellectual property developed to the marketplace is an important means of fulfilling an institution's research and public service mission.

The research foundations are instrumental in managing intellectual property invention disclosures, patent applications, copyright protections, and agreements to enable public use of intellectual property created at the universities. They advance research at the institution by:

- Assisting students, researchers and research administrators in locating industry and business information.
- Assisting researchers with the invention process.
- Providing potential business partners who are searching from outside the university with an easy-access entry point

Contributions to Economic Development

The universities contribute to the development of the state's workforce, create intellectual property, advance ideas to the stage of market readiness, support creation of new companies, and attract new companies to the state. They:

- Create jobs, businesses, technology, and innovations that generate income for the state in areas such as biotechnology, software, instrumentation, pharmaceutical, health and medical sciences, and computer simulations.
- Ally with partners of diverse organizations critical to formulating long-run, sustainable and meaningful solutions to the challenges posed by a dynamic, interdependent, local/regional and global research and innovation environment.
- Promote proactive engagement of new workers to assure the vitality of Iowa business.
- Explore ways to expand the role of community foundations.
- Participate actively on boards and committees to enhance awareness of resources and capabilities in the state, especially in the life sciences and advanced manufacturing.

State Appropriation Cuts

Significant reductions in state funding for the economic development programs at the Regent universities (approximately 12% in FY 2002 and almost 60% in FY 2003) will severely impact continued progress in economic development and technology transfer activities, which will:

- Jeopardize the leveraging of state investments with large amounts of federal and industry funding which are crucial for sustaining momentum in building new ventures and improving existing ones.
- Decrease the ability of the universities to retain or attract researchers that drive the intellectual property development.

Underfunding university services may result in:

- Longer time to develop technologies
- Increased fees for services
- Minimized support services
- Curtailed services to some outlying parts of the state
- Reduction in cooperative partnerships
- Fewer technology companies formed
- Greater risk of failure
- Increased risk of poor decisions
- Companies moving to other states for services

Analysis:

The performance indicators related to economic development are included in G.D. 6, Annual Report on Performance Indicators, which includes trend information. Only current year data will be presented in this docket memo.

The institutions' economic development and technology transfer activities relate to the following specific performance indicators established by the Board:

- Sponsored research (#18 all universities, see below)
- Number of intellectual property disclosures (#22 all universities, see below)
- Number of new technologies licensed (#23 Iowa State University with 37);
- Number of new licenses and options executed (#65 Iowa State University with 297)
- Number of new patent applications files (#64 Iowa State University with 30)

#18 Sponsored Funding
FY 2002

University of Iowa	$341.0 million
Iowa State University	$225.4 million
University of Northern Iowa	$20.7 million

These dollars:

- Are competitively attracted by the Regent universities to Iowa from the federal government, corporations, and entities outside the state.
- Represent a return on the state's FY 2002 total operating investment to the universities of 103%.

#22 Intellectual Property Disclosures
FY 2002

University of Iowa	88
Iowa State University	100
University of Northern Iowa	1

Summary of FY 2002 Accomplishments

The following are excerpts from the executive summaries of the institutional reports and provide brief descriptions of the many activities and accomplishments of the three universities relative to economic development and technology transfer.

The three Attachments A – University of Iowa (beginning on page 12); B – Iowa State University (beginning on page 54); and C – University of Northern Iowa (beginning on page 90) contain numerous examples of successes of the Regent universities. The list is impressive, especially considering the constraints of the national and state economies.

University of Iowa

The SUI experienced a highly successful year in FY 2002, maintaining and in some cases expanding its various technology transfer activities. FY 2002 was a year of economic recession, especially for technology-related industries, and it was a year in which State funding for technology transfer and all SUI programs was severely constrained. In this context, the University's successes are even more pleasing.

The SUI Division of Sponsored Programs (DSP) and the Clinical Trials Office successfully negotiated 351 corporate sponsored research agreements at The University of Iowa in FY 2002, generating $32.7 million in support. Over the past five years 1,714 corporate research agreements generated $162.8 million in industrial research support. The FY 2002 total of $32.7 million represented 9.6 percent of the $341 million in total external support reported by the University.

The University of Iowa Research Foundation (UIRF) maintained a high level of activity during FY 2002. The UIRF received 88 new invention disclosures, filed 77 U.S. patent applications, received 36 issued patents, executed a record high 37 license and option agreements, and earned a record $8,082,305 in royalty/license fee income. UIRF'S staff is among the smallest among peer institutions. UIRF licensed intellectual property to spin-off company ViraQuest, Inc., a new Iowa-based biotechnology business.

The Office of Corporate Partnerships (OCP) replaced the Office of Research Marketing & Corporate Relations in FY 2002. Partnering with the SUI Nonprofit Resource Center, the OCP articulated a broader SUI role in facilitating innovative alliances among industrial, educational, State and community partners to enhance economic, community and social development in Iowa and sought National Science Foundation funding. In FY 2002, OCP's Statewide Corporate Outreach Manager made 38 visits to Iowa companies to match business needs with SUI resources and capabilities.

The Technology Innovation Center (TIC) accepted two new tenant firms in FY 2002. It also successfully graduated three companies and reported 14 tenants occupying 100 percent of available laboratory space and the vast majority of available office space. In FY 2001 the Iowa Department of Economic Development joined the SUI in a plan to address a shortage of flexible wet lab space for start-up biotech companies. The SUI committed institutional funds to construct a building shell and the IDED accepted the Oakdale Research Park as recipient of a $500,000 Advanced Research Commercialization (ARC) award that was used to build out laboratory space for the TIC incubator. That laboratory was completed in FY 2002. The College of Medicine continued to provide short-term assignment of lab space for two biotech start-ups.

The Oakdale Research Park (ORP) experienced continued growth in FY 2002. Nine R & D companies had a presence on the ORP. A major new addition to the SUI Multi-Tenant Facility provided corporate-funded academic research space as well as flexible wet laboratory research space for start-up companies in the TIC business incubator. In mid-FY 2002, NCS Pearson became the anchor tenant in a new $4 million office building that opened on the Park. As FY 2002 ended, preparations for construction of a companion $3.6 million facility to house a growing NCS Pearson software development presence. Research staff of the National Advanced Driving Simulator (NADS) completed a detailed

checklist of systems and equipment, accepted the world-class instrument from the U.S. Department of Transportation, and placed the NADS in operation for research projects.

The Center for Advanced Drug Development (CADD) updated instrumentation and software in FY 2002 to offer unique services to pharmaceutical companies. In FY 2002, 26 companies, including three Iowa firms, contracted 404 projects with CADD. Undergraduate and graduate student employees developed skills in current Good Manufacturing Practices (cGMP) and current Good Laboratory Practices (cGLP) through their work at CADD. As part of its marketing efforts, CADD developed an Internet home page to inform prospective and current clients of its new capabilities.

Iowa State Universities

- ISU is one of the nation's leading universities in technology transfer accomplishments. In the last survey conducted by the Association of University Technology Managers, in which 142 universities participated, ISU ranked 23rd in the number of patents earned, 30th in invention disclosures received, 3rd in licenses and options yielding income, and 2nd in licenses and options executed on its intellectual property.
- ISU hit an all-time high in FY02 in sponsored funding. $225.4 million was received from both federal and non-federal sources. Of this amount, $15.3 million was received from businesses and commodity groups for research activities and $11.4 million for non-research activities, including many projects that provide technical support and outreach to companies in the State of Iowa.
- ISU researchers disclosed 100 new inventions to the Iowa State University Research Foundation (ISURF), and 29 new patents were issued to ISU inventors.
- ISURF signed 297 new licenses and options for ISU technology, including 262 for plant germplasm. Thirty-seven technologies were licensed for the first time in FY02.
- Technologies licensed to Iowa companies resulted in nearly $13 million dollars of sales by those companies in 2001.
- ISU received another R&D 100 Award in FY02. This brings the total of these awards received by ISU since 1984 to 24, placing ISU second among all universities.
- Six new companies and affiliates began operations in the ISU Research Park in FY02, bringing the total to more than 120 companies and research centers that have located in or been affiliates of the Research Park. These companies employ nearly 1,400 individuals statewide. The total square footage within the Research Park is now nearly 300,000 square feet. This includes over 10,000 square feet of wet lab and office space that was added this past year for ExSeed Genetics.
- The ISU Pappajohn Center for Entrepreneurship and the Small Business Development Center (SBDC) provided 7,291 hours of professional and student consulting assistance to start-up and existing companies in FY02 and they are working with more than 50 technology companies located at or affiliated with the ISU Research Park.

- During 2001, the Iowa SBDC network (including 13 centers in Iowa) assisted 12,211 clients with 95,582 hours of service. In one year, SBDC clients received $68.6 million in capital as a direct result of SBDC assistance, generated 765 new jobs, returned $9.54 in tax revenues for every $1 of long term counseling and generated $32.1 million in incremental sales.
- The Iowa Demonstration Laboratory completed 41 projects with Iowa companies in FY02 using nondestructive methods to evaluate materials.
- The Iowa Companies Assistance Program conducted over 115 projects with Iowa companies this past year.
- More than 50 Iowa companies received Center for Industrial Research and Service (CIRAS) assistance in developing products, improving fabrication and testing products to increase competitiveness. They provided assistance to more than 96 of Iowa's counties in 2000 and 2001.
- The Center for Advanced Technology Development (CATD) has been the state leader in matching Iowa businesses and entrepreneurs with university resources in cost-shared research and development projects through its contract research program. In FY02, CATD initiated 44 R & D projects with Iowa companies leveraging state funding of more than $475,000 with companies' investments of nearly $950,000.
- In the first six months of 2002, Iowa companies have won $4.23 million in federal SBIR/STTR awards with the help of CATD.
- A “Point of Contact” system was established in March 2001 to help companies find the assistance they need within the university. The university homepage has a link for business/industry that takes the reader to the “Point of Contact” information. Since the system was implemented, the Office of the Vice Provost for Research has handled about 125 inquiries. Inquiries have included requests from Iowa manufacturers for technical assistance, requests for information on special courses/workshops and requests for results of specific research projects.
- Four new companies were formed in 2002 due to ISU technologies and/or technical expertise. This brings the total number to 57 since 1990.
- The ISU Research Park and the Office of the Vice Provost for Research, together with the Greater Des Moines Partnership (GDMP), continued to make progress in the effort to recruit Korean biotechnology companies to the ISU Research Park. Members of the GDMP and the Vice Provost made a recruiting visit to Korea that was followed by three separate Korean delegations visiting Iowa/ISU. These delegations included governmental officials, academic researchers, and representatives from more than 30 Korean biotechnology companies.
- Considerable progress in the design and financing of a Biologics Facility was made during the last fiscal year. It is hoped that this facility will lead to the emergence of a major center involving many companies focused on the development and production of a variety of specialty proteins.

- Construction began on the Roy J. Carver Co-Laboratory Incubator and Facility for Public/Private Partnerships. This exciting new venture at ISU will promote economic development in the area of plant biotechnology. It will serve as an incubator facility for start-up companies associated with the Plant Sciences Institute and as a public/private partnership facility to promote the interaction and exchange between ISU scientists and researchers from the private sector.

University of Northern Iowa

UNI outreach programs focus on providing hands-on technical assistance and technical expertise to businesses and communities throughout Iowa.

This past fiscal year has been a period of measurable success for UNI's outreach programs. This is demonstrated by the nearly $8.4 million in federal, state, business-derived and private support dollars for the University's technology transfer and business/community development activities. Funding of outreach programs from external sources (non-general fund) increased by 25 percent during the past year.

The UNI outreach programs in technology transfer and business/community development activities have collectively served nearly 3,900 businesses and 465 community clients involving approximately 33,560 employees and community leaders in all 99 of Iowa's counties. More than 275 training workshops were also conducted this past year.

The Ag-Based Industrial Lubricants (ABIL) Research Program is committed to providing research and technology transfer activities that stimulate commercialization of soybean-based industrial lubricants and greases, leading to the expansion of market opportunities for Iowa. To date, UNI-ABIL has developed and licensed to market some 13 soy industrial products and 4 base oils (a total of 28 product categories).

The Institute for Decision Making (IDM) has provided hands-on technical services to 465 community clients, which reported the creation of 1,500 jobs, a result they credited in large part to the efforts of IDM. However, due to severe budget cuts, IDM has reduced staff and moved to a fee-based program. IDM will also supplement its state funding with contracted research projects for state government departments and utility companies.

The John Pappajohn Entrepreneurial Center (JPEC) provided research, consultation and services to 70 businesses; seed capital support to three new businesses; and 345 individuals participated in JPEC educational programs.

The Small Business Development Center (SBDC) continues to provide businesses with technical assistance and training. The Regional Business Center's Business Accelerator Program at the SBDC houses and assists seven early stage companies with a waiting list for new accelerator tenants. The facilities at the Regional Business Center offer the region's only small business library, business computer lab, virtual offices and low and no cost counseling from professional SBDC consultants and SCORE volunteers. Clients served by the center started or expanded 102 small companies in 2002.

The Iowa Waste Reduction Center (IWRC) serves small businesses throughout Iowa with free and confidential environmental assistance. The IWRC has provided compliance assistance or conducted on-site reviews with more than 2,200 businesses.

The Metal Casting Center (MCC) focuses on providing educational services and technology transfer activities to promote increased productivity for the metal casting industry allowing 32 Iowa foundries to economically compete in the global arena. The MCC program participates in a variety of collaborative partnerships with academia, industry and governmental agencies.

The Recycling and Reuse Technology Transfer Center (RRTTC) is an interdisciplinary research, education and outreach center serving Regents researchers and students, Iowa citizens, business and industry. Through a competitive grants program, the RRTTC has funded over 30 in-depth research projects and provided research, outreach and other educational opportunities to over 90 student interns. Through publication of RRTTC reports and outreach to the business/industry community and citizens supportive of recycling in Iowa, RRTTC information reaches several thousand individuals each year.

The Center for Energy and Environmental Education (CEEE) provides outreach to the public, educational and civic institutions and businesses on issues related to energy efficiency and the environment. Currently 13 projects, spanning a wide variety of issues, are supported within CEEE. Over 17,000 K-12 students and nearly 300 K-12 teachers have participated in CEEE outreach programs. Counting adult education, CEEE programs extend to 163 communities throughout Iowa.

The Management and Professional Development Center (MPDC) conducted 115 workshops enrolling 2,162 business professionals from 53 businesses during the past year. Three open enrollment certificate programs were offered, including Leadership Development, Business and Management Essentials and Business and Technology.

The Iowa Training Opportunities Program (ITOP) has assisted 47 companies by training more than 400 of their incumbent workers. ITOP provides short-term, highly focused technical training to meet the needs of incumbent workers and their employers, which translates into better wages, better jobs and increased job satisfaction.

Strategic Marketing Services (SMS) assisted 26 businesses throughout Iowa and the Midwest with 45 client projects related to market research and analysis this past year.

The UNI Intellectual Property Committee (IPC) to date has reviewed 28 patent disclosures and 19 patent applications. In addition, ten license agreements and related royalty agreements have been established, one new patent was issued this past year and three are still pending. The UNI Research Foundation has also taken an equity position in a spin-off business created from research conducted by ABIL.

Following Board action, the report will be forwarded to the appropriate persons and offices as mandated in the Iowa Administrative Code.

Pamela M. Elliott

Approved: Gregory S. Nichols

The University of Iowa

Report to the Legislature on Technology Transfer and Economic Development (TTED)

FY 2002

Submitted to the Board of Regents, State of Iowa

October 2002

PREAMBLE

The Case for Sustained Funding at Reasonable Levels: A Call for Renewed Commitment

The University of Iowa submits its annual report on technology transfer and economic development during a year in which three of the programs essential to its outreach efforts have sustained damaging budget cuts of 56% from the FY 2002 levels and aggregate cuts of 60% from FY 2000. These cuts reduce broad public confidence in the State's commitment to economic growth and threaten the integrity of a proven set of interlocking programs. It is essential that the State renew its commitment to provide sustained funding at reasonable levels for the three University of Iowa technology transfer/economic development programs that require State appropriations to fulfill their missions to serve Iowa.

During FY 2003 the Board of Regents, State executives, and the State Legislature, working with the UI, should develop a plan for sustained State funding at reasonable levels for the Technology Innovation Center (business incubator), Oakdale Research Park, and Center for Advanced Drug Development. That long-term funding plan should become effective in FY 2004. In addition, these same groups should contemplate institutional capital and programmatic improvements that will increase Iowa's ability to foster the growth of the state's business base in the life and health-related sciences.

The recent achievements of these three programs are highlighted and placed in their institutional context in the report that follows. The documented activities of the programs and their critical place in the fabric of institutional strategies for invigorating Iowa's economy, amply justify the call for a renewed public commitment to them.

UNIVERSITY OF IOWA
Report to the Legislature on
Technology Transfer and Economic Development
October 2002

Executive Summary

The UI experienced a highly successful year in FY 2002, maintaining and in some cases expanding its various technology transfer activities. It must be noted that FY 2002 was a year of economic recession, especially for technology-related industries, and it was a year in which State funding for technology transfer and all UI programs was severely constrained. In this context, the University's successes are even more pleasing. Extensive information on UI research and technology transfer is available on the World Wide Web at http://www.vpr.uiowa.edu/techtransfer/.

The UI Division of Sponsored Programs (DSP) and the Clinical Trials Office successfully negotiated 351 corporate sponsored research agreements at The University of Iowa in FY 2002, generating $32.7 million in support. Over the past five years 1,714 corporate research agreements generated $162.8 million in industrial research support. The FY 2002 total of $32.7 million represented 9.6 percent of the $341 million in total external support reported by the University during the year

The University of Iowa Research Foundation (UIRF) maintained a high level of activity during FY 2002. The UIRF received 88 new invention disclosures, filed 77 U.S. patent applications, received 36 issued patents, executed a record high 37 license and option agreements, and earned a record $8,082,305 in royalty/license fee income. While UIRF added one professional staff member during FY 2002, its staff is among the smallest among peer institutions. UIRF licensed intellectual property to spin-off company ViraQuest, Inc., a new Iowa-based biotechnology business.

The Office of Corporate Partnerships (OCP) replaced the Office of Research Marketing & Corporate Relations in FY 2002. OCP functions reflect the evolving role of a public university and its alliance-building mechanisms in an era of fast-paced technological advances. Partnering with the UI Nonprofit Resource Center, the OCP articulated a broader UI role in facilitating innovative alliances among industrial, educational, State and community partners to enhance economic, community and social development in Iowa and sought National Science Foundation funding. In FY 2002, OCP's Statewide Corporate Outreach Manager made 38 visits to Iowa companies to match business needs with UI resources and capabilities.

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UNIVERSITY OF IOWA
Technology Transfer Highlights
July 2001 – June 2002

This report presents some highlights of University of Iowa technology transfer activities in FY 2002. These and other activities are included in the University's Report to the Legislature on Technology Transfer and Economic Development.

These highlights reflect technology transfer activities that are consistent with the University's strategic plan and the vision and goals of ***Iowa 2010*** to encourage "new economy" growth in the high technology areas of Information Solutions, Advanced Manufacturing, and Life Sciences.

Corporate Research Funding and University Inventions

Important Corporate Funding and Research Agreements – University of Iowa faculty continued their remarkable record of success in industrial research support and corporate research agreements. In FY 2002 UI faculty attracted $32.7 million in corporate sponsored research funding for a total of $162.8 million in corporate research grants and contracts over the past five years. Industrial research funding represented 9.6 percent of a record $341 million in external support that the University attracted from all sources in FY 2002. The University's Division of Sponsored Programs and the Clinical Trials Office successfully negotiated 351 corporate research agreements in FY 2002 (generating $32.7 million in support). In just the past five years, the UI has successfully negotiated 1,714 corporate research agreements (generating $162.8 million in support).

Executed Licenses and Income Set Records – FY 2002 was another productive year for intellectual property management at the University. The University of Iowa Research Foundation received 88 new invention disclosures from faculty and staff, filed 77 U.S. patent applications, received 36 issued patents, executed a record high 37 license and option agreements, and earned a record high $8,082,305 in royalty and license income (cash basis). Importantly, the UIRF hired a third licensing associate to manage the growing UIRF technology portfolio, although the staff remained small compared to peer universities.

CMV Promoter – Among the most prominent technology transfer successes at The University of Iowa is the patented CMV Promoter for Increased Protein Expression. The significance of the CMV promoter was discovered in the laboratory of Mark F. Stinski, UI Professor of Microbiology, in his study of gene regulation mechanisms in the CMV virus. The CMV promoter has now become a very widely used tool in the biotechnology industry. It has gained importance in the commercial setting to manufacture bioengineered drugs, and may enable the development of gene therapy and DNA vaccine products. Five CMV-based drugs have received FDA approval and are currently being used to treat patients with cancer and other diseases. In March 2002, the FDA approved Zevalin® for the treatment of non-Hodgkins Lymphoma. At the end of FY 2002, the UIRF had negotiated non-exclusive licenses for use of the CMV promoter with 66 industrial partners, up from 57 licenses in FY 2001 and 45 licenses at the end of FY 2000.

Coley Pharmaceutical Group – Beginning in the mid-1990s The University of Iowa Research Foundation filed patent applications on inventions made by Arthur Krieg, UI Professor of Internal Medicine, and others that offer the prospect for the creation of novel therapies for the treatment and prevention of diseases by activating innate or acquired immune responses. The UIRF now holds a substantial portfolio of patents and patent applications that are licensed to Coley Pharmaceutical Group, a company founded in 1997 on the base UIRF technology. In August 2001, Coley Pharmaceutical Group executed a sublicense with Aventis Pharma for the development of asthma and allergic rhinitis products. Clinical trials are underway in the areas of cancer, asthma/allergy, and infectious diseases.

Integrated DNA Technologies, Inc. Commercializes UIRF DNA Based Technologies –In February 2002, the UIRF received revenue from Integrated DNA Technologies, Inc. (IDT) arising from the earlier licensure of inventions made by IDT founder Joseph Walder and others at the UI. The patented technologies relate to the use of nucleic acids (DNA) in research and clinical applications. One technology, called catalytic hybridrization amplification, allows researchers and clinicians to detect the presence of a nucleic acid sequence in a sample by designing a DNA probe that is cleaved when it identifies its target sequence. The second technology, in the field of "antisense," allows researchers to determine the function of particular genes in an organism by using specific DNA fragments to inhibit the activity of the targeted genes in cells. The University of Iowa Research Foundation filed patent applications on the two technologies, and in 1987 exclusively licensed those patent applications to IDT, which was then a start-up company at the UI Technology Innovation Center business incubator. In FY 2002, IDT announced plans for a $52 million, 40,000 square-foot expansion of its Iowa facility that would create employment opportunities for up to 200 scientists and technicians. A Community Economic Betterment Account (CEBA) award from the State and tax increment financing from the City of Coralville enabled the project.

Spin-Off Companies – The University of Iowa Research Foundation participates in creating "spin-off" companies by licensing inventions resulting from research in UI laboratories back to the new start-up firms, which then seek to develop and commercialize the technology. FY 2002 highlights involving several UI spin-off companies and other affiliates of the Technology Innovation Center business incubator and UI Oakdale Research Park are noted in the following section. The newest UI spin-off company is ViraQuest, Inc., which licensed intellectual property from the UIRF in FY 2002 and established its biotechnology laboratory in Iowa. The ViraQuest technology resulted from research in the UI Department of Internal Medicine.

<u>Business Incubator and Oakdale Research Park</u>

Employment Grows 14 Percent – As FY 2002 ended, 36 companies were affiliates of the Oakdale Research Park or Technology Innovation Center business incubator. Those companies, along with the four Oakdale-sited anchor laboratories, reported 1,077 total employees including 83 UI students (post-graduate fellows, graduate students, undergraduates). The total is an increase of 135 employees (14 percent) from FY 2001, 328 (gain of 44 percent) from FY 2000 and 494 (85 percent growth) since FY 1999.

TIC Incubator Biotech Graduate Expands in Iowa – UI biotech spin-off company and TIC graduate Integrated DNA Technologies, Inc. announced further expansion in FY 2002. Founded by former UI biochemistry professor Joseph A. Walder, Integrated DNA announced plans for a $52 million expansion of its research and production facility in Coralville. Previous expansions grew its facilities to 54,000 square-feet and its Iowa employment to more than 300. The firm is one of the world's leading suppliers of custom oligonucleotide synthesis and a leading developer of new biological materials.

Helping More Young Readers – UI spin-off company and TIC graduate Breakthrough to Literacy, Inc. continued to grow, with 64 employees at its Oakdale Research Park headquarters and 69 other staff in 40 states. In FY 2002, Breakthrough, a leading developer of interactive literacy programs, was in more than 6,000 classrooms and was helping more than 125,000 children around the country to be skilled readers. Carolyn Brown, who received her Ph.D. in speech pathology and audiology from the UI, founded the company. In early FY 2002, Brown and her husband, Dr. Gerald Zimmerman, Breakthrough president and co-founder, presented the Breakthrough to Literacy process at a U.S. Senate subcommittee hearing on education and technology.

Honors – TIC incubator graduate, Albany Molecular Research, Inc. (formerly EnzyMed), received an FY 2002 economic development award from the Iowa City Area Chamber of Commerce, becoming the sixth TIC graduate firm to be so honored.

Welcome to NCS Pearson – In FY 2002 local development group TMD, LLC completed construction of Corridor Technology Center Phase I, a three-story, $4 million, 37,500 square-foot project on the Oakdale Research Park and welcomed NCS Pearson as anchor tenant. In late FY 2002 TMD prepared to construct Phase II, a two-story, $3.6 million, 30,000 square-foot project that will enable NCS Pearson growth on the Park. NCS Pearson is a provider of applications, services and technologies for educational testing, assessment and complex data management. The assessment division, originally established as Measurement Research Corporation, was an early spin-off from research activities in the UI College of Education. NCS Pearson has a major corporate presence in Iowa City and another facility in Cedar Rapids. The new project on the Park houses software development and project management activities and reported 165 employees at the mid-point of its first year on the Park.

Incubator Wet Labs – As FY 2002 ended, the TIC incubator prepared to place start-up biotech companies in newly constructed flexible wet lab space. Responding to an urgent need at The University of Iowa in FY 2001, the Iowa Department of Economic Development approved a $500,000 Advanced Research Commercialization (ARC) award to the UI Oakdale Research Park in FY 2001. In making this award, the Iowa DED stepped forward to assist the University in addressing a critical shortage of laboratories for lease to small life science firms seeking to grow in the State. The funds were used to construct and equip much-needed wet lab space for biotech start-up companies in the UI TIC business incubator. The shortage of flexible wet lab space still constrains the ability of the TIC to serve the needs of new biotech companies, but the new ARC-funded labs represent a major step forward.

Spin-Off Acquisition – In FY 2002 the Microbial Biology Department (formerly Quorum Sciences, Inc.) of Aurora Biosciences Corp., a TIC tenant and UI spin-off company, was acquired by Vertex Pharmaceuticals of San Diego. The Iowa-based Vertex unit will continue its research relationship with the UI and move into expanded laboratory facilities in FY 2003. The Iowa-based unit is engaged in biomedical research dedicated to developing technology in the area of chemical signaling in bacteria. Its founder is E. Peter Greenberg, UI professor of microbiology.

Learning in Virtual Environments – TIC tenant Digital Artefacts, LLC continued to attract attention in FY 2002 for its pivotal role in creating a real-time, interactive virtual environment project for the Smithsonian Museum in Washington, D.C. Results of the summer-long project suggested that museum exhibits making extensive use of advanced information visualization technology can be effective teaching tools. Digital Artefacts, an information visualization developer, was founded by a UI undergraduate, graduate student, and professor.

Incubator News – The TIC incubator accepted two new tenant companies in FY 2002. They are Applied Fullerene and Market Technologies, Inc. Three tenants, AMRI (formerly EnzyMed), SportVu, Inc., and Entrepreneurial Learning Systems “graduated” from TIC to the Oakdale Research Park. Three of the five companies counted UI faculty or graduate students among their founders.

THE UNIVERSITY OF IOWA
Report to the Legislature on
Technology Transfer and Economic Development
October 2002

Introduction and Strategic Links

The University of Iowa submits the following report on activities related to technology transfer and economic development. Without exception the activities for technology transfer and economic development are consistent with the **University Mission Statement** which says:

> *"The University of Iowa seeks to advance scholarly and creative endeavor through leading-edge research and artistic production; to use this research and creativity to enhance undergraduate, graduate, and professional education, health care, and other services provided to the people of Iowa, the nation, and the world; and to conduct these activities in a culturally diverse, humane, technologically advanced, and increasingly global environment.*"

The technology transfer and economic development programs addressed in this report are inextricably linked to **New Century Iowa: Bridges to the Next Horizon, a Strategic Plan for The University of Iowa 2000-2005.** The activities described here directly follow and support the achievement of the following Strategic Goal:

Goal 3: To foster distinguished research, scholarship and artistic creation.

- *Create an intellectual environment that supports the exchange and critical analysis of ideas.*
- *Cultivate a distinguished and diverse research community of scholars that activity involves undergraduates as well as graduate students.*
- *Accelerate enhancements to infrastructures supporting research, scholarship, and creative activities in selected areas of strength and promote opportunities for increasing external funding in all areas.*
- *Promote the role of the University in technology transfer and economic development*

The report is based on strategic plans drafted by the relevant program units reporting to the UI Vice President for Research and External Relations. These units include the Oakdale Research Park (ORP), Technology Innovation Center (TIC), University of Iowa Research Foundation (UIRF), Office of Corporate Partnerships (OCP), and Division of Sponsored Programs (DSP). Also included here is information from three State-funded laboratories established as part of an earlier University strategic planning initiative. They are the Center for Advanced Drug Development (CADD), Center for Biocatalysis and Bioprocessing (CBB), and National Advanced Driving Simulator (NADS).

Program Activity: Pharmaceutical Development

Definition

The Center for Advanced Drug Development (CADD), established in 1992, is located on the University of Iowa Oakdale Research Campus and employs 16 full-time employees, one part-time employee, one post-doctoral fellow, two graduate students, and three undergraduate students.

CADD operates under the umbrella of the University of Iowa College of Pharmacy and its staff works in close collaboration with the faculty of the College. CADD has the capability to engage in the full range of the drug development process by calling upon the resources of the UI College of Pharmacy's Division of Pharmaceutical Service (PS), the Center for Biocatalysis and Bioprocessing and University research facilities.

Collectively this expertise offers a unique Research and Development partnership with the Pharmaceutical and Biotechnology industry. The Center offers an excellent resource to enhance technology transfer and attract/develop new industry to Iowa. Outsourcing to CADD allows clients to shorten the lead time between new pharmaceutical discoveries in the laboratory and their communication in the marketplace.

Scope

The Center's services are geared to benefit the following types of clients:

- Small or medium-sized pharmaceutical companies which do not typically have an extensive scientific staff or facilities to perform the studies CADD provides.
- Veterinary pharmaceutical companies
- Biotechnology companies
- Large pharmaceutical companies which periodically lack the capacity to pursue all projects internally
- Medical departments that require stability studies on new drugs or drug products under investigation
- International pharmaceutical companies that seek to market a drug in the United States
- Governmental agencies

Relationship with University of Iowa College of Pharmacy

The Center offers contract services which complement those of the College of Pharmacy's Division of Pharmaceutical Service (DPS). More particularly, the Center offers non-production services relevant to the clinical trials process. Services include: management of FDA relationships for client firms (especially in the processing of new drug applications), development and execution of new chemical assays for candidate new dosage forms and new chemical entities, technical transfer or validation of assay methods, development and execution of stability studies of dosage forms, and testing of active pharmaceutical ingredients/excipients for compliance.

Through the Division of Pharmaceutical Service, the UI College of Pharmacy offers the special capacity to produce under contract limited quantities of new medicines under FDA approval and utilizing an FDA registered facility (the only such comprehensive facility in a College of Pharmacy in the U.S.). The capacity is particularly valuable to firms wishing to bring new products through clinical trials. The close collaboration between DPS and CADD is demonstrated by the fact that 50% of the FY 2002 projects were of a joint nature. CADD also performs active pharmaceutical ingredient/excipient testing following official testing procedures for DPS and outside clients.

Relationship with Iowa, National, and International Industry

The 2002 client base, which contracted 404 projects with CADD, included three companies from Iowa, seven companies from surrounding Midwestern states, and 16 companies from elsewhere in the USA.

Involvement in Education

Undergraduate Students:

In response to the University of Iowa's goal to create an undergraduate experience that enables students to fulfill their intellectual, social, and career objectives; CADD exposes undergraduate student employees in the sciences to current Good Manufacturing Practices and current Good Laboratory Practices (cGMP/cGLP). cGMP/cGLP experience is a sought-after skill in the pharmaceutical industry or any FDA compliant laboratory.

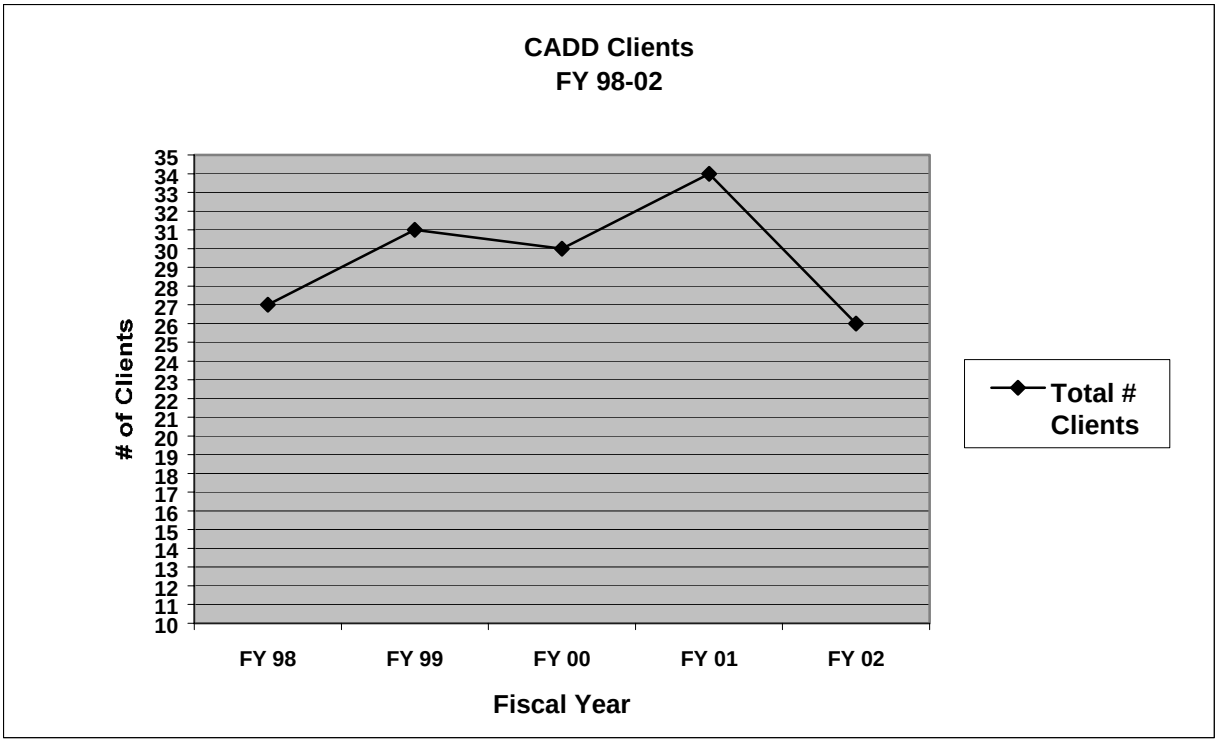
Graduate Students:

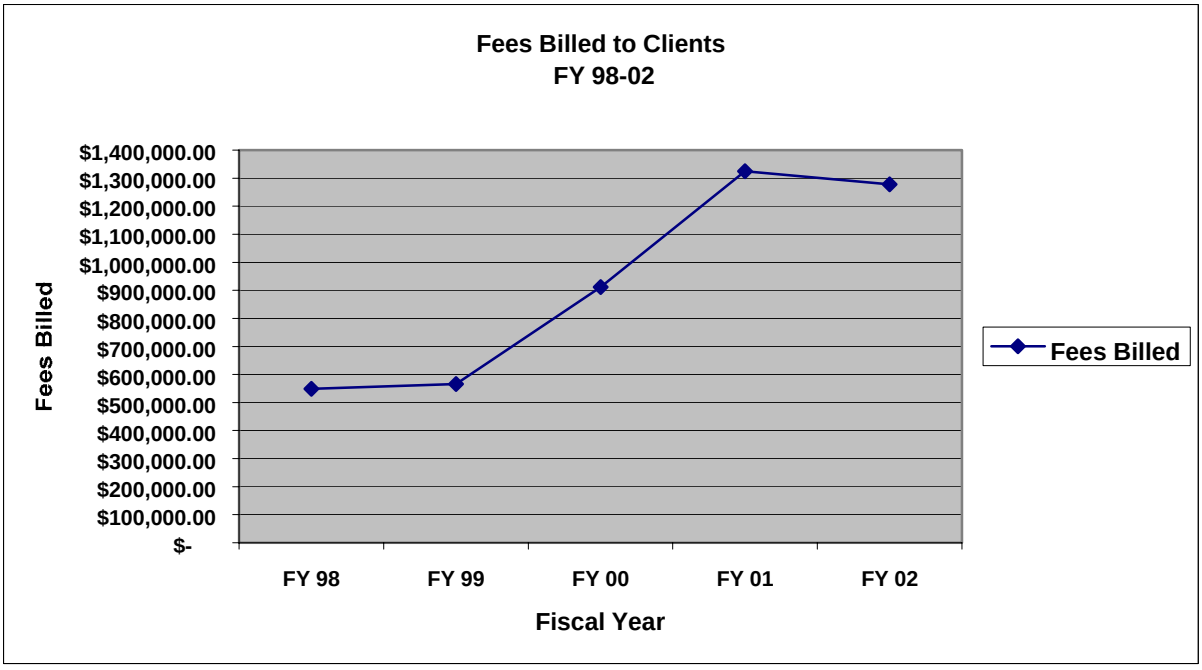
One of the goals of the College of Pharmacy and the UI graduate and professional programs is to achieve premier recognition in a significant number of areas.

In this effort, CADD employs graduate students to assist in client research and to perform routine assays. Graduate students are trained to follow cGLP/cGMP and the Quality Assurance Unit reviews their notebooks. Upon leaving CADD, they are well versed in cGLP/cGMP.

Accomplishment of Goals

The following graphs reflect CADD's five-year (FY98-02) accomplishments regarding the client base, the number of projects completed, and the amount billed for these projects:


CADD Clients
FY 98-02
# of Clients
35
34
33
32
31
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
FY 98
FY 99
FY 00
FY 01
FY 02
Fiscal Year
Total # Clients


Fees Billed to Clients
FY 98-02
Fees Billed
$1,400,000.00
$1,300,000.00
$1,200,000.00
$1,100,000.00
$1,000,000.00
$900,000.00
$800,000.00
$700,000.00
$600,000.00
$500,000.00
$400,000.00
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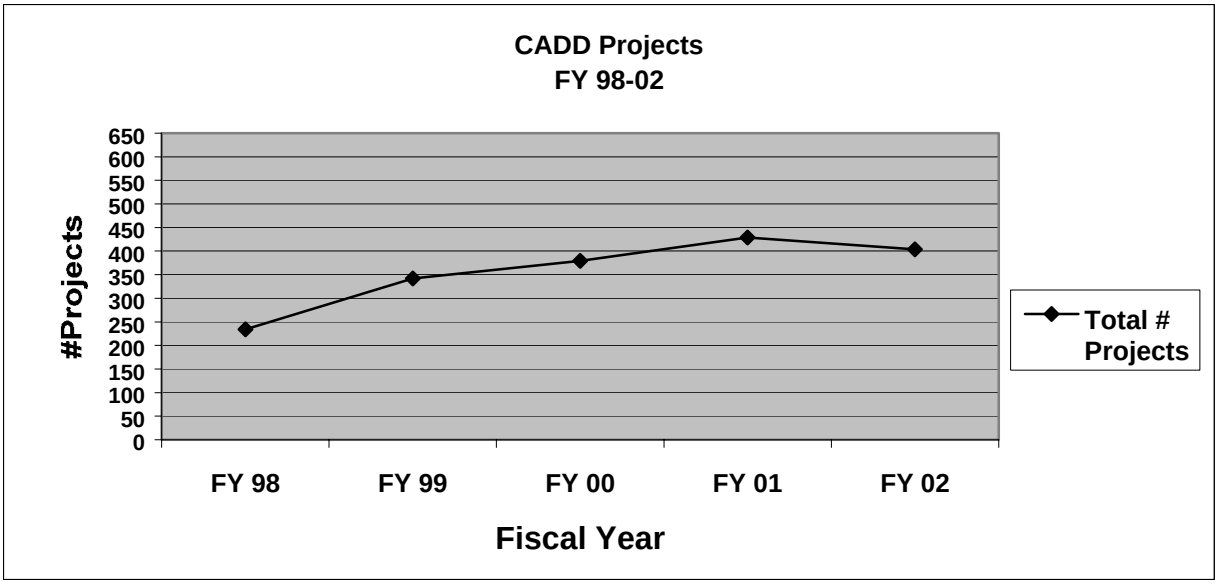
FY 98
FY 99
FY 00
FY 01
FY 02
Fiscal Year
Fees Billed



Accomplishments

Full compliance with current Good Manufacturing Practices (cGMP) and Good Laboratory Procedures (cGLP) as mandated by the FDA:

A full-time metrologist was added for installation, qualification, calibration and maintenance of equipment;

An information technology position was added to be responsible for compliance with the FDA requirements regarding electronic documents.

Marketed the joint capabilities of CADD and the Division of Pharmaceutical Service by exhibiting at annual meetings of the national American Association of Pharmaceutical Scientists'.

Developed an Internet home page to reflect new capabilities to current clients and information to prospective clients.

Strived to update instrumentation and software to offer unique services.

For additional information please contact: http://www.uiowa.edu/~cadd, e-mail Dr. Alta Botha, Laboratory Director, alta-botha@uiowa.edu, or phone 319-335-4096.

Program Activity: Research Park

The Oakdale Research Park strives to increase the academic vitality of the UI by fostering private sector relations with the University by attracting businesses with potential links to the University to the Park. Corporate locations on the Park increase the economic vitality of the region and State. The Park emphasizes such fields as pharmaceuticals, industrial biotechnology, health and medical sciences, and computer simulation of complex systems.

In FY 2002 the Park continued to build a nucleus of businesses in Iowa that are drawn by the research strengths of the University. This is in keeping with the University strategic plan to reach out to external constituencies and to participate in Iowa's economic growth in fields that are congruent with the State's targeted cluster areas of life sciences, information solutions and advanced manufacturing. It is important to note that the Park continued to experience growth in terms of employment and capital investment in facilities during a year in which the State of Iowa and the nation as a whole struggled through an economic recession that hit the technology industry sector particularly hard. Viewed in that light, the Park's FY 2002 growth is remarkable and contributed to the region's selection as one of the nation's 12 "Pockets of Prosperity" by Business Week magazine (10/14/02).

- Capital projects representing an investment of nearly $12 million for 67,500 square-feet of laboratory and office space were constructed on the Park in FY 2002.

*Corridor Technology Center, a $4 million, 37,500 square-foot, office facility for NCS Pearson software development, was occupied in mid-FY 2002. The developers were already planning a $3.6 million, 30,000 square-foot Phase II facility for construction in FY 2003.

*Construction of a 30,000 square-foot addition to the UI Multi-Tenant Facility, a life science laboratory building owned by the University Facilities Corporation, was completed in FY 2002. The project includes a 15,000 square-foot laboratory funded by corporate research contracts and a 15,000 square-foot building shell for future University research needs. Importantly, in FY 2001 the Iowa Department of Economic Development awarded a $500,000 Advanced Research Commercialization (ARC) grant to the Park for construction of laboratories and associated office space in part of the shell. Completed in FY 2002, the laboratories will be leased to startup biotechnology companies admitted to the UI Technology Innovation Center business incubator, a close affiliate of the Park.

- Nine companies had a presence on the Park at the end of FY 2002. New to the Park in FY 2002 was NCS Pearson, which established a major facility for its software development and program management activities associated with the NCS Pearson Government Solutions Division.

- Breakthrough to Literacy, Inc., a graduate of the TIC incubator, continued to experience business growth in FY 2002. Breakthrough was recognized as one of the nation's leading developers and providers of early literacy programs, serving 125,000 children in 40 states. Breakthrough had 134 employees nationwide including 64 in Iowa.

- In FY 2002 artificial intelligence software developer ScreamingMedia of New York, a leading Internet content provider, acquired Stockpoint, Inc. The transaction was publicly valued at $21.6 million. Stockpoint/a ScreamingMedia Company successfully weathered a period of downsizing due to economic conditions and the acquisition. However, its Park presence was expected to expand in FY 2003, due in part to the transfer of New York-based software development and engineering personnel to the Park. Stockpoint continued to maintain a close relationship with the UI colleges of Engineering and Business, and reported 15 UI student interns among its 68 employees on the Park.

- Total employment on the Park in FY 2002 was 524, an increase of 29 or nearly 6 percent from the FY 2001 total of 495. The total employment figure includes 55 students, interns and post-graduate fellows employed at the nine private companies on the Park and four University anchor laboratories at Oakdale. Total employment on the Park was 445 in FY 2000 and 352 in FY 1999 when the first annual survey was undertaken.

- Seven of the nine Park companies volunteered salary information for this report. Average annual salary figures were provided for all full-time employees and for newly hired employees with a four-year college degree. The average salary for all full-time employees in FY 2002 was $52,605, while the average salary for a new college graduate hired by a Park company in FY 2002 was $33,571. This was the third year that companies were asked to provide average salary figures. In FY 2001 the average was $50,786 for all employees and $41,857 for new graduates. In FY 2000 the average was $60,158 for all employees and $37,500 for new college graduates.

- In FY 2002 Park staff participated in a briefing and tour for Governor Vilsack and staff of the Iowa Department of Economic Development and Iowa Workforce Development. In cooperation with the Iowa City Area Chamber of Commerce, Park staff planned, hosted and coordinated a program and laboratory tours for U.S. Senator Charles Grassley and a delegation of 100 ambassadors and other diplomats. The Park co-sponsored the University's participation in the 2002 BIO Conference in Toronto, a joint initiative with the Iowa Department of Economic Development, the Iowa Biotechnology Association, Iowa State University and the University of Northern Iowa. Park staff served on the board of the Iowa City Area Development Group and Area Chamber of Commerce economic growth committees. The Park Director received the Board of Regents, State of Iowa Staff Excellence Award in FY 2002.

FY 2002 activities of the state-funded anchor laboratories sited at Oakdale are discussed elsewhere in this report and in the appendix.

Program Activity: Business Incubator

The Technology Innovation Center (TIC) is a business incubator providing space and a range of services to new commercial enterprises using advanced technology. Its tenants include start-up companies spun off from UI research activities. The TIC is closely affiliated with the Oakdale Research Park.

- The TIC ended FY 2002 with 13 tenant companies and 20 "graduate" firms which succeeded in meeting their business goals upon leaving the TIC incubator. During the year three companies, Albany Molecular Research, Inc., SportVu, Inc., and Entrepreneurial Learning Systems, Inc., graduated from the incubator. AMRI consolidated its laboratory on the Oakdale Research Park, while SportVu located in Iowa City and Entrepreneurial Learning Systems moved to Cedar Rapids. Two new tenants were admitted to the TIC in FY 2002. They are Applied Fullerene and Market Technologies, Inc. It should be noted that UI faculty were the founders of spin-off company Market Technologies, while a former member of the UI staff founded Applied Fullerene.

- TIC tenant and UI spin-off company Quorum Sciences, Inc., previously acquired by Aurora Biosciences Corporation of San Diego, underwent a second acquisition in FY 2002 ands became a unit of Vertex Pharmaceuticals of San Diego. Quorum, now known as the Microbial Biology Department of Vertex Pharmaceuticals, maintains its Iowa presence in

the Technology Innovation Center laboratory. Vertex was prepared to move in early FY 2003 to new and expanded TIC laboratory and office space substantially funded by a $500,000 Advanced Research Commercialization award from the Iowa Department of Economic Development in FY 2001 [this project is reported in the Oakdale Research Park section above].

- Historically, TIC affiliate companies have leveraged considerably more than $20 in non-state investment for each $1 of state funds to support the TIC incubator.

- In FY 2002 TIC tenant The Patient Education Institute received the Silver Award for the Best Health Web Portal. The company's educational program on anthrax was placed on the World Wide Web soon after the anthrax incidents in October 2001 and became one of the most-visited destinations on the Internet. PEI offers customized interactive multimedia patient education programs for consumer health information on the National Library of Medicine website. PEI's user-friendly programs of animated graphics, narration, and interactive questions with feedback have been available to medical patients in hospitals and clinics since 1995.

- TIC company Digital Artefacts, LLC, an information visualization developer, earned national recognition in FY 2002 for its role in creating a real-time, interactive virtual environment project in cooperation with the Smithsonian Museum in Washington, D.C. The pilot project, which was extensively visited by the public at the Smithsonian, may become a template for the museums of the future.

- Profiles Corporation/Buckle Down Publishing Company, a leading educational publisher located in Iowa City, expanded its staff to 62. Former staff of ACT, an early UI spin-off company, founded Buckle Down.

- Breakthrough to Literacy, Inc. expanded its research-based early literacy programs to serve 125,000 children in 40 states. Breakthrough reported 133 total employees including 64 locally at its headquarters facility on the Oakdale Research Park

- Total employment among 14 TIC tenant companies at the end of FY 2002 was 64, including nine students. The TIC total was down from 77 in FY 2001, 89 in FY 2000 and 120 in FY 1999, largely due to the graduation of six TIC tenants over those three years. Among TIC graduate firms, total employment in FY 2002 was 684, including 41 students. The total represented an increase of 32 or 5 percent from FY 2001 (652 employees), an increase of 211 or 48 percent from FY 2000 (441 employees) and an increase of 359 or 110 percent from FY 1999 (325 employees), the first year of the TIC employment survey.

- Ten of the 14 TIC companies volunteered salary information for this report. The average (mean) salary reported for all full-time employees in FY 2002 was $53,817, compared to $47,337 in FY 2001 and $48,367 in FY 2000. The average salary for new full-time employees with a four-year college degree in FY 2002 was $37,050, compared to $34,167 in FY 2001 and $33,000 in FY 2000.

- Eleven of the 20 TIC graduate companies volunteered salary information for this report. The average (mean) salary reported for all full-time employees in FY 2002 was $48,541, compared to $43,944 in FY 2001 and $45,000 in FY 2000. The average salary reported by TIC graduate companies for new full-time employees with a four-year college degree hired in FY 2002 was $35,455, compared to $35,556 in FY 2001 and $37,500 in FY 2000.

- The TIC continued to strengthen its working relationship with the UI Small Business Development Center (SBDC) and John Pappajohn Entrepreneurial Center (JPEC). Staff of those programs continued to assist the TIC with application reviews and prospect referrals. The TIC arranged programs of tenant company tours for two JPEC summer entrepreneurial youth camps, encouraged TIC tenants to participate in SBDC and JPEC training programs, and explored arrangements for the SBDC and JPEC to establish a part-time office presence at Oakdale in order to be more accessible to technology companies in the TIC incubator, on the Park, and elsewhere in the Coralville/North Liberty corridor.

- TIC staff also met with representatives of venture firms, angel investors and financial institutions and in selected cases helped arrange introductions and presentations involving TIC affiliates. Among the firms meeting with TIC staff were Iowa State Bank & Trust Co., Emerging Growth Group, Eastern Iowa Angel Investors, Viable Technologies, and Iowa Area Development Group.

- Improved telecommunication infrastructure was installed in Oakdale Hall in FY 2002 as part of the campus fiber optic network project. As a result, TIC tenant companies in Oakdale Hall have access to faster Internet connectivity and telecommunication service that is more versatile and reliable. This infrastructure project addressed a leading concern of TIC tenants engaged in software development and Internet commerce (the TIC building received its own telecommunications upgrade in FY 2001).

- In cooperation with staff of the University of Iowa Research Foundation and the Office of Corporate Partnerships, TIC and ORP staff continued to utilize the expertise of a website developer in the Research Office to improve and update the web presence for the TIC incubator and the other units [http://www.vpr.uiowa.edu/techtransfer/].

Key findings from the FY 2002 employment survey of TIC business incubator and Oakdale Research Park affiliates are reported below. Also provided here are graphic presentations of employment trends for FY 1999, 2000, 2001 and 2002.

FY 2002 EMPLOYMENT/SALARY REPORT

UI Technology Innovation Center (TIC)
UI Oakdale Research Park (ORP)
September 25, 2002

Employment Totals

- TIC Firms 64 Employees (includes 9 students)
- **ORP Firms & TIC Grads 864 Employees (includes 42 students)**
- **Oakdale Anchor Labs 149 Employees (includes 32 students/fellows)**

<u>1,077 TOTAL</u> (includes 83 UI students)

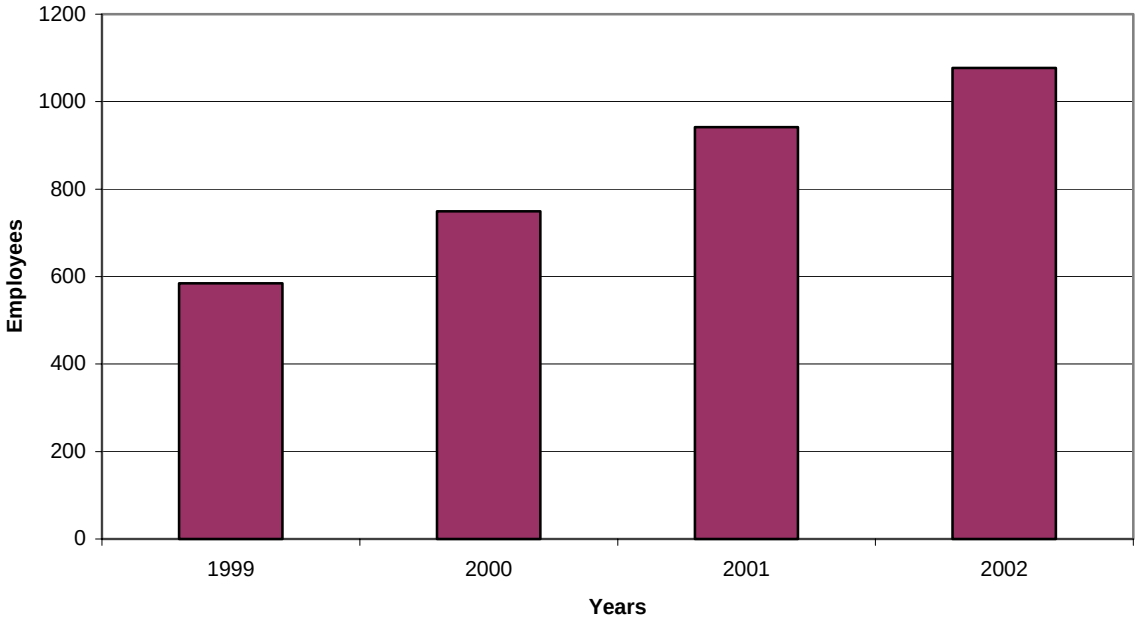
Average Full-Time Salary

- **TIC Firms $53,817 ($37,050 for new college graduates)**
- **TIC Graduate Firms $48,541 ($35,455 for new college graduates)**
- **ORP Firms $52,605 ($33,571 for new college graduates)**

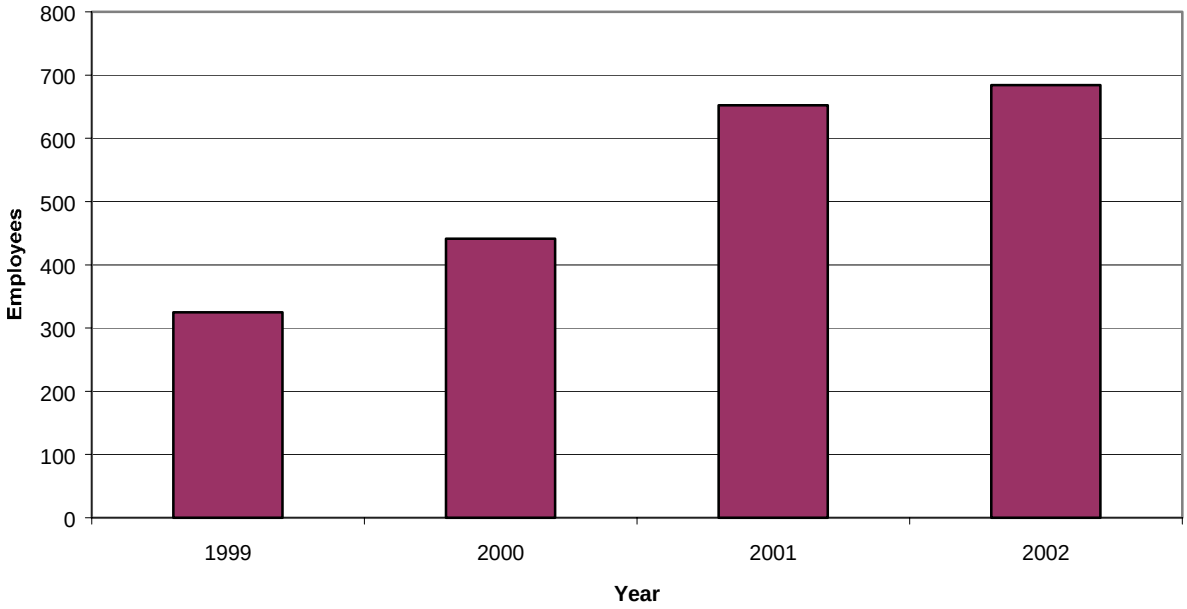
<u>TIC/ORP Employment Region</u>

- In FY 2002 TIC/ORP affiliates and anchor laboratories reported employees living in the following 12 counties in Iowa: Buchanan, Cedar, Clinton, Iowa, Jefferson, Johnson, Jones, Linn, Muscatine, Polk, Scott and Washington.
- In FY 2002 TIC/ORP affiliates and anchor laboratories reported that the home towns of their Iowa employees included Ainsworth, Amana, Anamosa, Atalissa, Aurora, Cedar Rapids, Coralville, Davenport, Des Moines, De Witt, Ely, Fairfax, Fairfield, Hiawatha, Hills, Independence, Iowa City, Kalona, Lisbon, Lone Tree, Lowden, Marion, Massillion, Mechanicsville, Monticello, Mt. Vernon, Muscatine, North Liberty, Oelwein, Oxford, Riverside, Robbins, Rochester, Solon, Swisher, Tiffin, Walford, Washington, Wellman, West Branch, West Des Moines, West Liberty, and Wilton.

Employment Trends
All TIC/ORP Affiliates & Laboratories Employees



Employment Trends
TIC Graduate Firms Employees



Program Activity: Intellectual Property Management

The University of Iowa Research Foundation (UIRF) is the organization responsible for managing intellectual property created at the University. It is a freestanding foundation tied to the academic mission of the institution.

FY 2002 was another productive year for intellectual property management at the University. The University of Iowa Research Foundation received 88 new invention disclosures from faculty and staff, filed 77 U.S. patent applications, received 36 issued patents, executed 37 license and option agreements, and earned $8,082,305 in royalty and license income (cash basis). The 37 executed license and option agreements and earnings were annual record high totals.

- Details and trends are reflected in the following set of graphs covering the period from FY 1987 – 2002 and the five-year period from FY 1998 – 2002. Several technologies managed by the UIRF were identified for inclusion in this report.

CMV Promoter – Among the most prominent technology transfer successes at The University of Iowa is the patented CMV Promoter for Increased Protein Expression. The significance of the CMV promoter was discovered in the laboratory of Mark F. Stinski, UI Professor of Microbiology, in his study of gene regulation mechanisms in the CMV virus. The CMV promoter has now become a very widely used tool in the biotechnology industry. It has gained importance in the commercial setting to manufacture bioengineered drugs, and may enable the development of gene therapy and DNA vaccine products. Five CMV-based drugs have received FDA approval and are currently being used to treat patients with cancer and other diseases. In March 2002, the FDA approved Zevalin® for the treatment of non-Hodgkins Lymphoma. At the end of FY 2002, the UIRF had negotiated non-exclusive licenses for use of the CMV promoter with 66 industrial partners, up from 57 licenses at the end of FY 2001.

Coley Pharmaceutical Group – Beginning in the mid-1990s The University of Iowa Research Foundation filed patent applications on discoveries made by Arthur Krieg, UI Professor of Internal Medicine, and others that offer the prospect for the creation of novel therapies for the treatment and prevention of diseases by activating innate or acquired immune responses. The UIRF now holds a substantial portfolio of patents and patent applications that are licensed to Coley Pharmaceutical Group, a company founded in 1997 on the base UIRF technology. In August 2001, Coley Pharmaceutical Group executed a sublicense with Aventis Pharma for the development of asthma and allergic rhinitis products. Clinical trials are underway in the areas of cancer, asthma/allergy, and infectious diseases.

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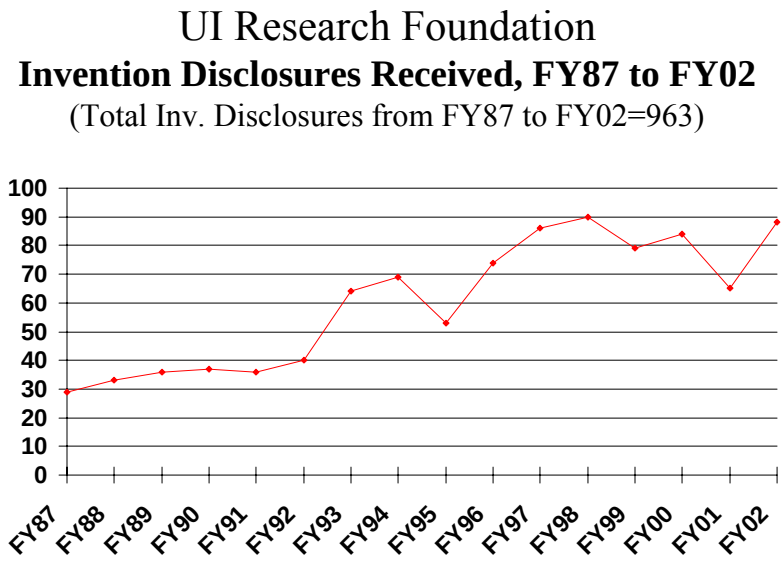
Slide 1

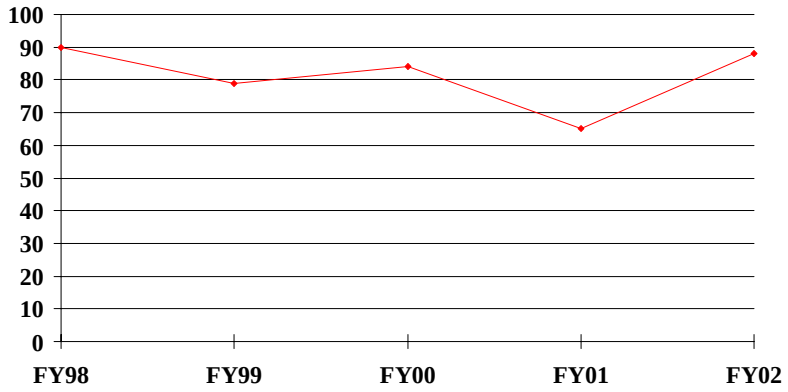


Slide 2

UI Research Foundation

Invention Disclosures Received, 5 Year Trend

(Total Inv. Disclosures from FY98 to FY02=406)



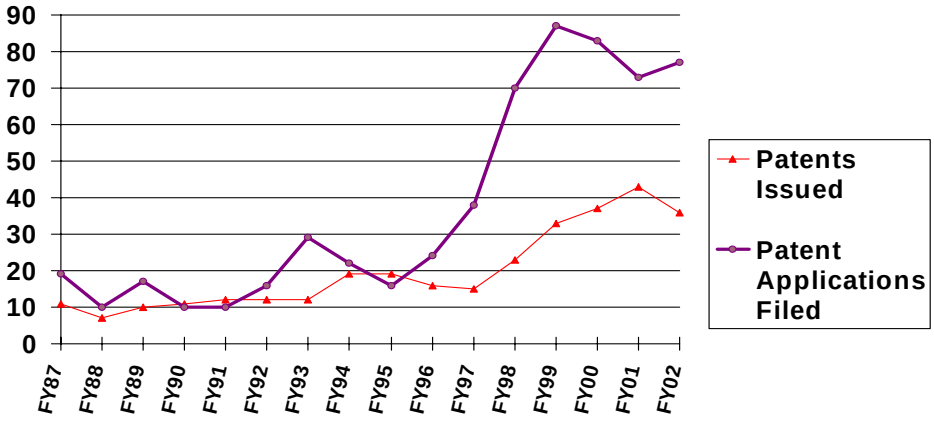
Slide 3

UI Research Foundation

Patents Filed & Issued, FY87 to FY02

(Total No. of Patents Issued, FY87-02 =316)

(Total Patent U.S. Applications Filed, FY87-02=601)

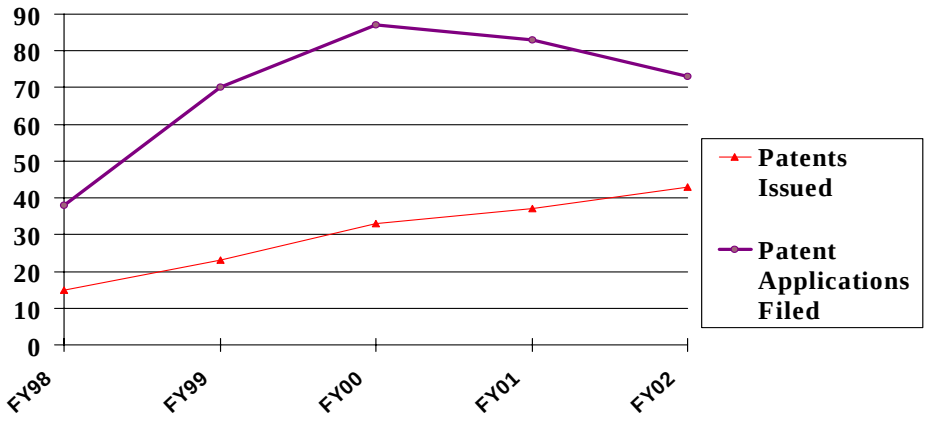


Slide 4

UI Research Foundation

Patents Filed & Issued, 5 Year Trend

(Total No. of Patents Issued, FY98-FY02 =172)
(Total Patent U.S. Applications Filed, FY98-FY02=390)

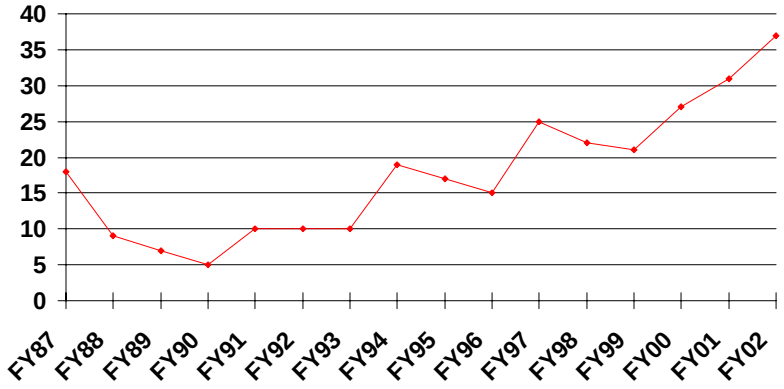


Slide 5

UI Research Foundation

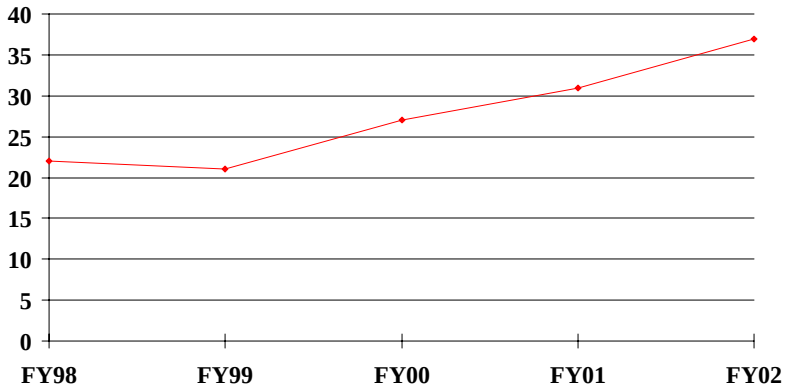
Options/Licenses Executed, FY87 to FY02

(Total Options/Licenses Executed, FY87-FY02=282)



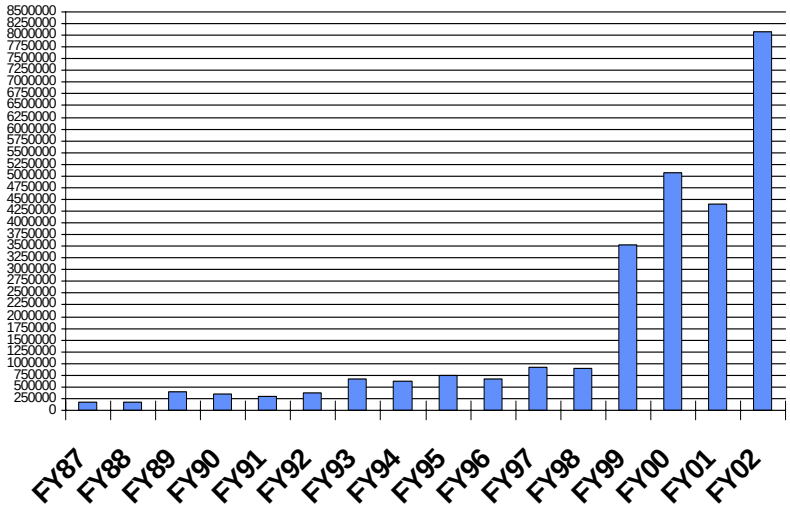
Slide 6

UI Research Foundation
Options/Licenses Executed, 5 Year Trend
(Total Options/Licenses Executed, FY98-FY02=137)



Slide 7

UI Research Foundation
Total Income*, FY87 to FY02
(Total Income from FY87 to FY02 = $27.4 million)



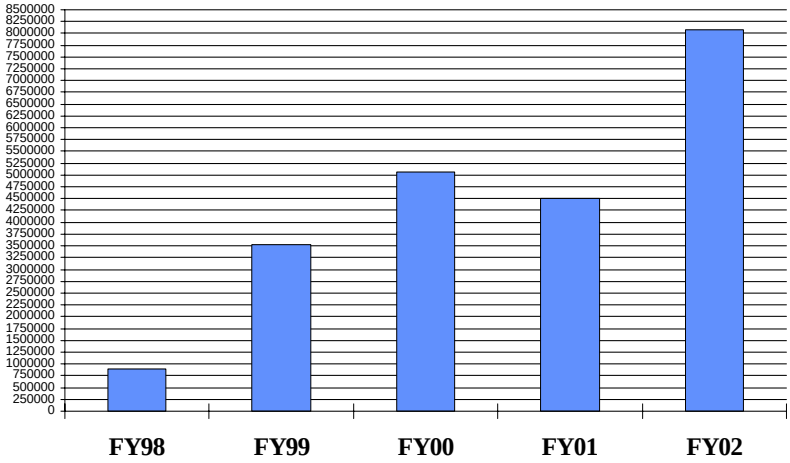
*This chart reflects UIRF earnings, patent cost reimbursements are not included.

Slide 8

UI Research Foundation

Total Income*, 5 Year Trend

(Total Income from FY98 to FY02 = $22.1 million)



*This chart reflects UIRF earnings, patent cost reimbursements are not included.

Program Activity: Statewide Outreach to Iowa Corporations/Economic Development Agencies

In FY02, the Office of Corporate Partnerships (OCP) adopted its new name (changed from old name of Office of Research Marketing & Corporate Relations) to reflect the new and expanded vision and role of activities undertaken by this Office under new leadership over the past two years. New desktop brochures were developed and incorporated into our new website (*http://www.vpr.uiowa.edu/corporate-partnerships/).* The UI Office of Corporate Partnerships established a unique, niche role for facilitating innovative alliances among industrial, educational, State and community partners to leverage the State's investment in UI and thereby enhance Iowa's economic vitality. These alliances enable the UI and its alliance partners to more meaningfully address emerging challenges in complex issues in areas such as scientific literacy, workforce development, technology transfer, large-scale collaborations and economic, community and social development, especially in rural communities of Iowa.

CONTACTS AND NETWORKING: Focused activities undertaken in the last two years

Over the past two years, the OCP has established strong ties with state agencies such as the Iowa Department of Economic Development (IDED). Since 2000, the OCP Statewide Corporate Outreach staff has undertaken 80 site visits to Iowa companies to match business needs with UI capabilities. The OCP has taken an active role in advancing economic development-related projects through service on several boards. For example, OCP Director Usha Balakrishnan serves on the Boards of the IDED and the Community Foundation of Johnson County and Advisory Boards of the State of Iowa-SBDCs and the Iowa Biotechnology Association. The Manager of Statewide Corporate Outreach serves on the IDED Human Resource Recruitment Consortium and the Iowa Rural Development Council. The OCP Director graduated from the Iowa City Chamber Community Leadership Program in June 2001 and from the ABI Leadership Iowa program in June 2002 and in November 2001 was appointed as the UI Deputy on the Iowa Business Council. The OCP Director serves as a key internal and external UI liaison for several ongoing strategic initiatives to advance economic development in Iowa.

The OCP has initiated and facilitated discussions among several diverse groups – Iowa corporations, UI colleges and administrative groups, school districts, other higher education institutions, local/regional economic developers, and community organizations. The OCP's role in coordinating collaborative relationships and in managing engagement practices has significantly expanded. Such engagement practices or "alliance facilitation functions" frequently involve cross-functional collaborations across campus, and across industries as well as other sectors. The University of Iowa is now a valuable intermediary player in creating and maintaining dialogue with new internal and external constituencies on a wide range of topics that transcend disciplines, professions, and functional specialties. As a "cultural translator" of sorts, the OCP has worked with groups in both the non-profit as well as for-profit sectors to align interests toward productive collaborations. The OCP has also worked at various stages of these facilitation processes. The OCP's role and the intensity of its involvement are guided by the nature of the project and the perceived desires and objectives of various participating internal and external constituencies. During FY 2002, the OCP staff participated in several conferences, including economic development-related events around the State.

BROADER VISION: Resulting from the unique linkage with Nonprofit Resource Center

The OCP acts as a clearinghouse for information regarding research resources and unique strengths spread across multiple departments and functions within the UI. The OCP's Statewide Corporate Outreach effort and its involvement with economic development agencies also permit the OCP to appreciate and anticipate community needs. These two roles uniquely position the OCP to identify potential synergies from innovative partnerships.

Beginning in November 2001, the OCP's linkage with the Iowa Nonprofit Resource Center led to the crafting of a much broader vision for the OCP in the context of economic development and UI's outreach activities (in facilitating public-private-nonprofit alliances). Whereas the Nonprofit Resource Center serves as a "clearinghouse" to appropriately access UI resources to match the needs of Iowa nonprofits and community-based organizations, the OCP acts as a "clearinghouse" to appropriately access UI resources to match the needs of Iowa businesses and economic development groups. The linkage between these "clearinghouse functions" renders enormous opportunities for (a) knowledge transfer in a timely way not only across UI functions but also their respective alliance partners or clients, both internal and external; (b) synergies in terms of recognizing opportunities for collaborations; and (c) developing implementation strategies based on a more holistic approach to resolving complex issues and problems facing communities, most particularly in rural areas of Iowa.

It is OCP's belief that such a (larger) holistic approach that is conceptualized, encouraged, taught and adopted by respective collaborating institutions or organizations and individual champions in our society is what can enable social change to occur. Because such endeavors are inherently interdisciplinary, (or cross-functional or interorganizational) a large, comprehensive university such as the UI can play a very important intermediary role in these processes in a variety of ways through its various research, educational, service and outreach programs.

This enhanced understanding resulted in the OCP Director preparing and submitting a large multidisciplinary proposal to the National Science Foundation in May 2002. The proposal included co-investigators from law, sociology, management, pharmacy, computer science and public policy.

STATEWIDE CORPORATE OUTREACH

Beginning in July 2000, the OCP initiated a corporate outreach effort with a view to systematically undertake site visits to Iowa companies to match business needs with capabilities within the University of Iowa. Outreach efforts also include numerous site visits to chambers of commerce and economic development groups in the targeted areas.

A Sampling of new partnerships facilitated by the OCP

Each of the OCP projects is unique given the nature/number/background of the participants and the discussion topic. A sample of such projects is included below:

1. Examining nonprofits as vehicles for rural economic development

In conjunction with the economic development arm of Iowa's rural utility providers (the Iowa Area Development Group) and the Community Development Division of the Iowa Department of Economic Development (IDED), the Office of Corporate Partnerships and the Nonprofit Resource Center began to explore ways to expand the role of community foundations as an effective vehicle for economic development in rural Iowa.

2. Facilitating meetings: Internships and Student Placements in Iowa companies

Based on a site visit to Maytag Corporation in Newton, Iowa, the OCP facilitated a meeting with faculty and staff in the Colleges of Engineering, College of Business and College of Liberal Arts and Sciences to discuss internships and student placement issues.

3. Promoting UI Partnering with K-12

The OCP has been involved in several alliances where a small investment of time, effort and facilitation to make the appropriate linkages can make a huge difference:

- Scientific Literacy

  The OCP worked with the Grant Wood Area Education Agency and the UI Science Education Center to support their efforts to establish a science and materials distribution center in Cedar Rapids.

- Science & Math Education among under-represented minorities

  The OCP Director represented the UI at the First Annual ALCOA-SECME banquet to celebrate the partnership with the UI. This partnership was strengthened due to the facilitative role that OCP played by organizing a one-day campus visit in March 2001 for ALCOA (Davenport) executives, Davenport school district superintendent and 10 science teachers, 2 program managers from SECME (a non-profit corporation in Atlanta), to showcase programs, resources and faculty in our College of Engineering and College of Education. This partnership aims to enhance math and science education in middle and high schools, particularly among underrepresented minority students, to better prepare them with skills, learning experiences and motivation to enter and complete post-secondary studies in science, mathematics, engineering and technology. Davenport school district students have visited the UI campus as a result and there are ongoing activities between several other units on campus including the College of Engineering, Opportunity at Iowa and the College of Education.

4. Partnership with Iowa's Higher Education Sectors

The OCP Director launched a collaborative effort with Drake University and Kirkwood Community College to develop a Higher Ed-IDED-Business Partnership website. A demonstration-scale website was developed. There is unanimous support for this project from the Executive Directors of the Board of Regents, the Association of Community Colleges, and the Association of Private and Independent Colleges of Iowa. This collection represents 55 higher education institutions. The web offers an enabling tool and infrastructure support system to promote in a collaborative way – both within and outside of the State – Iowa's higher education course offerings and other resources. The IDED has agreed to host this website and integrate it within its promotional strategies when funding is available.

As part of the Board of Regents office's effort to increase awareness for and the accessibility to resources and expertise existing at the Regents institutions, the OCP participated in several outreach presentations and organized several campus visits for Iowa companies and State agencies, including the Iowa Department of Economic Development.

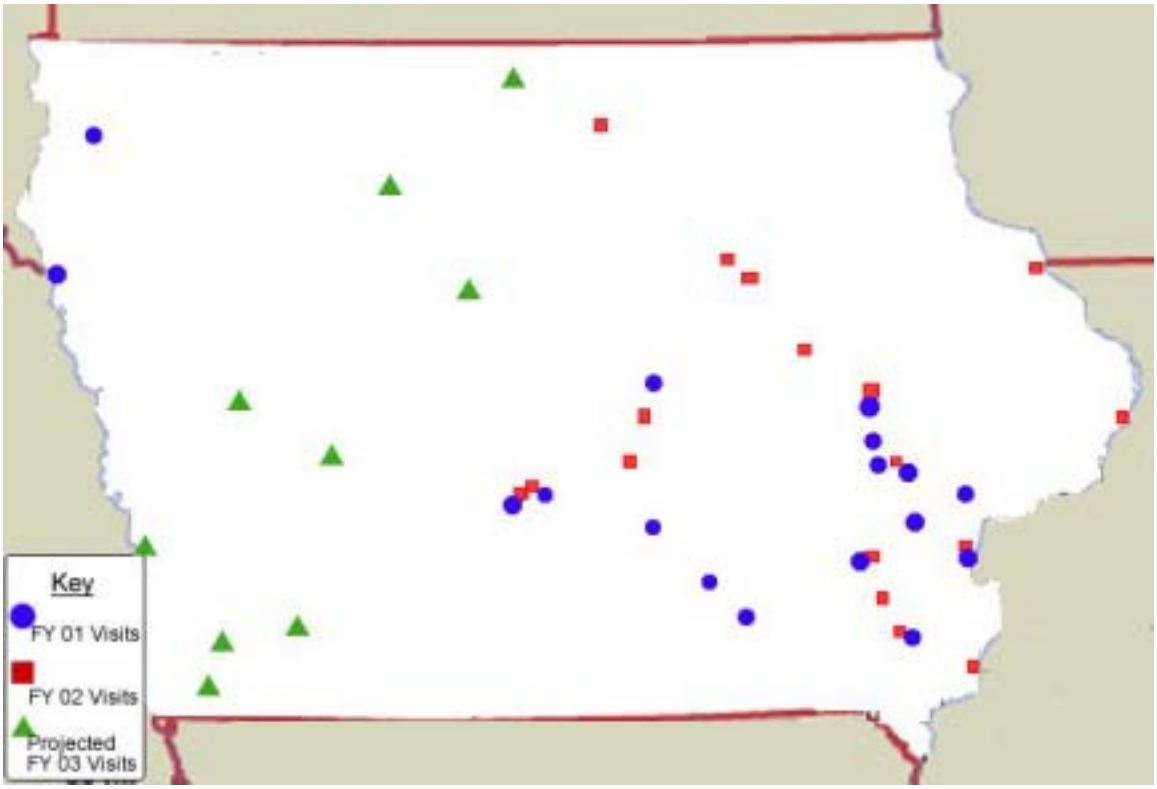
PERFORMANCE INDICATORS

Given the OCP's mission and objectives, provided below are ONLY THOSE readily quantifiable indicators that seem meaningful to track on a regular basis for external reporting purposes. These numbers cannot however capture the essence or comprehensive sense of the activities undertaken with limited resources by a small but energetic three-person team including the Director, Manager and Office Assistant. Many of the OCP's strategic or relationship-building functions, outlined below under items 1 through 8 are not meaningfully quantifiable. Such activities include but are not limited to the following:

1. Participation in strategic research initiatives.
2. Time involved in the coordination and development of new materials or brochures or "talking points" and "opinion pieces" or other matters specifically undertaken from time to time at the request of the President or the VP for Research and External Relations.
3. Time and effort involved in the identification, development and facilitation of new interdisciplinary projects, which have the potential to garner funding from new and emerging research sponsors.
4. Time or effort spent on responding to individual or corporate inquiries or requests for information/materials or referrals on UI programs.
5. Interactions or meetings with UI staff or researchers during which no external constituent participated, eg. regular, periodic meetings with various internal constituencies.
6. Travel, background preparation or overnight stay time involved in undertaking statewide on-site corporate visits or for participation in State Boards and commissions.
7. Participation at a host of events and receptions to represent the Office of the VP for Research and External Relations or the President as designates, or to heighten the visibility for UI.
8. Time or effort spent on routine project facilitation or coordination among large number of internal UI participants.

Participation in Type of Activity (categorized by the intensity of involvement by the OCP staff)	No. of UI Participants (excluding OCP Staff)	No. of External Constituent (non-UI) Participants	Total No. of Visits in FY 2001
On-site corporate visits to Iowa companies	5	67	38
Campus visits hosted by the OCP	47	34	6
Campus visits that the OCP helped organize	N.A.	N.A.	6

Map indicating locations of site visits made by Manager of Statewide Corporate Outreach



Planned FY03 visits include Algona and Fort Dodge - North Central Iowa; Red Oak-Corning-Shenandoah - Southwest Iowa; and Council Bluffs - Western Iowa. Visits to Algona, Red Oak, Council Bluffs, Dubuque and Ottumwa are directly targeted on the basis of networking contacts developed by OCP Director during her Leadership Iowa class participation.

Program Activity: Specially Supported Programs for Technology Transfer, Economic Development, and Workforce Development

As called for in an earlier strategic plan, the State has supported the establishment of three anchor laboratories on the UI Oakdale Research Park and Oakdale Research Campus. They are the Center for Advanced Drug Development, the Center for Biocatalysis and Bioprocessing, and the National Advanced Driving Simulator. Descriptions of these programs, along with a summary of their FY 2002 activities, are provided in the following appendix to this report.

Performance Indicators

Board of Regents Indicators

- 88 invention disclosures were received by the UIRF in FY 2002
- 20 new technologies were licensed by the UIRF in FY 2002
- 7 new licenses generated revenue to the UIRF in FY 2002
- $8,082,305 in total royalty and license fee income was earned by the UIRF in FY 2002 (cash basis)

Other Indicators Unique to the University of Iowa

See trends reported in the University of Iowa Research Foundation section of this report.

APPENDIX

CONTENTS

Appendix: University of Iowa Anchor Centers and Technology Transfer Offices

Part I: University of Iowa Anchor Centers

Consistent with strategic planning, a set of "anchor centers" was established at Oakdale. Descriptions of these centers are provided here in Part I of the Appendix.

Center for Advanced Drug Development

Definition

The Center for Advanced Drug Development (CADD), established in 1992, is located on the University of Iowa Oakdale Research Campus and employs 16 full-time employees, one part-time employee, one post-doctoral fellow, two graduate students, and three undergraduate students.

CADD operates under the umbrella of the University of Iowa College of Pharmacy and its staff works in close collaboration with the faculty of the College. CADD has the capability to engage in the full range of the drug development process by calling upon the resources of the UI College of Pharmacy's Division of Pharmaceutical Service (DPS), the Center for Biocatalysis and Bioprocessing and other University research facilities.

Collectively this expertise offers a unique research and development partnership with the pharmaceutical and biotechnology industry. The Center offers an excellent resource to enhance technology transfer and attract/develop new industry to Iowa. Outsourcing to CADD allows our clients to shorten the lead time between new pharmaceutical discoveries in the laboratory and their communication in the marketplace.

Scope

The Center's services are geared to benefit the following types of clients:

- Small or medium-sized pharmaceutical companies which do not typically have an extensive scientific staff or facilities to perform the studies CADD provides.
- Veterinary pharmaceutical companies
- Biotechnology companies
- Large pharmaceutical companies which periodically lack the capacity to pursue all projects internally
- Medical departments that require stability studies on new drugs or drug products under investigation
- International pharmaceutical companies that seek to market a drug in the United States
- Governmental agencies

Relationship with University of Iowa, College of Pharmacy

The Center offers contract services which complement those of the College of Pharmacy's Division of Pharmaceutical Service (DPS). More particularly, the Center offers non-production services relevant to the clinical trials process. Services include: management of FDA relationships for client firms (especially in the processing of new drug applications), development and execution of new chemical assays for candidate new dosage forms and new chemical entities, technical transfer or validation of assay methods, development and execution of stability studies of dosage forms, and testing of active pharmaceutical ingredients/excipients for compliance.

Through the DPS, the UI College of Pharmacy offers the special capacity to produce under contract limited quantities of new medicines under FDA approval and utilizing an FDA registered facility (the only such comprehensive facility in a College of Pharmacy in the U.S.). The capacity is particularly valuable to firms wishing to bring new products through clinical trials. The close collaboration between DPS and CADD is demonstrated by the fact that 50% of the FY 2002 projects were of a joint nature. CADD also performs active pharmaceutical ingredient/excipient testing following official testing procedures for PS and outside clients.

Relationship with Iowa, National, and International Industry

The 2002 client base, which contracted 404 projects with CADD, included three companies from Iowa, seven companies from surrounding Midwestern states, and 16 companies from elsewhere in the USA.

The Center for Biocatalysis and Bioprocessing (CBB)

The CBB is a multidisciplinary research group with a primary focus on biocatalysis and bioprocessing. The group consists of 58 faculty members and more than 300 researchers from eight different university departments. CBB faculty members are recognized internationally as one of the world's foremost groups specializing in this area.

Receipts of more than $2.2 million in competitive biotechnology training grants from the National Science Foundation (NSF) and the National Institutes of Health confirm CBB's prominence. More than $18 million in federal and corporate research support in FY 2001 gives further strong evidence of the competitive standing of the group. Based on reputation, CBB was invited to join with Washington University in St. Louis and the University of Kansas in developing a new Center for Environmentally Beneficial Catalysis, a pending grant application to NSF.

A. The CBB Fermentation and Bioprocessing Laboratory

The laboratory on the Oakdale Campus continues to expand collaborative efforts with industry from Iowa and around the world. Enabled by special appropriations from the State of Iowa, the Center completed installation of sophisticated equipment in 1996, and developed an experienced full-time staff. Well-matched downstream processing and analytical instruments support 23 highly-instrumented fermentors ranging from two- to

1,000-liter working capacity. The facility conforms to Good Laboratory Practices standards, essential for providing quality contract services. In collaboration with industry and others, the laboratory researches, develops, optimizes and scales up fermentation processes, and then recovers products. The laboratory cultures "recombinant" microorganisms to develop a large variety of products, ranging from vaccines and antibiotics to food and feed ingredients. Although about 95% of CBB's clients are from the private sector, others serviced include many of the nation's leading universities, as well as agencies like the U.S. Army and the National Cancer Institute.

Currently, CBB is involved in an initiative to produce biopharmaceuticals suitable for use in humans; this requires Good Manufacturing Practices (cGMP). In addition, CBB personnel currently serve on Life Sciences initiative committees to establish a cGMP protein processing facilities for the state of Iowa. CBB's plans for a cGMP facility are in place, and the laboratory has already produced vaccines adhering to these standards, as noted below.

Recent examples of CBB laboratory's R&D and technology transfer follow.

Vaccine
In 1997, a San Diego company approached CBB with a patented vector capable of producing a large immune response. CBB collaborated with the company, developing the fermentation and purification processes. During 2000, a cGMP facility adjacent to the CBB lab became available. CBB halted dismantling operations and invited the client, Apovia Inc., to view the possibilities. Subsequently, CBB designed the nearby Apovia manufacturing facility, specifying processing equipment. CBB is still providing cells to Apovia, now well into Phase 1 clinical trials with a promising Malaria vaccine. (Malaria is responsible for approximately two million deaths annually.)

Steroid Hormone Biotransformation
Collaboration with Magainin Pharmaceuticals Inc. involved screening microbes to 7α-hydroxylate a steroid. This step was critical to synthesize Squalamine, a potent anti-tumor agent. CBB selected the most productive organism from shake-flask studies of sixteen microbial cultures. After organism selection, CBB optimized many process variables, and then, produced a purified product.

Bad Bugs for Good Causes
CBB grows pathogens in our biological-safety-level-2, large-scale facility. The lab grows organisms like *Helicobacter pylori* and *Haemophilus influenzae*, at 100-liter scale for researchers interested in diagnostics, vaccines, and therapeutics. CBB is the only university-based fermentation laboratory capable of cultivation of *H. pylori* at large scale. Industry and universities including Northwestern, Yale and Vanderbilt have sought collaborative services with our pathogen cultivating capabilities.

Organism-Enzyme-Polymer
A large German pharmaceutical company approached CBB to help develop a multi-step process to produce a polymer from table sugar. The first step required fermentation of a recombinant organism to produce the enzyme. CBB's state-of-the-art two-liter fermentors optimized variables, improving yields and reducing fermentation time from 120 to 28 hours. The two-liter process was then scaled up to 10 and 100-liter scales. Subsequently, CBB conducted polymerization reactions at 500-liter scale. A financial

model of the process, based on data obtained at 500 liters, assisted in evaluating economics of scale up to 150,000 liters. Finally, the lab provided appropriate documentation and training to transfer the technology.

Treating Explosives Waste
As a result of processing, Army Ammunition Plants generate "Pink Water", a wastewater contaminated with TNT, RDX and HMX. Because of toxicity, environmental agencies apply stringent standards for release of these compounds. The preferred treatment technology passes Pink Water through granular activated carbon (GAC) columns. TNT, RDX and HMX adsorb onto the GAC, but then the GAC becomes a hazardous waste. The U. S. Army sought a biological treatment process to regenerate these columns in situ by degrading the adsorbed compounds. The concept involved minor modification to the GAC columns to turn them into bioreactors. CBB examined organism viability and determined chemical fate of degrading TNT. After optimizing treatment conditions, CBB provided inoculum. The process demonstrated destruction efficiencies in excess of 99% at pilot scale at two ammunition plants, Milan TN and Middletown IA

Donated Patents, a Platform Technology
E. I. DuPont donated patents to the university defining glycolate oxidase (GO) technology, an enzyme from spinach that catalyzes important chemical oxidations. CBB developed the process to produce high-cell-density fermentations of *Pichia pastoris* providing quantities of GO. CBB then optimized reaction conditions to minimize activity loss, allowing repeated catalyst recycling, and maximizing conversion. Most of this work was done to produce pyruvate, a dietary supplement and chemical intermediate. Licensing of the technology is available and discussions with interested companies are in progress.

B. Technology Transfer and Outreach

Technology transfer activities are focused interactions between industry, faculty, and the laboratory. These activities are summarized below.

Annual Conferences
Annual CBB conferences in Iowa City attract industrial and academic audiences from throughout the USA and abroad. Each conference features world-renowned invited speakers from academia and industry. In addition to outside speakers, each conference features four CBB top predoctoral fellows as podium presenters, plus poster sessions featuring more than 50 posters. The 11th annual conference entitled "*Biocatalysis, Evolution and Metabolic Engineering*" will take place in October 2002. Scientists from more than 28 nations and 28 states have visited Iowa in connection with this conference.

Industrial Clients Drawn to Iowa through the CBB Laboratory
The CBB Laboratory has been very successful in drawing industrial clients to Iowa. Figure 1 shows the dramatic increase in contracts FY1996 through FY2002. This has been a building period during which the laboratory has established a solid reputation as a successful partner. Based on successful performances, most of our new projects are obtained on a "word of mouth" basis from satisfied industrial clients. We anticipate that growth will continue to improve for at least the next five years.

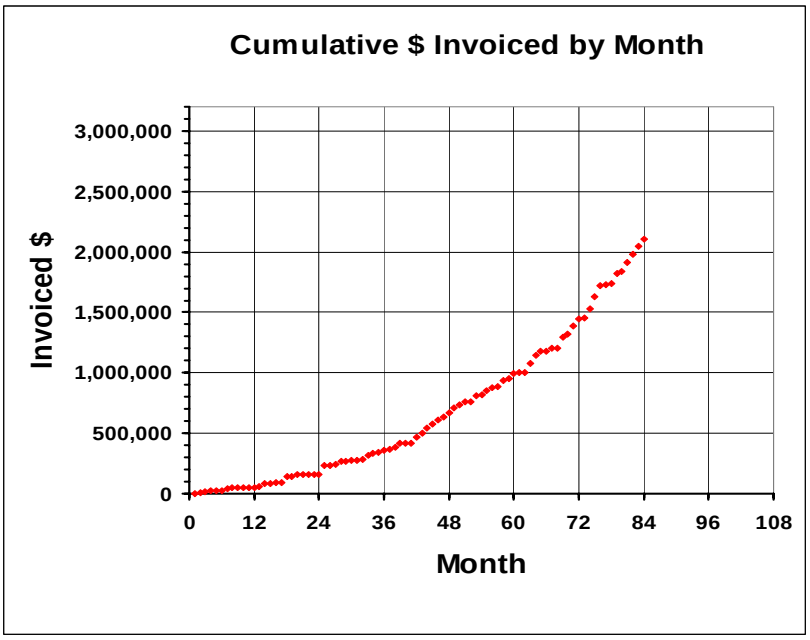


Figure 1. Growth in Contracts for the CBB Laboratory since 1995

Advisory Board
CBB's distinguished Industrial Advisory Board is a powerful asset to the state and university. In keeping with the recommendations by a Long Range Planning Committee, board composition includes scientists from several different walks of professional biocatalysis life. These include: industrial, federal and academic scientists; business people and venture capitalists. Representatives are drawn from industries that are regional, biocatalysis, pharmaceutical and agrochemical in nature. CBB's board has included: Director of Process Research (Merck) Vice President for Biotechnology Research (Cargill); Corporate VP for Enzyme Development and Applications to Industrial Biotechnology (Novo Nordisk) Denmark; Fellow, and Distinguished Scientist (E. I. DuPont); President Research (ADM); Deputy Director - Central Research, Hoffmann La Roche (Basel, Switzerland); Director Natural Products Drug Discovery & Development (Merck); Head, Biocatalysis Research (Eli Lilly)

Technology Transfer through a National Science Foundation Engineering Research Center in Environmentally Beneficial Catalysis.
This multi-institutional NSF ERC program is a joint effort with Washington University in St. Louis, and the University of Kansas. If awarded, CBB's portion of a 5-year budget is estimated at $5.5 million. The NSF ERC encourages integrated partnerships involving the University of Iowa, industry, and state and national government laboratories.

Industrial awareness of the CBB, University and State as Leaders in Biocatalysis, Fermentation, and Bioprocessing.
Exposure of industrial and academic scientists through CBB's direct contacts, conferences, newsletters, and our website, **http://www.uiowa.edu/~biocat**, have greatly increased awareness of the capabilities of CBB, the University, and State. For example, CBB has a contact list of more than 1,000 individuals working in related industrial settings. Through continuing scholarly and research activities of faculty, their

students and laboratory researchers, and the CBB Laboratory, CBB continues to be an attractive feature of the State. The outputs of these activities, namely publications, patents, students and faculty interested in industrial interaction render the CBB as a valuable technology transfer asset.

National Advanced Driving Simulator

The National Advanced Driving Simulator (NADS) is one of four "anchor centers" on the Oakdale Research Campus. NADS is a joint project of the Department of Transportation, the State of Iowa and The University of Iowa. NADS is an internationally unique, and the most advanced, motor vehicle simulator for conducting human-centered driving safety research in a highly re-configurable computer generated environment. The primary mission for NADS is to conduct and support NADS-based research to assist the National Highway Traffic Safety Administration (NHTSA) of the Department of Transportation in obtaining fundamental understanding of cause and effect during routine and critical crash avoidance maneuvers, determining the limits of operator performance, improving vehicle design and highway systems that will significantly enhance the driving safety. A second mission is to conduct vehicle system engineering research with government and industry to enhance the productivity of the automotive manufacturing sector.

NADS staff is supporting two research projects of national significance that have been included in NHTSA's plan for experiments using the NADS. The first project will study the effects of blood alcohol content on driving performance and the second will study the effects on safety when drivers use, for example, cell phones, on-board computers, internet services, e-mail, faxes, and navigational devices. These two projects are also examples that can only be conducted safely, repeatedly and under controlled conditions in the simulator. NADS staff continues to develop enabling technology for users from the automotive, agriculture, construction, and military sectors as well as medical community, and to attract users to use the Simulator. Through contract awards, NADS staff also provides support for development of enabling technologies for other simulators.

NADS, jointly with the VRAC (Virtual Reality Applications Center) at Iowa State University, is pursuing advanced simulator networking research for vehicle and equipment distributed product design. This project aims at linking, through the ICN, VRAC and NADS with industrial quality, agricultural equipment design test cases that will be provided by Deere & Company. Benefits and challenges of networking of VRAC and NADS environments are being studied. This project will also enable the engineers to gain unique insight into the operation of the vehicle under realistic operating conditions, and to identify challenges and opportunities in information technology that are critical to the networking of operator-in-the-loop simulator environments and virtual reality – an area which holds potential for economic development in the state.

NADS currently employs 49 highly qualified staff and has approximately 12 students working in a multi-disciplinary research and development environment.

Part II: University of Iowa Technology Transfer Offices

As previously noted in the body of the report, the UI maintains four offices which have responsibilities for technology transfer interactions with the business community. Summary descriptions of these offices are provided here.

Oakdale Research Park

The University's Oakdale Research Park was established in 1989. It is an important way in which the University works to attract firms to the State. The Park offers leased building sites and space to businesses engaged in basic and developmental research, product development, and light manufacturing linked to research and development activities. By locating on the Park, companies requiring a sustained relationship with the University will benefit from their proximity to its research resources including faculty expertise, specialized equipment, and laboratory facilities.

The University encourages interaction between its faculty members and corporate tenants on the Park as a means of promoting both corporate and University research and the transfer of technology to and from the laboratory and the marketplace. "Anchor centers" sited at Oakdale are devoted to pharmaceutical development, industrial biotechnology, human health and medicine, and driving simulation.

The Oakdale Research Park is especially well suited to accommodate the expansion needs of growing companies emerging from the University's Technology Innovation Center (business incubator).

Twenty lots on the 189-acre Park are available for lease and development. Seven projects on the Park include the Multi-Tenant Facility, which houses anchor laboratories for biotechnology and medicine, the LMS CADSI corporate headquarters, the Stockpoint, Inc./ScreamingMedia (formerly Neural Applications Corp.) headquarters, the Oakdale Systems, Inc. building, the National Advanced Driving Simulator, the four-building Myriad Technology Plaza (which houses Stanley Environmental, Police Law Institute, Breakthrough to Literacy, Inc., and Apovia, Inc.), and Phase I of the Corridor Technology Center which was completed in FY 2002 and welcomed NCS Pearson as tenant.

In late FY 2002, the University began occupancy of a major new addition to the Multi-Tenant Facility laboratory complex. It adds a 15,000 square foot laboratory and auxiliary space to accommodate rapidly growing research activities of the Department of Ophthalmology. The $5.5 million project was funded by corporate research grants won by UI investigators. The University also constructed another 15,000 square foot addition that provides speculative shell space for future build-out as UI needs are presented and as funding is identified to provide much-needed wet laboratories for biotech “incubator” companies. Following the University’s $1 million investment in the building shell and infrastructure, the Iowa Department of Economic Development agreed to accept the Park as recipient of a $500,000 Advanced Research Commercialization award to construct laboratories for incubator companies in part of the new building shell. The laboratory construction was completed in FY 2002.

Office of Corporate Partnerships

PREAMBLE: For large public universities such as the University of Iowa (UI), institutional alliances with a diverse set of organizations are increasingly critical in formulating long-run, sustainable, and meaningful solutions to the challenges posed by a dynamic, interdependent, local/regional and global research and innovation environment. Multiple stakeholder views and public-private-nonprofit partnerships are required to address emerging and complex challenges in a host of areas including scientific literacy (learning), workforce training and education (skills), large-scale collaborations (joint research or cause-driven initiatives) and technology transfer (applications of lab research), all of which directly impact our collective economic and social well-being.

MISSION: The OCP mission is to advance research, teaching and service at the University of Iowa to benefit community and society. We leverage the State's investment in the University of Iowa by facilitating alliances among industrial, educational, State and community partners. Such alliances aid the appropriate matching of existing and emerging needs with available resources and capabilities to create value and strengthen our economic vitality.

OBJECTIVES & ACTIVITIES: The Office of Corporate Partnerships – reporting to the Vice President for Research and External Relations – works with a broad-based constituency, within and outside the University of Iowa, to enhance the University of Iowa's participation as a key partner in economic, community and social development. To accomplish this goal, the Office:

- Fosters and facilitates alliances among industrial, educational, State and community partners to aid the appropriate matching of existing and emerging needs with available resources and capabilities
- Builds and strengthens relationships between the UI and State constituencies and collaborates with local and regional economic development agencies and industry trade associations to jointly promote Iowa's capabilities: including active participation on special boards and committees to enhance awareness for UI's unique research centers, facilities and tremendous resources and capabilities in the life sciences, advanced manufacturing and other sectors, including outreach programs that serve Iowa communities
- Leverages various sources of funding for selected UI programs or projects in which the UI participates: for instance, identifying available funding sponsors (jointly with the Division of Sponsored Programs), and participating in grant proposals as a key collaborator and/or supplemental partner to enhance funding prospects
- Provides administrative assistance with strategic research initiatives to enhance research funding and technology transfer for targeted research programs
- Undertakes – through its Statewide Corporate Outreach function – site visits to Iowa companies to match business needs with University of Iowa capabilities
- Showcases University of Iowa's resources and programs to external constituencies
- Organizes campus visits for corporations
- Responds to inquiries regarding University of Iowa research expertise and programs

Technology Innovation Center

The Technology Innovation Center (TIC) was established in 1984 to foster the development of new technology-based business ventures. The center provides cost-effective office and laboratory space, access to shared office equipment and facilities, and assistance in establishing relationships with the University. Those relationships may include research sponsorship or collaboration, student or graduate employment, faculty consulting, and licensing of intellectual property. The center offers ready access to the University's computing facilities, research equipment and instruments, as well as advisory services on management, marketing, and finance.

Since its inception, the center has attracted approximately 65 companies created from the business strengths of Iowa, spin-off companies from research work at the University, and new research and development units of existing companies. Companies stay at the center for a limited time. Currently, 14 companies in residence at the center are preparing products and services in a broad range of fields, including:

Information visualization
Patient education software
Interactive teleconference delivery
Diagnostic assays for parasitic disease
Dynamic image analysis
Environmental engineering software
Internet communications
Optimization software development
Antibacterial therapeutics
Hazardous chemical detection
Greenhouse gas emission validation
Internet-based prediction markets
Microcircuit apparatus development
Health care management software

Twenty "graduate" companies achieved their business goals after leaving the center.

The University of Iowa Research Foundation (UIRF)

The University of Iowa Research Foundation was established in 1975 as a freestanding nonprofit corporation to manage inventions and intellectual property created at the UI. It does so by selectively obtaining patent or copyright protection for UI inventions or discoveries and by licensing these inventions to business and industry. Policy decisions for the UIRF are determined by a Board of Directors, selected from UI faculty and staff, members of the State Board of Regents, officers and directors of The University of Iowa Foundation and the public.

Objectives of the UIRF

Since 1987, the UIRF has been granted 316 patents. Specific objectives of the UIRF are to:

- Educate the UI community about issues concerning the protection of intellectual property
- Identify research with potential to produce new and useful knowledge which could be commercialized for the public benefit
- Disseminate new and useful knowledge resulting from University research through the use of the patent system
- Market patented technologies as well as those technologies being considered for patenting
- License patents to industry in order to promote the development and commercialization of inventions
- Assure that patent-related obligations to outside research sponsors and funding agencies are met

Patent Policy

To encourage and assist the University inventor in the use of the patent system in a manner that is equitable to all parties, the Board of Regents approved the University of Iowa Patent Policy. This policy requires that all faculty, staff, employees and students disclose to the UIRF all ideas, inventions or discoveries conceived or made during their employment or association with the University while using University time, materials or facilities. UIRF staff then determines what rights, if any, the University or any of its sponsors has to the idea, invention or discovery. With the UI Patent Committee as its advisor, the UIRF evaluates the invention and decides whether or not to pursue it further, based on these criteria: its patentability; its benefit to the public; its commercial potential; its scientific soundness and value; and its benefit to the University.

Licensing of Inventions to Industry

The purpose of licensing inventions to industry is twofold: (1) to provide a mechanism for transferring the results of University research to the public for the public benefit, and (2) to generate income for education and research. Net proceeds from licensing income are shared between the inventor and the University in accordance with the University of Iowa Patent Policy. Licensing activity may begin any time following disclosure and need not be delayed to allow a patent to issue. To ensure confidentiality and protection of non-patented technologies, an agreement is co-signed by the UIRF and the potential licensee prior to release of specific information about the invention. The UIRF maintains a summary of all patented and licensable technologies and distributes this information to the business community.

Iowa State University
2002 Technology Transfer Accomplishments

Introduction

The Technology Transfer and Economic Development Network at Iowa State University

Iowa State University, as part of the higher education system in the State, is charged with advancing technology transfer and economic development activities that promote growth and benefit all citizens. The University evolves these goals by contributing to workforce development, creating intellectual property and advancing ideas to the stage of market readiness, supporting creation of new companies, offering assistance to existing companies, and attracting new companies to the State. The fuel that powers the technology transfer system comes from the University, its colleges and research centers, which create the intellectual property that attracts existing companies and forms the foundation for the creation of new companies.

On the basic level of creating intellectual property, the University's technology transfer support system consists of the departments, colleges and the research centers and institutes. This includes the Institute for Physical Research and Technology, the Plant Sciences Institute, the Biotechnology Program, the Center for Transportation Research and Education and other central centers and institutes, such as the statewide Iowa Energy Center and Iowa State Water Resources Research Institute. The departments, colleges and research institutes/centers collaborate closely with units that are more directly charged with technology transfer and economic development, such as the ISU Research Foundation, the Office of Intellectual Property and Technology Transfer, the Center for Advanced Technology Development, the Pappajohn Center for Entrepreneurship and the Small Business Development Center, the ISU Research Park, the Center for Industrial Research and Service, and the Iowa Manufacturing Extension Partnership.

The activities of the colleges, institutes and centers are coordinated through the Coordinating Council on Technology Transfer (CCOTT) that advises the Vice Provost for Research and Advanced Studies in all matters related to technology transfer and economic development. The Vice Provost and CCOTT continuously communicate with economic development entities within the State, such as the Iowa Department of Economic Development, the Iowa Business Council, the Greater Des Moines Partnership and other local and regional agencies.

The Technology Transfer Report is organized according to the strategic goals of Iowa State University, including

- Strengthen discovery and innovation on campus related to technology development and economic development,
- Engage with key constituents through synergistic partnerships to stimulate technology transfer and economic development.

For each goal and subgoal the report lists the pertinent facts, statistical data, and notable accomplishments during the last year. Many campus units contribute to several goals during the course of a year and hence their related activities will be listed in different sections. The report concentrates on technology transfer and economic development activities in the State of Iowa. It does not touch upon the many broader national and international accomplishments of ISU.

I. Goal: Strengthen discovery and innovation on campus related to technology development and economic development.

A. Enhance overall support for research and development on campus.

Sponsored Funding

In FY02, $225.4 million was received by ISU in sponsored funding, a record high (Figure 1).

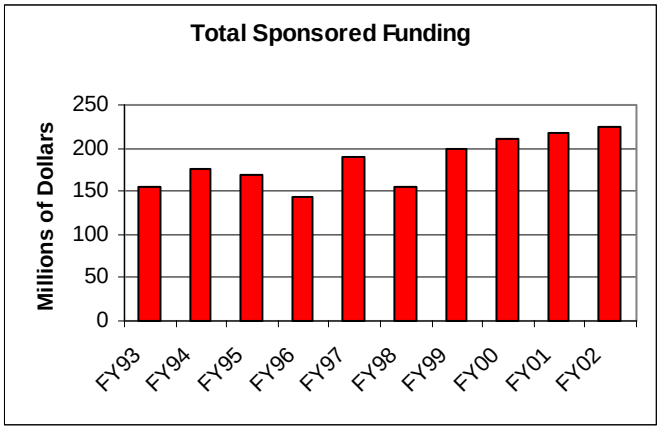


Figure 1

$139.4 million of this was dedicated to research activities (Figure 2) and the rest to public service, educational projects, financial aid and buildings.

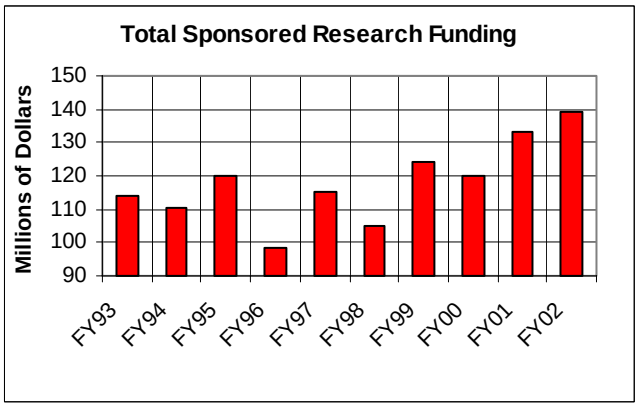


Figure 2

The research awards include contracts and grants from both federal and non-federal sources. Many projects supported by these funds result in technology that is transferred to the marketplace and consequently assists companies and communities across Iowa. Figures 3 and 4 show the two major sources for this type of support – the federal government and businesses and commodity groups. In FY02, the federal government funded 403 research projects totaling $100.9 million (Figure 3).

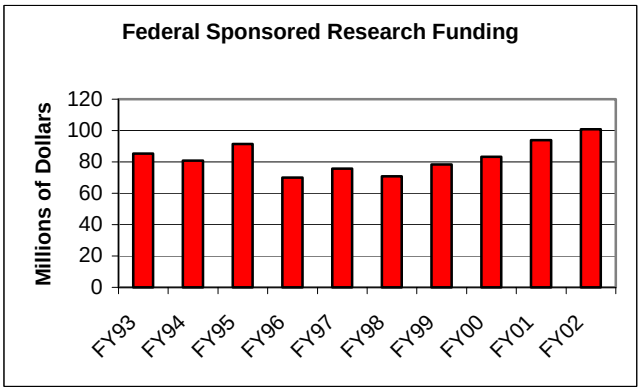


Figure 3

As shown in Figure 4, in FY02 businesses (including commodity groups) funded 405 research projects at ISU totaling $15.3 million. In addition, businesses funded 71 non-research projects totaling $11.4 million (not shown in Figure).

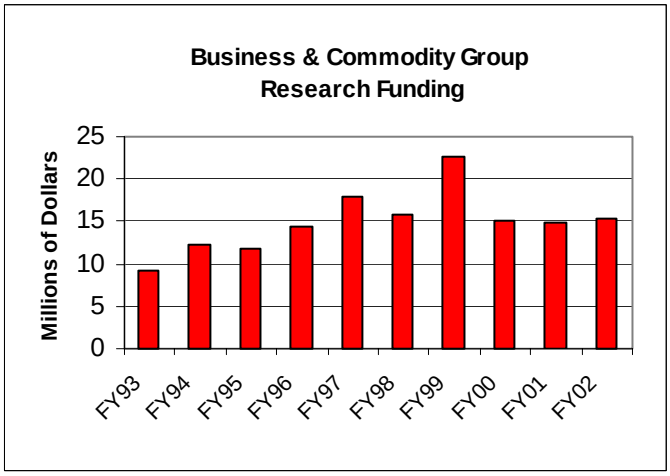


Figure 4

Sponsored Agreements Between Industry and University

The Director of Industry Relations reviewed or negotiated more than 200 agreements with industries located around the world in collaboration with the Office of Sponsored Programs Administration and the ISU Research Foundation. These contracts fostered an exchange of information and support for research for more than 100 faculty and staff members in five

colleges at the university. This represents a portion of the contract activity.

IPRT Seed Funding Program

$950K in seed funding has resulted in continued funding of more than $9M for 12 projects funded in FY99 and FY00, the first two years of the program. The Institute for Physical Research and Technology (IPRT) Research Seed-funding Program funds interdisciplinary projects for preliminary work that has the potential to impact Iowa's economy and that will lead to continued funding. In a follow-up survey of the teams funded during FY99 and FY00, researchers report that seed funding has led to additional public and private funding as well as other achievements such as student research, publications, NSF Career grants, and a license option.

- ***Immersive Virtual Environments*** One of the strongest reports continues to result from a FY99 project led by a mechanical engineering professor whose team designed tools in immersive virtual environments and investigated the application of these tools to power plants. This research has, to date, funding commitments of more than $4.75M over a five-year period.

- ***Bioprocessing Training*** NSF has awarded $250K for a three-year program at Indian Hills Community College in Ottumwa, Iowa. There are a number of bioprocessing concerns in southeast Iowa, and the results of this research project have become part of a training program for operators at the bioprocessing plants at Corydon and Centerville, Iowa.

Initiatives Earn $7.5M in Federal Funding

Four university initiatives led by the Ames Laboratory and IPRT have earned $7.5M in federal funding this year. The Department of Energy (DOE), the National Institute of Justice (NIJ), and NASA are directing ISU and the Ames Laboratory to lead research programs in forensics, advanced nondestructive evaluation, biorenewables, and catalysis. These projects will lead to product development and/or training that has significant potential for economic development in the State of Iowa.

- ***Ames Laboratory and IPRT tapped to lead regional forensics partnership*** NIJ's $3M appropriation for the Midwest Forensics Resource Center funds a partnership of eight crime laboratories, four federal agencies, the Ames Laboratory, and IPRT. This initiative grew out of forensics R&D projects that received attention from regional and state groups, which concluded that the region's critical, overlapping forensics demands should be led by an ISU-based center to meet training, research, casework, and educational needs.

- ***Advanced NDE for future aerospace systems*** A new $2M NASA program led by the Center for Nondestructive Evaluation (CNDE) integrates ISU core strengths in nondestructive evaluation and materials science to improve the reliability of aerospace sensors. These sensors must be integrated within the structure, continuously sense the condition and take corrective actions as appropriate—a concept that is central to NASA's goal of ageless aerospace vehicles.

- ***Catalysis Center to investigate catalysis applications*** The Center for Catalysis (CCAT) at ISU was established with $500K of funding from the DOE. The objectives of the center are to investigate the fundamental and applied aspects of catalysis and to develop useful, practical catalysts by investigating the application of catalysis to environmental, industrial, and agricultural sciences. The center will facilitate a nationwide exchange of scientific information and promote collaboration with groups involved in developing environmentally friendly industrial processes.

- ***Strive For Safer Nuclear Power*** A research project submitted by IPRT's CNDE and the Ames Laboratory seeking to improve the safety of future nuclear power systems has been awarded $940,000 for a three-phase project under the Nuclear Energy Research Initiative. Only 13 out of 145 projects were selected to receive funding in this program.

MIC Microfabrication Lab

The Keck Laboratory for the Fabrication of Microminiaturized Analytical Instrumentation, funded in part by a $1.2 million grant from the W.M. Keck Foundation of Los Angeles, is now operational. This "clean room," part of IPRT's Microanalytical Instrumentation Center (MIC), is being used to create a new generation of more reliable, less costly and smaller portable instruments. MIC researchers are working on analytical instruments and entire systems, such as dime-sized chromatography systems. The lab is open to researchers from ISU, other universities, and industry. It supports all phases of microfabrication in fields ranging from chemistry and biology to zoology

and genetics. The new lab is also helping to attract new faculty to ISU.

B. Encourage the development of intellectual property that has the potential for generating patent applications and license agreements.

Disclosures of Inventions

ISU researchers disclosed 100 new inventions to the Iowa State University Research Foundation (ISURF). Figure 5 shows disclosures received during the past 10 years by discipline.

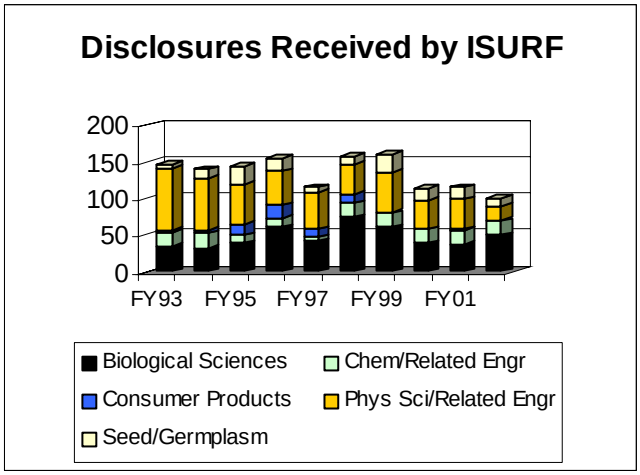


Figure 5

Patents Issued to ISU Inventors

Ten years of data from the Association of University Technology Managers (AUTM) show that, overall, 19% of invention disclosures to U.S. universities result in issued patents. ISURF has been more successful, with an average of 32%. Figure 6 shows patents issued to ISURF during the last ten years. The recent downward trend is the result of greater selectivity prior to patent filing in an effort to determine which technologies are most likely to be marketable.

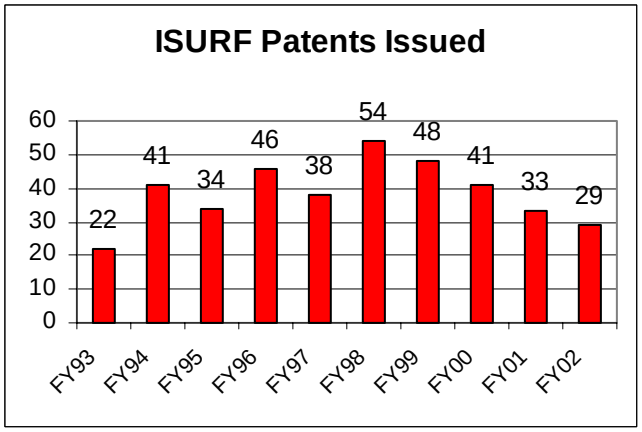


Figure 6

ISURF Signs New Licenses

Iowa State University contributes to the diversity of Iowa's economy through the invention of new technologies, many of which are licensed to Iowa companies. In FY02, ISURF signed 297 new license and option agreements, including 262 for plant germplasm. This is a critical statistic, since it characterizes the actual transfer of ISU technologies to the marketplace. It should be noted that 37 inventions were licensed/optioned for the first time in FY02. Of these, ten are plant varieties and 27 are other technologies. Figure 7 shows the number of active license and option agreements during the last ten years.

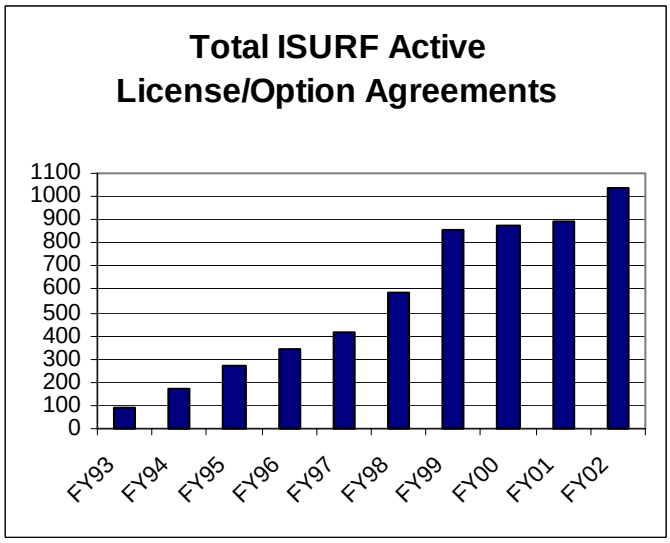


Figure 7

ISU Ranked High Nationally

ISU is one of the nation's leading universities in research accomplishments. In the last AUTM survey, in which 142 U.S. universities participated, ISU ranked 23rd in the number of patents issued, 30th in invention disclosures received, third in licenses and options yielding income and second in licenses and options executed on its intellectual property, all while placing 45th in terms of research expenditures.

ISU Technology Generates Iowa Sales

New technologies originating at ISU contribute directly to the economy of Iowa. Technologies licensed to Iowa companies, resulted in $12.8 million in sales by those companies in calendar year 2001. Figure 8 shows both Iowa and non-Iowa sales of licensed ISU technologies during the last ten years. Total sales of ISURF-licensed technologies (not including plant germplasm) were $162 million in calendar year 2001. Figure 9 shows the pattern during the past ten years of only Iowa companies.

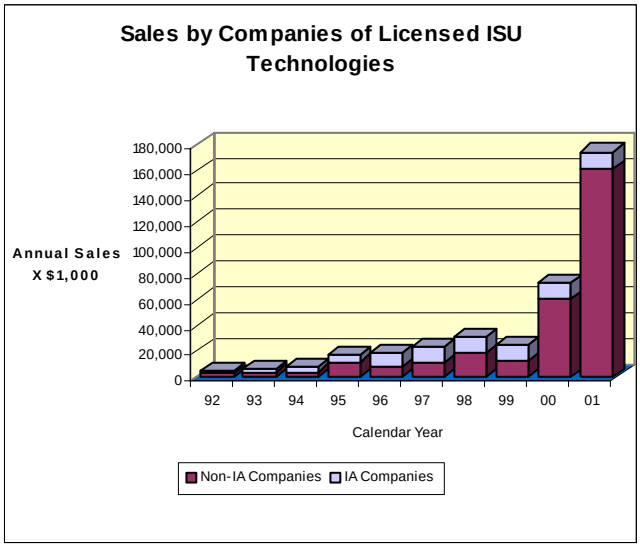


Figure 8

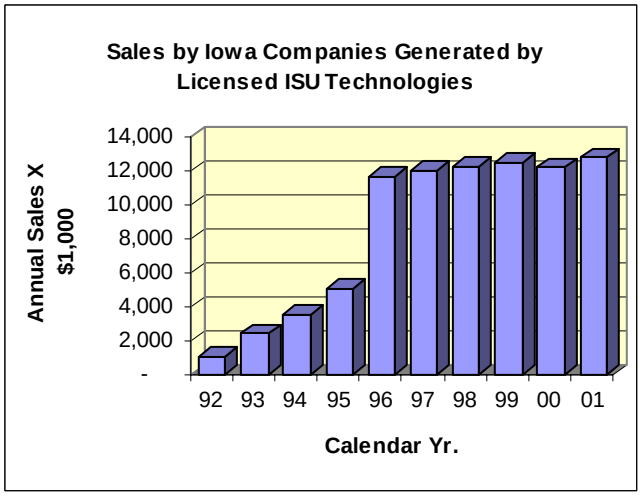


Figure 9

Making New Plant Germplasm Available

Figure 10 shows the number of bushels of soybeans planted in Iowa on which royalties were collected and the dollar amount of those royalties. In FY02, 43,958 bushels of specialty soybean varieties developed at ISU were planted in Iowa, generating $86,473 in royalties. Both of these numbers represent a significant increase over FY01.

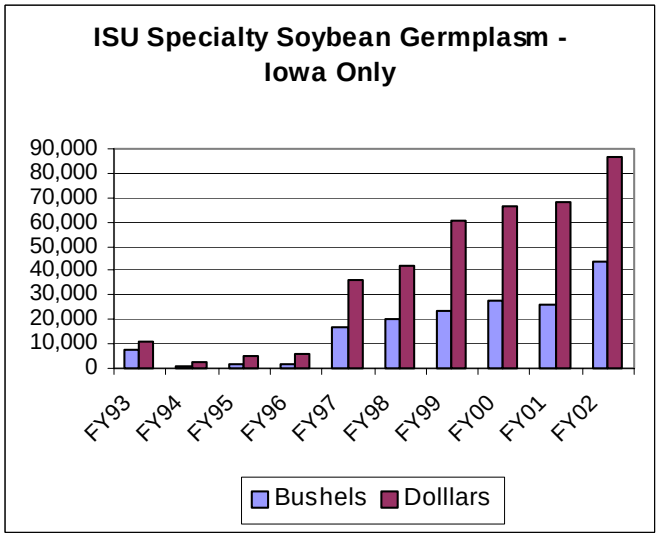


Figure 10

R&D Magazine Award

ISU received an R&D 100 Award for the discovery of a genetic marker in pigs called PT1. The winning technology, invented by Prof. Max Rothschild and graduate student Kwan Suk Kim, is a simple laboratory test that helps identify boars whose progeny have a lower appetite, consume less feed, grow leaner and

produce less waste. The technology has been licensed to Sygen International, PLC. Since 1984, ISU has received 24 R&D 100 Awards, second among all universities.

Encouraging the Development of Intellectual Property

In FY02, ISURF funded seven ISU inventor projects for a total of $153,000. Several of theses projects are the subject of patent applications and are being actively marketed and licensed.

ISURF Sponsors Inventor Dinner

ISURF sponsored the third inventor dinner at the Gateway Center on April 29. A total of 25 inventors whose technologies have been licensed since the last inventor dinner (1999) were recognized. In addition, ISU's R&D 100 award winners for 1999, 2000 and 2001 were honored.

Try A Little Tenderness — With the Right Pork Genes

Ongoing swine genetics research continues to yield results that provide vital support to one of Iowa's major agricultural industries. Consumers desire high-quality tender and good-tasting pork. Two pig genes recently were shown to have a great effect on pork quality. The genes affect tenderness after cooking. With 25 million pigs marketed annually in Iowa, the impact of the research is considerable as its monetary value is likely to exceed 25 cents per pig. Patents are pending for both genes. Genetic tests have been licensed to the world's largest pig-breeding company and also to its parent company. These companies funded the research that discovered the genes and have been funding ISU research for ten years.

Technology Makes Every Drop of Nitrogen Important

Each year more than one billion pounds of nitrogen are applied as anhydrous ammonia to Iowa cornfields. Nationally, ten billion pounds are applied. Distribution problems inside the manifold on the applicator cause farmers to slightly over-apply to ensure that all plants receive adequate nitrogen. Over-application wastes fertilizer, and extra nitrates leach into groundwater. ISU researchers developed a prototype manifold to increase application uniformity. Methods to increase uniformity were the subject of three field days and five winter schools attended by 624 people. ISU's newly designed manifold has a patent pending, and a company is studying the technology for possible use.

Soy Protein-based Biodegradable Plastics

Researchers in Food Science and Human Nutrition are developing biodegradable plastics based on soy-protein. Protocols have been developed for producing plastics from protein isolates, concentrates, and flours using conventional processing methodologies including compression and injection molding and extrusion. The Iowa Department of Transportation is testing biodegradable road markers produced by the group, and Iowa State University recently granted a license to Soy Works, Woodridge, Ill., to market and promote this technology.

Professors Take Research to The Market

To deal with problems companies encounter with large and complex software, two ISU faculty members have developed and commercialized a new technology, Knowledge-Centric Software (KCS). The two have formed a new Iowa company that is providing KCS-based products and professional services to help companies develop and maintain complex software in a variety of platforms. The company is working with major customers in Iowa to evolve software infrastructure and develop new products.

ISU Works with a Des Moines Physician To Develop a Working Prototype

An established Des Moines, Iowa physician specializing in otolaryngology believes his innovation for wireless, hands-free, wearable telecommunication devices will become a reality. His two-year collaboration with ISU is putting his start-up company closer to that goal. In the past year, the CATD-funded research and development project has connected the company with CIRAS' product development team and faculty from the departments of Aerospace Engineering and Engineering Mechanics and Electrical and Computer Engineering for complex interdisciplinary product development that is only available in Iowa in the ISU environment. This resulted in a university-company invention disclosure in sensor design. The efforts in acoustics, signal processing, computer design, and antenna research has set the stage for the company to proceed with development of a working prototype.

Faster…Simpler…Cleaner

The headline on the CombiSep web page tells the story plainly. New technology, developed by a distinguished professor of chemistry and licensed by CombiSep, will do the job faster, simpler, and cleaner. This patented technology applies massively parallel processing to chromatographic separations, allowing for universal detection of many compounds and eliminating the need for fluorescent tags. Companies currently use banks of machines employing High Performance Liquid Chromatography (HPLC) to analyze one sample at a time. CombiSep's product (MCE 2000) can analyze 96 compounds simultaneously. Sample size and use of reagents by the MCE 2000 is also approximately 1000 times less than what can be used with conventional HPLC.

C. Encourage the development of research collaborations with other Regent's universities and/or industrial partners that will increase and broaden the scope of intellectual property developed at the university.

Roy J. Carver Co-Laboratory Public/Private Partnership Facility

Construction began on the Roy J. Carver Co-Laboratory Incubator and Facility for Public/Private Partnerships. This exciting new venture at Iowa State will promote economic development in the area of plant biotechnology. It will serve as an incubator facility for start-up companies associated with the Plant Sciences Institute and as a public/private partnership facility to promote the interaction and exchange between ISU scientists and researchers from the private sector. It is envisioned that this facility will provide a productive research environment where scientists from ISU and industry can work together to advance the mission of the Plant Sciences Institute and promote economic development in the State.

Kernels Of Truth Found In Marketing Specialty Grains

Iowa State and Farmers Cooperative Elevator Company, Farnhamville, Iowa have taken national leadership in application of quality management systems (QMS) for agricultural marketing. In the fall of 2002, the partners will implement a certified QMS at the first of the cooperative's 34 facilities. Farmers Cooperative began the QMS process to increase markets for specialty grains, but it quickly became apparent that internal efficiencies would generate immediate profits. ISU estimates the company is generating at least $2 in annual profits for every $1 invested in the system. Because the company is able to track truckloads of grain delivered to its facility, producers will be able to access future high-value biotechnology products requiring strict documentation and isolation. Iowa State was integral to the development of this technology, which also has important applications in food security and bioterrorism prevention. The company now plans to expand the program to its other 33 elevators, plus its feed and agronomy businesses.

Improving Compressed Air Systems Saves Energy and Improves Productivity

The Iowa Energy Center, a statewide program, is a founding sponsor of the Compressed Air Challenge (CAC), which is a private/public initiative to improve the efficiency and performance of industrial compressed air systems. Although state-by-state numbers are not available, short-payback improvements in compressed air systems and operation could save, on a national basis, 15,670 GWh of electricity per year or $747 million at current industrial electric rates. Compressed air system users should also realize substantial improvements in production efficiencies that could translate into higher profits. A goal of the CAC is to educate compressed air system users through fundamental and advanced training courses. Through the efforts of the Energy Center and several Iowa industrial partners, 170 users from small through large industrial firms, have been trained in Iowa. Nationwide, nearly 5,000 people have participated in the training program. Survey results show that more than 70% of the industrial users whose employees attended CAC trainings invested in systems efficiency upgrades. To address the need for more highly trained engineers, the Energy Center worked with the CAC, air compressor distributors, and Iowa State University to develop and offer a college-level engineering course in compressed air systems.

Extruder-expeller Soy Processing Plants

In cooperation with Iowa Soy Specialties (Vinton, Iowa) and InstaPro (Des Moines, Iowa) scientists from the Center for Crops Utilization Research (CCUR) are

developing low-cost oil crushing and refining protocols for extruder-expeller milling operations. The extruder-expeller is a new milling concept well suited to small cooperatives and value-added grain processors. The extruder-expeller mills are being evaluated as an economic development opportunity for rural Iowa. ISU researchers have investigated the functionality of the higher-quality baking flours and texturized vegetable protein produced from extruder-expeller-processed soybeans. Other work is comparing the quality of extruder-expeller processed "natural" organic oil to conventional hexane-extracted oil.

II. Goal: Engage with key constituents through synergistic partnerships to stimulate technology transfer and economic development.

A. Promote programs that stimulate economic development by assisting new or established companies through university partnerships that provide technical, financial, or other assistance.

Update on Point of Contact System

A "Point of Contact" system was established in March 2001 to help companies find the assistance they need within the university. The university homepage has a link for business/industry that takes the reader to the "Point of Contact" information. Since the system was implemented, the Office of the Vice Provost for Research has received and acted upon approximately 125 inquiries. Inquiries have included requests from Iowa manufacturers for technical assistance, requests for information on special courses/workshops and requests for results of specific research projects.

Small Business Development Center (SBDC)

The Iowa SBDC operates 13 centers in Iowa including one at the ISU Research Park (16 centers before the recent Iowa legislative budget cut of 57%). During 2001, the Iowa SBDC assisted 12,211 clients, with 95,582 hours of service. Of these, 3,841 clients received one-on-one counseling and 8,370 attended SBDC training.

In regard to the economic impact of the Iowa SBDC, a recent independent study by James Chrisman of Mississippi State University showed that in one year SBDC clients in Iowa:

- Received $68.6 million in capital as a direct result of SBDC assistance.
- Generated $32.1 million in incremental sales, an increase of 18.4% versus an increase of only 1.1% by the average Iowa business.
- Contributed almost $4 million in additional federal and state tax revenues.
- Generated 765 new jobs, an increase of 51.2% versus an increase of only 2.6% by the average Iowa business.
- Leveraged the cost of SBDC assistance by approximately $36.60 in debt and equity capital.
- Returned $9.54 in tax revenues for every $1 cost of long term counseling.

Source: James Chrisman, Mississippi State University "Economic Impact of Small Business Development Center Counseling Activities in Iowa - 2000-2001".

The Iowa SBDC also operates a web site entitled the Iowa Business Network (IBN) that offers more than 500 small business articles and more than 400 links to other business resources. The IBN offers an "Ask the Experts" section designed to provide quick and reliable answers on a wide variety of topics and also features a wide variety of business workshops and training events that are sponsored by SBDC centers throughout Iowa. As an adjunct to the IBN, the SBDC state office e-mails more than 3000 "Solutions" newsletters to Iowa business owners and stakeholders.

Companies Arising from ISU Technology

Companies whose formation was based in part on technologies and/or technical expertise at Iowa State University are listed in Table 1. Nineteen additional companies were formed prior to 1995.

Table 1

COMPANIES THAT HAVE FORMED DUE TO ISU TECHNOLOGIES AND/OR TECHNICAL EXPERTISE

Name of Company	Date	Specialization
Advanced Structural Engineering	2002	Computer aided tap testing
DAF Enterprises	2002	Data filtering and padding
Osteoceramics, Inc.	2002	Animal orthopedics
International Cooperation Analysis & Planning	2002	Algorithms for mining databases
Glass House Studio	2001	Visualization and simulation techniques
Advanced Structural Imaging	2001	Aviation materials inspection
Ensoft, Corp.	2000	Software reengineering
NewLink Genetics Corp.	2000	Genomics and therapeutic products
CombiSep, Inc.	2000	Electrophoretic instrumentation technology
Nitro Cream, Inc.	2000	Ice cream processing system
Novascan, Inc.	2000	Instrumentation for atomic force microscopy
Phytodyne Incorporated	1999	Plant transformation technologies
Technology Labs, Inc.	1999	Assessing computer performance
MASIM, Inc.	1999	Process for joining ceramics
IA-TEK	1999	Process for analyzing seeds
Biotronics	1999	Ultrasound techniques for food animals
Innovative Materials Testing Technologies	1999	Advanced nondestruction evaluation techniques
Modelspace Corporation	1998	CAD System for turbomachinery
MSTRS Technologies	1998	Metered semiochemical timed-release systems
NDE Technologies, Inc.	1998	X-ray simulation code
epmt, inc.	1998	auction market simulators
Carbon Energy Technology (CETECH)	1997	Biomass gasification technology
MechDyne Corporation	1997	Haptic feedback devices
Advanced Analytical Technology, Inc.	1997	Applications of microanalytical instrumentation
Engineering Analysis, Inc.	1997	Computational fluid dynamics
Applied Academics	1997	Interactive veterinary training
Delta Tie	1997	Engineered structures
Accumen	1997	Data storage
Engineering Manufacturing, Inc.	1997	Powdered metals
Vista R & D	1997	Video hardware, software
X-L Space Systems	1997	Rocket fuel processing
Anaerobic Biosystems Corporation	1996	Anaerobic technologies
ESGA, Inc.	1996	Computer-based patient medical records system (closed in 1997)
Palisade Systems, Inc. (formerly MidAmerica Networking, Inc.)	1996	Computer network products
NewMonics, Inc.	1996	Real-time Java software & computer memory management systems
Amtak, Inc.	1995	Nondestructive evaluation instrumentation
Pefftronics	1995	Audio processing
Intellignostics, Inc.	1995	Biomedical sensors (closed in 1997)

Iowa Procurement Outreach Center

The Procurement Technical Assistance Center reported 420 jobs were created as a result technical assistance from the Iowa Procurement Outreach Center and CIRAS staff. Decker Acquisition Corporation of Fayette received a $180,000 subcontract from Cedar Rapids, Inc. in support of its $5,100,000 U. S. Army contract for rock crushers.

CIRAS Assistance by Counties

CIRAS provided assistance to companies in more than 96 of Iowa's counties in 2000 and 2001 through CIRAS' assistance to Iowa industries, the Iowa Procurement Outreach Center and Engineering Distance Education.

CIRAS ISO 9001:2000 Implementation

A company in Peosta received its ISO 9001:2000 certification with assistance from the CIRAS ISO team. CIRAS ISO specialists provided implementation assistance with management and employee education and training, quality management system documentation development and review, internal auditor training, and a pre-certification audit. As a result of obtaining ISO 9001:2000 certification, the

company forecasts an increase in sales of $4 million and the hiring of ten additional full time tool makers.

CIRAS Product Design and Testing

More than 50 Iowa companies received CIRAS assistance in developing products, improving fabrication, and testing products to increase competitiveness. For example, CIRAS used reverse engineering and rapid prototyping technologies to assist a northwest Iowa company. One of the design engineers stated, "CIRAS completed a task that I was unable to do. They created CAD files for my part and also did a rapid prototype form CAD files so that I could see what the files would create." CIRAS also conducted FEA studies on existing and modified weldment designs to analyze stress reduction effects for an engineering company in Cedar Falls, Iowa. The product engineering manager said, "From the day the design changes were implemented, there have been no further failures. With CIRAS input, the reliability of this unit went to 100%."

Using Economic Analysis to Avoid Over-Expansion

Recent developments in the market for oxygenated fuels have created opportunities for the midwestern ethanol industry. Several groups in Iowa are pursuing the expansion of ethanol capacity as a major value-added economic development strategy. This strategy has risks for investors if the industry over-expands. ISU economists conducted an analysis to evaluate the opportunities for expanding the ethanol industry in Iowa and the Midwest. Economic impacts for local communities and producers were estimated and used to help local groups. Very quickly, six new plants were permitted and are currently under construction. Based on the analysis, information on industry trends and national markets was presented to the Iowa Department of Economic Development and state policy-makers to help avoid an over-expansion of the ethanol industry in the state and the risk of losses for new investors.

Pork Quality Workshops

A research group in Food Science and Human Nutrition (FSHN) continues to organize Pork Quality Workshops for professionals associated with the pork industry. Throughout 2001, they provided one-day pork quality workshops for veterinarians, feed managers, livestock managers, and consultants. Presentations were also offered internationally in Merida, Mexico to provide information to an up-and-coming packing company that exports product to Japan. This group has provided leadership in pork quality evaluation to more than 300 professionals since the inception of this program.

Incubating Value-Added Product Companies

The Center for Crops Utilization Research (CCUR) and FSHN manage a small industry incubator program for companies to develop new value-added products. During FY02, ExSeed Genetics, L.L.C., worked on developing a technology base to control the biosynthesis of starch and modify the genetics of corn to produce value-added traits. Kemin Biotechnology used a laboratory and the fermentation facility to genetically engineer crops to produce valuable enzymes and other products. Ajinomoto, Eddyville, used laboratory and office spaces to develop enzymes for meat products. Proliant, Ames, worked on developing value-added products from blood using CCUR's pilot plant. Proliant has constructed a new plant in Boone, Iowa to produce pharmaceutical-grade

bovine serum albumin based on technology developed by using CCUR pilot-plant facilities.

Sharing Food Safety Information

The Food Safety Project (FSP) web site was developed and launched in 1995 by researchers and extension staff from the Departments of FSHN and Hotel, Restaurant and Institution Management (HRIM). It is now one of the most recognized internet sources of food safety information. The purpose of the Web site is to make available educational materials and programs that provide the public with tools needed to minimize the risk of food borne illness. The website is currently supported by HRIM extension faculty in the department of Apparel, Educational Studies, and Hospitality Management. It is funded by the U.S. Department of Agriculture and the Food Safety Consortium of Iowa, Arkansas, and Kansas. The site had 5.3 million hits during 2002. http://www.extension.iastate.edu/foodsafety/

IPRT Works for Iowa

IPRT's research centers and outreach programs support economic development through world-class, interdisciplinary research, working as a critical component in the university's efforts to strengthen the economic vitality of the State of Iowa. IPRT centers and programs link the university research community to Iowa manufacturers and entrepreneurs, facilitate technology transfer and provide technical assistance. The following map shows where IPRT centers and outreach programs have served Iowa companies and entrepreneurs during FY02, and Figure 11 provides historical data regarding the Institute's outreach programs that are specific to Iowa.

IPRT *Works* for Iowa
IPRT Outreach Programs and Centers—
Legend: ★One Project ● Five Projects ▲Ten Projects
Iowa Companies Assistance Program (ICAP)—117 projects
Iowa Demonstration Laboratory for Nondestructive Evaluation (IDL)—41 projects
Center for Advanced Technology Development (CATD) —44 research contracts
IPRT Centers—36 research projects or interactions

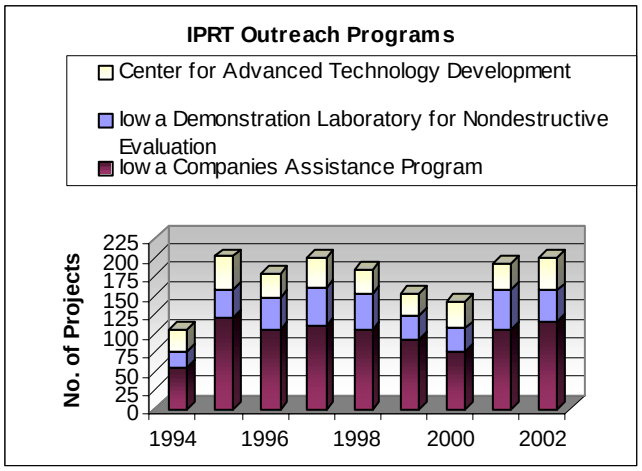


Figure 11

CATD Continues to Build R&D Teams with Iowa Industry

Since 1993 the Center for Advanced Technology Development (CATD) has been the state leader in matching Iowa businesses and entrepreneurs with university resources in cost-shared research and development projects. In FY02, CATD initiated 44 research and development projects with Iowa companies leveraging state funding of more than $475K with companies' investments of nearly $950K. Iowa's research and development needs are diverse and the following briefs illustrate how CATD puts together expertise from across the university to meet those diverse needs and the table below summarizes public and private investments in the center's contract research program.

- ***Cosmetologist Adds 'Entrepreneur' to Resume***

Three years ago a north central Iowa cosmetologist had an "in the night" idea for a hair lift styling device. After receiving a patent in 2001, the hairdresser called ISU seeking product development and marketing advice. ISU's Pappajohn Center for Entrepreneurship led her to CIRAS and CATD. A prototype was developed through a cost-sharing project of under $6000. Currently, the entrepreneur is working with a

Nevada, Iowa firm for production and an Ames, Iowa company for packaging. The Pappajohn Center also directed her to New York City-based Accessories Brainstorms, and through that contact, she has a sales commitment for her "Clip-N-Lift" from a national accessory outlet as well as interest from several television sales companies**.**

- ***Research Park Start-up Cites CATD Assistance***

An Ames start-up company specializing in remote field eddy current instruments that detect deep-lying flaws within metal, rated high in U.S. Air Force technology trials and credits the partnership with CATD in its preliminary successes. The company was working with the U.S. Air Force and aircraft manufacturers to develop nondestructive evaluation instruments that will evaluate aging aircraft components when they asked CATD for assistance. The Center sought expertise from the Ames Laboratory's Engineering Services Group and provided cost-sharing funds to support the research. Schematics and PC board layouts were prepared, and sample boards were assembled. Company engineers also collaborated with the Laboratory to design the probes used to evaluate components.

- ***New Product, New Market***

CATD and CIRAS teamed up with a Storm Lake, Iowa company in a research project to develop commercial pit-less wells, something that has never been done before. To assist, CATD provided cost-sharing funds to the 53-year old, 50-employee company for the CIRAS-led project. As part of the project, the company built a prototype based on CIRAS' recommendations and tested it at ISU. The company reports that the work was beneficial because it could not have performed the testing itself. The laboratory is the only one in the area that could work with the high loads required to test the new design. The company is now ready to pursue its own development of the commercial pit.

- ***Summary Contract Research—Center for Advanced Technology Development (CATD)***

Year	Number of Projects[1]	Iowa Industrial Incentive Program[2]	Industry Investment	University-Other Funds	IMEP[3]	Contract Totals
2002	44	478.4	949.6	553.0	N/A	1,981.0
2001	34	329.5	691.6	604.0	N/A	1,625.1
2000	36	426.9	887.8	522.3	N/A	1,837.0
1999	29	350.2	603.7	382.2	N/A	1,336.1
1998	35	400.1	477.1	443.1	N/A	1,320.3
1997	37	331.0	608.5	476.3	70.0	1,485.8
1996	27	316.1	373.0	469.7	130.2	1,289.0
1995	31	284.5	428.5	367.5	214.1	1,294.6
1994	16	280.3	294.2	360.5	268.7	1,203.7
1993	10	282.5	500.6	136.8	0	919.9
1993-2002	**299**	**3,479.5**	**5,814.6**	**4,315.4**	**683.0**	**14,292.5**

Dollars in thousands

[1]At any point in time, CATD staff will be developing, implementing, or managing 25-30 projects. CATD's technology transfer associates work with Iowa industry to define research needs and match those needs with university resources. The reported number reflects the number of discussions that end in contract research agreements with Iowa firms.
[2]The figure in this column reflects the allowance of carryover funds from one fiscal year to the next and additional IPRT appropriation to CATD for contract research projects.
[3]Since 1996, IMEP funding to CATD is used for project development/management and is not reflected in the contract documents

CATD Efforts Significantly Increase Iowa's Successes in SBIR/STTR Six years ago ISU's CATD began a targeted plan to affect Iowa's *participation* and *success* in the SBIR/STTR federal research-funding program, which is an important indicator of a state's competitiveness in tech-based economies. CATD's efforts —through its Rural Outreach Program—are now paying off, and many grant awardees credit CATD's assistance. In 2001 CATD assisted ten Iowa companies that were granted 11 awards worth $1.8M. Already in 2002, Iowa companies have been granted 12 SBIR/STTR awards worth $4.23 million—the most awards ever won in a single year and the highest dollar amount ever: Three companies received four Phase II awards at an estimated $3.0 million and seven companies received eight Phase I awards at $1.23 million. Of the awardees, four are start-up companies and four are established small businesses. All of the companies anticipate creating new jobs and/or needing facilities and equipment components that will contribute to Iowa's economy.

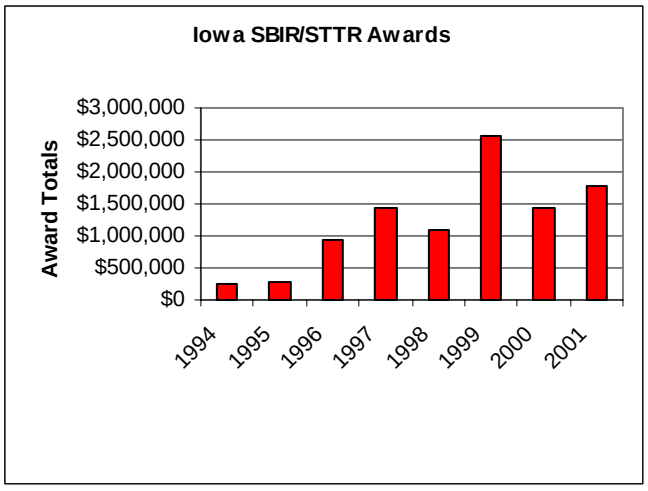


Figure 12

- ***Wood Utility Poles and Microtoughness Testing*** A Boone county firm that offers technical services in the field of wood preservation and testing received a USDA Phase I award of $70K for a feasibility study to detect the decay of in-service wooden utility poles

by microtoughness testing. As a result of successful preliminary feasibility testing, the firm was contacted by the Iowa Department of Transportation. Based on the result of the testing, the Iowa DOT has purchased a device for making test samples, is working with the firm to rewrite bridge inspection protocols, and is adopting the firm's testing as a standard on nearly 25,000 wooden bridges across the state.

Start-up for AACE Technology Impacts Local Economy

The central Iowa company that negotiated a licensing agreement with ISURF last year for the computer-aided tap test (CATT) system has delivered two units. The first commercial unit was sold to a French firm for inspection of carbon fiber composites on racing sailboats. The second unit was delivered to a Colorado firm. In the meantime, the company is impacting the local economy as two separate Nevada, Iowa companies have production contracts. One is fabricating the automated scanning unit and the other is producing the cover of the scanning unit using rapid prototyping and injection molding.

Short-term, No-cost Technical Assistance

Capitalizing on the materials science strengths of the Ames Laboratory, the Iowa Companies Assistance Program (ICAP) has provided Iowa manufacturers short-term, no-cost technical assistance with materials analysis, characterization, and testing for nine years and this year recorded more than 115 projects that impact the competitiveness of Iowa manufacturers across the state including:

- ***Hose Clamps*** A north central appliance manufacturer was unable to resolve in-house the reason for hose clamp failures and sought assistance from ISU. ICAP determined that hydrogen embrittlement was the problem and the company was able to fix its supplier problem and reports that nearly $500K in warranty work was saved.
- ***Golf Clubs*** A manufacturer of sporting goods equipment in Spencer wanted to introduce an aluminum-shaft golf club line and sought advice on material selection and processing of aluminum alloys. ICAP performed design calculations and tests to recommend materials and fabrication and heat-treating methods. The company expects to have more than $100K in annual sales and add 1.5 jobs.
- ***Egg Containers*** A northeast Iowa manufacturer worked with ICAP and CIRAS to redesign its existing egg container to hold very large eggs. Now the company is doing market research on the "jumbo flat" to accommodate all grades of eggs, which is currently not offered by any other national company.
- ***Strong Bolts*** A 110-employee machining company in a small northwest Iowa community was experiencing problems with bolts that resulted in additional production costs. ICAP testing revealed that the surface hardness of the bolts closely corresponded with the torque at which the bolts would break. Working with its supplier, the company found the correct bolts and reports that costs were reduced and product quality improved.
- ***Fuel Lines*** A southeast Iowa manufacturer of high-pressure fuel lines needed to verify that its carburized steel ferrules met ASTM heat-treating and plating specifications or face the loss of a client. ICAP examined the ferrules through scanning electron microscopy and electron dispersive spectroscopy and conducted a microhardness profile, providing information that demonstrated the standards were met. In addition to retained sales of $300K, the company reports at least three jobs were saved.

Providing NDE Expertise to Iowa Companies

The Iowa Demonstration Laboratory (IDL) draws on the strengths of the internationally renowned CNDE by offering Iowa manufacturers nondestructive evaluation expertise in assessing materials integrity and providing company specific-NDE techniques and on-site training. This year 41 projects were conducted, including:

- ***Powder Coating*** A central Iowa company came to IDL to help justify construction of a powder-coating system believed necessary to remain competitive. IDL provided research results that convinced the company to move to the powder-coating process. In addition to the 8,000 square-foot facility expansion, the company hired two employees.
- ***Heat-treated Inspection*** In eastern Iowa, IDL was a key player when a company took steps to improve its inspection process and procedures in its fabrication of heat-treated pins and bushings used by agricultural equipment manufacturers. Without IDL's help, the company reports it could

have incurred a quality problem costing more than $250,000.

- ***Ultrasound Inspection*** An east central Iowa company worked with IDL to implement an ultrasonic technique for inspecting flash welds and to review its magnetic particle inspection practices. The company estimates that enhanced nondestructive evaluation methods will save approximately $17,000 a year by reducing destructive testing and improved process control.
- ***Magnetic Particle inspection*** An eastern Iowa rebuilder of gas and diesel engine components learned about ISU's nondestructive evaluation expertise through a workshop sponsored by the Iowa Manufacturing Extension Partnership at Eastern Iowa Community College. The company requested that IDL do an on-site evaluation of its magnetic particle inspection process. The company reports the evaluation was very beneficial to the quality of its procedures and will make a difference in operations.
- ***Injection Molding*** A North Liberty injection molding firm worked with IDL to discuss the feasibility of developing an instrument to measure nondestructively the wall thickness of foamed plastic materials in difficult to reach areas. A probe that has ranges beyond commercially available units was configured and evaluated. The feasibility project has now moved into a CATD cost-sharing research contract.

IPRT Outreach Programs Work Together and Across the State

IPRT's ICAP and CATD teamed with ISU's Biocomposite Group to help a Marshall county firm test an unusual new material for plastic injection molding. The material is a blend of switchgrass fiber and virgin resin. The use of such material could reduce resin costs and lower operating costs for the company. The use of switchgrass for such applications may also provide new markets for growers. The company reports using the switchgrass blend significantly reduced part-making cycle time. With IPRT's assistance, this group is also working with a southern Iowa organization to grow and process switchgrass for uses such as injection molding.

Knock on Wood, Iowa Fibers Found in New Doors

ISU research and extension personnel helped an Iowa company identify and test a locally grown wood fiber to use in its door-skin product. A production run demonstrated an Iowa wood crop can be used to make a better product at lower cost. The company is proceeding with plans to procure a consistent supply of 50,000 pounds per day of wood for the Dubuque mill. This would generate more than $0.5M per year of economic activity in Iowa. In the short term, this would mean a new market for growth derived from more than 4,500 acres of native Iowa forests. In the long term, it could mean the planting of up to 1,500 acres of fast-growing tree crops on lands that would otherwise be prone to floods and erosion.

BOEC Has Diverse Appeal

The Biotechnology Outreach Education Center (BOEC), in its second year of educating, nearly doubled the number of people that were reached. More than 1,900 students, teachers, industry personnel, biotechnology professionals, and members of the general public visited the center in FY02. An additional 948 people were reached through external presentations and workshops. These 2,854 people reached in FY02 compares to 1,500 in FY01. In addition, 12,637 students with 132 different teachers in 121 schools conducted biotechnology laboratory experiments in the classroom with supplies provided by the BOEC. The number of students reached showed an increase of more than 1,000 compared to FY01. Finally, through the BOEC, the Director of Industry Relations and Biotechnology Liaison presented more than ten talks regarding consumer issues in biotechnology, and the Bioethics Outreach Coordinator presented more than 20 talks on the ethics of biotechnology and reached more than 500 people.

B. Heighten efforts to ensure the results of ISU research and technology are used for public benefit.

Transferring Technology to the Meat Industry

A professor in food science and human nutrition (FSHN) provided lectures to more than 500 individuals in the meat industry on "Nonmeat Ingredients" and on "Rapid Methods of Analysis" throughout 2001. In addition, research on lactate and diacetate for control of *Listeria monocytogenes* in processed meats has been

widely adopted by the meat industry, and increased levels of use of these antimicrobials for meat applications were adopted by the USDA last year.

Please Squeeze the Bathtub

If one picture is worth a thousand words, then having the chance to touch and squeeze an object is worth ten thousand words. That's the purpose behind the Universal Design Learning Laboratory (UDLL), the brainchild of a professor in Human Development and Family Studies. The laboratory is a demonstration "home" with full-sized kitchen, bathroom, living room, home office, and children's bedroom. Visitors to the UDLL can see and experience new technology that makes homes more convenient and comfortable as well as provide accessibility for people with disabilities. Visitors are encouraged to squeeze the soft bathtub, take a ride on the electronic toilet seat lifter, or use the environmental control unit to operate 16 lights and appliances from one location. The lab is used by students and faculty from across campus and is scheduled for tours by individuals and groups throughout Iowa. www.fcs.iastate.edu/udll/default.htm.

GIS Databases and Software

As part of his thesis research, a graduate student working with a landscape architecture faculty member developed GIS databases and online software to access data from the original General Land Office (GLO) survey of Iowa (started in 1832, completed in 1859) via the Internet. This makes it possible for landowners, land managers, researchers, students, and others to view GLO maps and read GLO surveyors' field notes using a Web browser.

Knowledge Assessment Tool

In the summer and fall of 2001, a landscape architecture professor and two undergraduate research assistants received funding from the Iowa DNR to apply a social assessment tool in Winterset and Madison County to determine the sources and accuracy of residents' knowledge and perceptions about water quality in the area, particularly with regard to Cedar Lake, which is considered heavily polluted and in need of cleanup. Together with local stakeholders, the Iowa DOT is using the data gathered to help determine how to approach landowners and citizens in the Cedar Lake watershed to build public support for the proposed mitigation project.

Ames Laboratory Integral to ISU Research Efforts

Ames Laboratory continues to play a key role in ISU's overall research effort. In the current federal fiscal year, Ames Lab will contribute $24.8M in DOE funding, accounting for roughly 19 percent of the university's total sponsored research budget. Ames Lab researchers continue to be at the cutting edge of technology in a number of fields as the following briefs illustrate:

- ***Magnetic refrigerator tested—***Using materials developed at Ames Lab, researchers have successfully demonstrated the world's first room temperature, permanent-magnet, magnetic refrigerator. Previous successful demonstration refrigerators used large superconducting magnets. This is the first demonstration using a permanent magnet operating at room temperature.
- ***Database to help combat bioterrorism—***Scientists at Ames Lab developed a new tool that could help in the battle against bioterrorism. The project utilized expertise at the ISU's Veterinary Diagnostic Laboratory to compile an online database of existing information experts and diagnostic facilities for the most deadly animal diseases that could damage or wipe out the livestock industry, and, as in the case of anthrax, infect the human population.
- ***Metal filter material may allow clean burning of "dirty" coal—***Researchers at the Ames Lab may hold the key that would allow some power plants to cleanly burn high-sulfur, dirty coal. A thin metal filter material developed at Ames Lab would overcome the final barrier to commercial application of new clean-burning, coal-fired electric generation technology, resulting in lower generating costs, cleaner air, and a potential economic boom for Iowa.
- ***Ames Lab gets a share of $57M computer research initiative—***Researchers at Ames Lab will receive approximately $1.35 million from the DOE during a three-year period under the new Scientific Discovery through Advanced Computing (SciDAC) initiative. SciDAC awards totaling $57 million have been given to 13 DOE laboratories and more than 50 colleges and universities to support research designed to improve software for high-performance computing systems – terascale computers that are capable of doing trillions of calculations per second.

CSET Researchers to Turn Switchgrass into Power

Iowa farmers may soon be growing power in the form of switchgrass, thanks to research at IPRT's Center for Sustainable Environmental Technologies (CSET). The research is being conducted with the aid of a $250,000 grant from the U.S. DOE's Office of Energy Efficiency and Renewable Energy. The research will take place at the Biomass Energy Conversion (BECON) facility operated by the Iowa Energy Center. A biomass gasifier will convert switchgrass into a hydrogen-rich gas that can be converted into electric power using a fuel cell.

Using Computers to Improve Citizenship

The Research Institute for Studies in Education (RISE), in the College of Education, is working in collaboration with Drake University on a grant funded by the National Science Foundation to enhance Iowans' knowledge about and use of computers. Studies will be conducted during three years to provide data and recommendations for a national program on digital government.

Concrete Research

Every mile of highway constructed in Iowa costs approximately $1 million. Because of the high costs, the Iowa DOT is trying to extend the lifespans of major highways in the state. In an effort to meet this goal, the DOT is collaborating with professors in geological and atmospheric sciences who have been studying de-icing effects on Iowa concrete highways for the past decade. The ISU studies have indicated that de-icing salts cause the mineral ettringite to grow, causing cracking in the concrete. The researchers are now looking at ways to limit the growth of ettringite and increase the lifespan of Iowa's roadways.

Soybean Oil

A research team in the Center for Crops Utilization Research is developing unique new plastics based on soybean oil. The products under development range from very rubbery to hard plastics. The Iowa Soybean Promotion Board has been funding this project for the past five years. Most recently, an economic feasibility study was conducted that identified potential industrial partners and key properties of this technology that makes it economically attractive. Examples of the properties are sound and vibration dampening, shape memory – the products can be heated, reshaped and cooled, and low temperature and pressure polymerization.

Corn Starch

A professor of biochemistry, biophysics and molecular biology has been doing some "amaizing" research on corn ever since he arrived on the ISU campus 15 years ago. Currently he and a colleague are using molecular genetics as a starting point to identify and characterize starch production in corn kernels. Approximately 15 percent of the corn produced is used to extract starch from the corn to create industrial products such as ethanol, fabric starch, and many others. This research will help scientists learn how to customize starch production in the corn plant for a specific end-use.

Promoting ISU Research and Technology

Representatives for ISU attended the national biotechnology associations' BIO2002 conference in Toronto and exhibited a display of research and industrial resources available at Iowa State. ISU was also a major sponsor for the Iowa Department of Economic Development's efforts to promote the state's biotechnology development opportunities by hosting the final reception of BIO2002.

C. Enhance the growth of the Research Park.

The accomplishments of the Research Park in FY2002 demonstrate ISU's success in assisting the establishment of technology companies to establish themselves and helping them grow in Iowa. One unique aspect of the Park is the diversity and potential represented by the companies located there. Companies that reside in the Park, as well as those that are affiliated with the incubator program, are developing technologies that will provide superior crops, cures for disease, healthier and safer foods, and new tools for the medical and biotechnology industries, to name a few.

In the early stages of development, each dollar a start up company spends must be carefully managed to provide the greatest results. It is not unusual for technology companies to spend 2-5 years or more developing a product, testing it in the market and building the business required to produce, sell, and support the product. This is why services provided by

the Research Park, Pappajohn Center and SBDC, the Center for Advanced Technology Development, and others are so important. Each organization provides valuable services to the early stage ventures leveraging the impact each dollar spent by the growing companies.

The commitment necessary to develop technology businesses is a long term and risky business. The Research Park has been doing this successfully for 15 years, creating more than 120 companies that employ nearly 1,400 individuals statewide. A significant portion of the success has been the support received from its partners: Iowa State University, Ames Economic Development Corporation, City of Ames, Story County, Iowa Department of Economic Development, and the State of Iowa. The loss of support from any of these partners affects the operations of the Park, as well as the opportunities available to its companies.

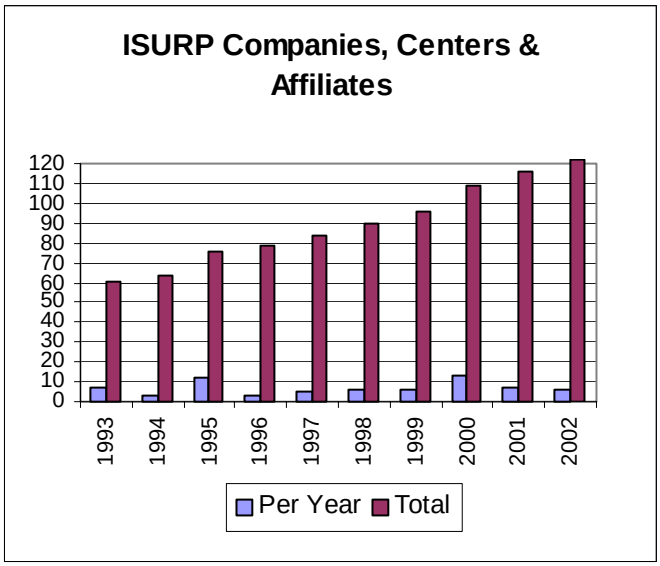


Figure 13

New Company Highlights

Currently 43 companies and centers and eight ISIS affiliate companies are located in the Research Park. Six new companies and affiliates have joined the Park during FY02. Several companies have either expanded during the past year or are planning expansions. Some of these companies include:

- ***NewLink Genetics*** is a biopharmaceutical company developing functional genomics solutions with a primary focus on cancer. The primary mission is to become a vertically integrated pharmaceutical company providing novel diagnostics and drugs for cancer patients. The company intends to link a genomic sequence to its protein function, building upon a unique technology platform to develop new molecular medicines. NewLink is planning its expansion for phase II of Building IV.

- ***NovaScan Technologies*** was created to capitalize on the tremendous emerging markets within the biotech, semiconductor, and other technology industries that utilize scanning probe devices. NovaScan Technologies is already established as a primary worldwide developer and manufacturer of custom-modified scanning probe microscope tips. NovaScan is an ISIS tenant and has more than doubled its space in Building I.

- ***Phytodyne, Inc.*** has developed unique proprietary technologies that strategically position this company within the plant biotechnology sector. Phytodyne's technologies simplify the production of genetically modified crop plants and offer new methods for plant genome manipulation. These technologies enable the production of valuable, proprietary germplasm. Market opportunities for Phytodyne are driven by an expanding need for specialty products produced by genetically modified crop plants for the farm, industry, and consumer. Phytodyne is currently an ISIS tenant in the wet-lab incubator in Building III and will be occupying more than 4,000 square feet in Building IV.

Other Highlights

- ***Construction began on Multi-tenant Building IV, Phase I*** in August of 2001. With the shell building complete, construction of more than 14,000 square feet in tenant finishes is anticipated for completion in October 2002.

- ***Wet lab and office for more than 10,000 square feet for ExSeed Genetics*** were completed in October of 2001 in Multi-tenant Building III. Building III is now completely built and fully leased.

- ***Design and financing for a Biologics Facility*** began in earnest during the summer of 2001. This facility will attract tenants from among the world's leading firms in plant-derived specialty proteins.

- ***Planning is underway for construction of Multi-tenant Building IV, Phase II*** beginning in Fall 2002.

- ***Steve Carter became the permanent president of the ISU Research Park Corporation*** in January of

2002 and continues as director of the ISU Pappajohn Center for Entrepreneurship. With that appointment, the Research Park and Pappajohn Center/SBDC staffs have combined to bring innovative entrepreneurial assistance to technology companies in the Research Park and throughout the state.

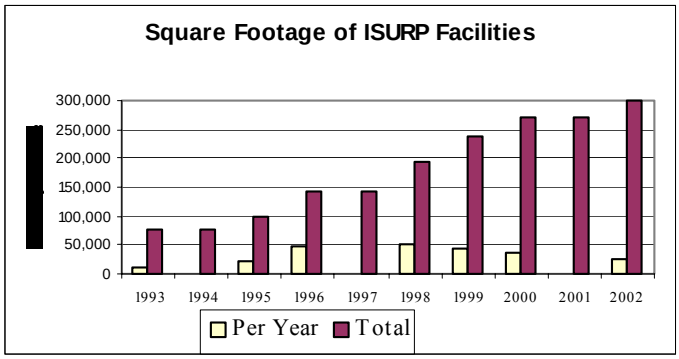


Figure 14

Korean Biotechnology Center

The ISU Research Park and Office of the Vice Provost for Research and Advanced Studies, together with the Greater Des Moines Partnership (GDMP) continued to make progress in the effort to recruit Korean biotechnology companies to the ISU Research Park. Members of GDMP and the Vice Provost made a recruiting visit to Korea that was followed by three separate Korean delegations visiting Iowa/ISU. These delegations included governmental officials, academic researchers, and representatives from more than 30 Korean biotechnology companies. Included in these visits was a business proposal for the formation of a Korean Biotechnology Center Incubator to be located in the ISU Research Park.

D. Continue to develop and implement programs that interface ISU graduate and undergraduate students with Iowa companies and communities.

Pappajohn Center Supports Business Development

The goal of the business development is the creation of wealth through the formation of new companies and the expansion of existing companies. The highest priority is the establishment of companies that utilize technologies developed at ISU. This has been accomplished by creating networks of people in the business community to assist students, faculty and others interested in starting businesses.

The past year has been met with significant budget reductions; however, the Center has continued to deliver support for client companies by:

- Contributing 7,291 hours of professional and student consulting assistance to start-up and existing companies.
- Serving 343 clients and educating 330 through its Smart Start business start-up workshop.
- Working with more than 50 technology companies located at or affiliated with the ISU Research Park.

Entrepreneurial Studies Attracts Many Students

ISU's unique multidisciplinary minor in Entrepreneurial Studies was introduced in the fall of 1998. The minor is available to all majors at the university, and currently there are more than 100 entrepreneurial courses available to students at Iowa State University.

- More than 300 students enroll in the introductory entrepreneurship core courses each year.
- Sixty percent of students in the entrepreneurial studies program are non-business majors.
- Enrollment in the graduate level entrepreneurship courses, Innovation and Technology Transfer, as well as Entrepreneurship & New Venture Creation, continues to increase and attract students from business, life sciences, and technical majors.

Experience Based Learning for Entrepreneurs

The Pappajohn Center offers a variety of experience based learning opportunities for ISU students, the purpose being to provide exposure and experience in starting or working in an entrepreneurial company.

- The Center has offered an entrepreneur internship program since 1997. Nearly 100 students from a variety of majors have worked directly with technology start-up companies located at the Research Park. Many of the students have continued with the companies on a part-time or full-time basis.
- In 2000-2001, the Center formalized three learning laboratories for students; approximately 75 students participate in these laboratories annually.
    - *New Venture Laboratory:* Students work on research, sales, and business planning

projects for a variety of both technology and non-technology clients.

- *Software Development* Laboratory: Students from Computer Science, Computer Engineering and MIS majors engage in software development applications for real companies all around the country.
- *Business Analysis* Laboratory: Teams of students from Business, Engineering, and Industrial Technology work on semester-long research projects for 3M and Lockheed Martin.

Partnerships in Economic Development

The Pappajohn Center strives to establish and expand partnership program opportunities with other university and Iowa organizations committed to economic development and entrepreneurship in the state. Between 2,000 and 4,000 individuals participate in program opportunities throughout the year, twenty times the number of participants from the first year of operation. Programs range from an in-school entrepreneurship curriculum for youth to statewide conferences for seasoned entrepreneurs.

- The Center is a key partner in the Technology Commercialization and Acceleration Program (TCAP) headed by the Iowa Department of Economic Development (IDED) and created to assist technology based start-ups in the state.
- Center staff have partnered with the ISU College of Veterinary Medicine to offer an online veterinary entrepreneurship course to more than 60 veterinary business owners.
- The Center co-hosts the annual Iowa Venture Capital Conference to bring together entrepreneurs, investors, and entrepreneurial students for education and networking opportunities. The conference is a partnership among the Iowa John Pappajohn Entrepreneurial Centers, the Iowa Department of Economic Development, and Equity Dynamics. Additionally, the Center facilitates the annual New Venture Business Plan Competition for students throughout the state of Iowa.
- Iowa State University hosted the first ever Collegiate Entrepreneurs of Iowa Conference to bring together students from a variety of business and technical majors for a day of workshops and brainstorming about entrepreneurship. The University of Northern Iowa will host the conference in 2003 and University of Iowa in 2004.
- Center staff serve on the boards and planning committees of organizations such as Software and Information Technology of Iowa (SITI) and the Iowa Business Council Protein Hot Team.

Pappajohn Center Launches a Communications/Network

In 2002, the Center launched its new website which includes a database communications system to facilitate information sharing, networking, and online registration capabilities for students, faculty, entrepreneurs, and the business community. More than 1,000 students and more than 3,000 individuals subscribe to the current network

ISU Adds New Intelligence to Bar Codes

A Mason City label making company asked an Iowa State Electrical and Computer Engineering senior design team to help develop a promising new market for smart labels that incorporate a Magnetic Radio Frequency Identification transponder in a line of products that could be interrogated at a short distance by a portable read/write device. The Iowa State team designed, implemented, and tested a system that will enable the company to manufacture the new line, contributing to the growth of the business.

What's More Exciting Than Watching Paint Dry?

Controlling the process. That's what a senior design project team from the Electrical and Computer Engineering department discovered when they tackled a project presented by a Centerville, Iowa maker of equipment for automobile body shops. New automobile paints have been developed that dry under infrared lamps in fifteen minutes or less, compared to hours for older coatings. However, the drying cycle times and temperatures must be controlled to an accuracy of plus or minus two degrees Fahrenheit without physically contacting the drying surface. The design team designed, implemented and tested an infrared lamp controller with remote temperature sensor that accurately sets and maintains drying temperatures across various drying cycles. The company plans to add the paint-drying controller to its product inventory.

Preserving and Restoring the Winterset Town Square Retail District

During fall semester 2001, faculty-supervised teams of senior interior design and graphic design students implemented a joint project with seven retail and service-oriented businesses in Winterset, Iowa. Winterset Town Square Retail Renovation focused on preserving or restoring the historic character of the building façades, tying together the interior and exterior appearances of each store, and updating the interiors aesthetically and functionally while fulfilling accessibility requirements. Winterset businesses partially funded the cost of materials, travel, and report publication. They are now reviewing project results for implementation.

CNDE Launches Distance Education Program in NDE

CNDE developed a distance education program in nondestructive evaluation. The university, through CNDE and working closely with the IPRT and the College of Engineering, is arguably the national if not international leader in this area of technology. In response to training needs voiced by industry, a set of distance education courses are being assembled with the goal of establishing a Master's Degree program as well as offering a series of specialized short courses. The initial course, an Overview of NDE, is scheduled for the first time in during fall 2002, offered both through the ISU distance education program and the National Technical University.

National Partnership Introduces Virtual Environment Course

The Virtual Reality Applications Center with the Department of Industrial and Manufacturing Systems Engineering and Engineering Distance Education partnered to bring a cutting-edge virtual environments (VEs) and applications course to ISU. This course brought world experts together with advanced undergraduates and beginning graduate students across the U.S. allowing students and instructors to learn from each other and leverage the efforts of leading researchers in a highly complex and technical area. The course covers the hardware and software needed to produce a useful VE, emphasizing the design of applications. VE pioneers teach through live instruction to four delivery sites–Iowa State, Virginia Tech, Old Dominion, and Deere and Company.

IPRT Provides Research and Real-world Experiences for Students

When ISU students connect with IPRT centers the education is grounded in the land grant mission of learning, discovery, and engagement. Examples:

- ***Virtual Reality Applications Center***—When a mechanical engineering undergraduate started working with her professor in 1998, she probably did not imagine that her studies and work in evaluating a PC-based VR toolkit would land her an internship at Deere & Company, have her presenting a paper at an international conference, or spending this summer at the Bohn Fraunhofer Institute—all before beginning her masters program in Mechanical Engineering at ISU this fall. Another student will base his doctoral studies this fall on his masters program using work that began in 2000 as a project with Deere & Company, related to VR modeling of hose routing.
- ***MRC lab captures student interest***—ISU engineering and physical sciences students have the real-life opportunity to make semiconductor electronic devices in a laboratory-based course offered in IPRT's Microelectronics Research Center (MRC). The hands-on experiences complement the theoretical knowledge that students receive in other materials science and engineering and electrical and computer engineering courses. Job opportunities in the semiconductor industry, word-of-mouth advertising by students, and an increasing number of ISU faculty with interests in electronic materials and devices have contributed to the lab's soaring popularity.

An Electronic Chalkboard

An assistant professor of foreign languages and literatures compares the introduction of the chalkboard to the introduction of computer technology in this century. "I see a computerized classroom as a logical thing to do at the beginning of this century," he said. "This type of computer technology should be a necessary tool in today's classroom." The professor has gotten his wish this semester with the opening of a new foreign languages electronic classroom funded in part through donations from the Cargill Foundation, Inc. The new facility opened for student use in late August and contains 23 student computer workstations hooked to the Internet, a SMART board and an Internet-based video conferencing system (Polycom).

The Polycom video conferencing system will allow Iowa State students to interact through two-way audio and video sent via Internet.

E. Emphasize efforts to partner and build relationships with constituents and stakeholders by participating on committees, commissions, etc., that foster an awareness of as well as address the needs of communities and businesses.

"Reverse" Leadership Studio

During the past three years, 67 people who live and work in the Enterprise Community (EC) have completed a series of leadership development classes through the university's Tomorrow's Leaders Today (TLT) program. In fall 2001, 19 alumni from these classes became the teachers in a "reverse studio class." They used the skills and confidence learned in TLT to develop several presentations on topics of interest and importance to the EC. The Community Outreach Partnership Center is a joint program of the ISU Department of Community and Regional Planning, ISU Extension, the Des Moines EC, and the City of Des Moines, funded by the U.S. Department of Housing and Urban Development.

Students Develop a County Land-use Plan

Students in two Community and Regional Planning studios—fall 2001 and spring 2002—developed a land-use plan for Boone County. The fall semester class created a draft plan to identify areas of the county that would be suitable for future development as well as areas where development should not occur. The spring semester class evaluated and refined the draft plan. The final land-use plan was presented to the Boone County Board of Supervisors, which funded the project. The board will forward the plan to the Boone County Planning and Development Department for further action.

IPRT Works with Iowa's Economic Development and Industrial Leaders

IPRT collaborations in FY02 include:

- Iowa Business Council's initiative "Iowa Coalition for Innovation and Growth" has had the participation of several university units, including the College of Engineering, IPRT, and the Vice Provost for Research and Advanced Studies.
- Center for Advanced Technology Development (CATD) and the Iowa Manufacturing Extension Partnership (IMEP) continue to work with the Advanced Manufacturing Research and Collaboration Consortium, CATD working to lay the groundwork for an Internet-based clearing house for advanced manufacturing technologies available to Iowa companies and IMEP emphasizing LEAN manufacturing.
- CATD hosted at ISU the Professional Developers of Iowa's legislative round table.
- IDED's second DaVinci Conference—CATD panel presentation on entrepreneurial opportunities as well as displays by IPRT, CIRAS, and IMEP.
- CATD staff serve on the IDED Marketing Advisory Committee (MAC), providing review and input towards IDED communications efforts and the business development strategic marketing plan.

City Services Survey

The Research Institute for Studies in Education in the College of Education is working with the City of Des Moines to conduct and analyze data from a survey of the level of satisfaction by residents with services delivered by the City. The data resulting from this study will provide information to Des Moines government units about the implementation of the city's strategic plan, with a goal of making public agencies more aware of people's needs and to point out areas in which service delivery can be enhanced.

Developing Broader Research Relationships

The Director of Industry Relations hosted eight high-level visits aimed at increasing the connections between industry and university beyond individual industry-faculty connections. One long-term research relationship was established with an Iowa company as a direct result of this visit and discussions are continuing with three additional companies.

F. Build partnerships with state and local agencies in an effort to enhance a broad range of economic development efforts.

Assisting Companies to Meet USDA Regulatory Requirements

The Institute for International Cooperation in Animal Biologics organized the 12-day Veterinary Biologics Training Program to teach U.S. and international government officials and industry representatives how the USDA regulates veterinary biologics to facilitate the export of biologics to improve animal health internationally. In 2002, 56 U.S. individuals and 49 international representatives from 14 countries attended the program. Since the program began in 1996, 220 international representatives from 65 countries and 444 U.S. industry personnel have participated in this course.

Revenue Assurance Provides Peace of Mind for Farmers

Revenue assurance generates close to $500 million in annual sales and provides almost $5 billion in risk management protection to the nation's farmers. In 2002, 6.8 million acres in Iowa were insured with revenue assurance, providing almost $1.5 billion in crop protection and annual premiums of approximately $103 million. The revenue assurance insurance program was developed in 1996 by ISU economists and a group of Iowa corn and soybean producers. ISU helped the Farm Bureau Mutual Insurance Company commercialize the concept by developing a new method for rating crop insurance products.

The Center for Transportation Research and Education (CTRE)

The mission of the Center for Transportation Research and Education is to develop and implement innovative methods, materials, and technologies for improving transportation efficiency, safety, and reliability, while improving the learning environment of students, faculty, and staff in transportation-related fields. CTRE works in conjunction with faculty and students in the Department of Civil and Construction Engineering (College of Engineering), Logistics and Management Information Systems (College of Business), and Community and Regional Planning (College of Design).

The Center for Portland Cement Concrete Paving Technology (PCC CENTER)

The Center was approved by the Board of Regents in April 2000 and is located with CTRE. Six workshops were held this year, each attended by nearly 100 representatives of the construction, design, and cement manufacturing industries. The PCC center has 16 research projects underway, valued at more than $3 million. Five of these contracts are being conducted for the Iowa Highway Research Board The Center also took the lead in securing support from ISU, the Iowa DOT, and the Iowa Concrete Paving Association to develop a much-needed research laboratory in ISU's Town Engineering Building. The laboratory was completed in the spring of 2002.

The Bridge Engineering Center (BEC)

BEC research focuses largely on nondestructive evaluation techniques and on the use of new construction materials. These research areas are national priorities, because more than 15% of the nation's 583,000 bridges are functionally obsolete or structurally deficient. More than $7 billion annually is spent on bridge preservation and construction. The BEC provides training, software development, and technical assistance to the Iowa DOT bridge department staff. The BEC developed and administered a course on the use of structural engineering software and coordinated another on the use of a new design technique. The BEC was successful in initiating 5 new projects in 2001-2002 including the first launch of a steel plate girder bridge in the United States.

Traffic Safety

Deaths and injuries resulting from highway crashes are among the most significant public health issues facing our nation. In 2001 there were more than 42,000 fatalities and three million injuries in traffic related crashes in the United States, resulting in $230 billion in annual societal costs. Recognizing this national problem, Traffic Safety is a major research and training theme at CTRE. The research involves application of Geographic Information System and Global Positioning Satellite technologies to the collection and analysis of auto crash data. Two full-time staff members are devoted to safety training in engineering and law enforcement.

- **Iowa Traffic Safety Data Service (ITSDS)** Last year CTRE started the ITSD with funding support from the Governor's Traffic Safety Bureau in the Department of Public Safety. Geographic information system tools are used to map traffic crash data and interpret that data for the use of Iowa transportation agencies. CTRE staff have responded to more than 150 requests since the service began.

- **Crash Location Tool** Research related to the ITSD includes developing and updating a "crash location tool" for use by law enforcement personnel. This software product uses GIS and GPS to automatically locate an incident on an electronic map.
- **Law Enforcement Safety Liaison** In the summer of 2002, CTRE added law enforcement safety liaison to the safety program, funded by the Governor's Traffic Safety Bureau. Using analyses provided by the ITSD, the law enforcement liaison officer helps plan corridor enforcement campaigns around the state.
- **Safety Circuit Rider** The Safety Circuit rider has taught good safety practices to road maintenance and construction crews around the state since 1988. Nearly 1500 road workers participated in 46 workshops in 2001-2002. The Safety Circuit Rider and Law Enforcement Liaison are planning combined sessions to merge the engineering and law enforcement view of safety into a common message.
- **Identification of High-Crash Locations** CTRE used the data in the ITSDS to identify high-crash locations in Iowa and to improve the methodology for identifying locations. The most hazardous locations are not only those with the highest number of crashes, but those with the highest rate of crashes relative to traffic volume. The results of this work are used by the Iowa DOT to improve the roads in high-crash areas. The Des Moines Register carried an article on September 1, 2002, that drew on the results of this work.

Remote Sensing Applications to Transportation

New initiatives in the area of transportation applications of remote sensing were developed in 2001 – 2002. Remote sensing for transportation applications includes satellite imagery and airplane-based imagery such as light detecting and ranging. CTRE is a partner with three other universities and two private companies in the infrastructure group of the National Consortium on Remote Sensing in Transportation (NCRST). NASA and the U.S. DOT, with matching funds from the Iowa DOT, fund the consortium. CTRE faculty and staff are examining uses of remotes sensing technologies to improve assessment of infrastructure performance and to identify highway problem areas for older drivers. As part of the NCRST, CTRE staff and ISU faculty have made two presentations to Congress and several presentations to U.S. DOT staff in Washington, D.C. In August 2001 three Midwestern states associated with the NCRST met in Decorah, Iowa to share experiences in remote sensing applications to transportation

Standard Statewide Urban Roadway Design Specifications For Iowa

After five years of pre-planning and 18 months of work by CTRE, the organizational structure and financial plan are in place to reduce construction costs. Nearly 100 city, county, and state engineers are involved. Six district committees approve all changes to the specifications in the districts, and the statewide committee ratifies changes. Examples include:

- Standard specifications foster greater competition for construction projects and more competition results in lower bids. It is estimated that a statewide program will generate more than $9 million in taxpayer savings each year.
- Standard statewide urban design specifications provide a mechanism to move new technologies into place more rapidly. The statewide process has procedures to review and accept new methods and products. Once accepted, they may be used statewide.
- CTRE has been asked to publish the new specifications on the Web and in CD ROM format. The electronic versions will cross reference Iowa DOT specifications for rural roads with the specifications for urban roads being developed by CTRE.

The Midwest Transportation Consortium (MTC)

The MTC has been operating for more than two years, focusing on research and training in the area of asset management. The MTC is funded through a $5M, five-year, competitive federal grant to ISU/CTRE and four other universities. The components of the program are an annual research competition, a transportation scholars program, a spring transportation videoconference seminar, and the web-based Transportation Expo. Ten research projects are underway at institutions in the MTC's four-state region. Approximately forty student researchers at these schools have received research assistantships through the MTC. Thirty-two transportation professionals have addressed the consortium on the Friday videoconference series.

The Local Technical Assistance Program (LTAP)

- ***Research*** In 2002, a Traffic Engineering Studies handbook was completed for the Iowa Highway Research Board. This handbook explains how to conduct five of the most common traffic engineering studies faced by cities and counties. The manual also provides guidance for obtaining consultant assistance for more in-depth studies.
- ***Training workshops*** Since 1983, LTAP has provided training and technology transfer to local governments and the Iowa Department of Transportation. In 2002, LTAP staff conducted more than 100 training events attended by more than 4,000 Iowa transportation professionals.
- ***Highway Maintenance Expo*** The Expo has been held annually since 1995, and typically attracts more than 1000 state and local equipment operators, mechanics, and supervisors. In 2002 nearly 70 industry suppliers displayed heavy equipment, innovative materials, and services. In addition to this sales opportunity for Iowa suppliers a major benefit of the Maintenance Expo is a continuing training series on snow and ice removal.
- ***Roads Scholar Program*** The Roads Scholar is a new program to recognize individuals that have taken a series of LTAP training courses. All Iowa personnel who have taken LTAP training are automatically entered in the program, which tracks participants' hours of training and progress through the program.

CTRE's Involvement in the Iowa Pavement Management Program (IPMP)

CTRE has conducted research for the Iowa DOT since 1992 on ways to automate the collection of pavement condition data in order to help state and local transportation agencies make better decisions about how to spend maintenance and construction funds. Pavement distress data is collected using laser and video technologies, and CTRE provides a database that incorporates state-of-the-art geographic referencing tools and CTRE-developed software for analysis. CTRE provides pavement management services to the Iowa DOT for the 10,000-mile state system and to more than 50 Iowa cities and counties road systems. Starting in 2002, all county paved roads are also part of the IPMP.

Iowa Mississippi River Trail

CTRE planned the Iowa section of the Mississippi River Trail, a world-class, continuous, multi-use, non-motorized route running from New Albion to Keokuk. The route joins Minnesota and Missouri sections as part of a continuous national bicycle trail. Using data on road traffic volumes, pavement type, road and shoulder width from Iowa DOT records, and national bicycle level-of-service criteria, CTRE students and staff identified existing roads that would make the best bike trail. Maps were prepared showing the route and nearby amenities such as lodging, campgrounds, points of interest, and river crossings. Road improvements were recommended to address unavoidable safety problems – 197 miles of paved shoulder and 9 miles of off the road trail. This project will be a great asset to tourism in eastern Iowa counties.

CATD's SBIR/STTR Successes Bring More Opportunities to Iowa

Visible success and strong leadership led SBA to tap CATD to guide the new, statewide Iowa FAST Partnership. This Partnership seeks to stimulate the growth of technology-based businesses that emerge from research and development activities in Iowa and includes the Iowa Department of Economic Development, University of Iowa's Office of Corporate Partnerships, Iowa Small Business Development Center, and ISU's Pappajohn Center for Entrepreneurship. Initial efforts include building a mentoring community of SBIR/STTR winners in Iowa who are ready to provide one-on-one coaching to new SBIR/STTR applicants and developing a process for fast tracking SBIR/STTR proposals.

Aggressive Partnership Seeks to Accelerate Tech-based Business Development

The leadership at the Pappajohn Center for Entrepreneurship (PCE) and CATD developed a process to accelerate the instate commercialization of Iowa university research for technology-based businesses. With an IDED three-year $500K award to the Iowa State University Research Park, those units, along with the ISU Research Foundation, are implementing Technology Commercialization Acceleration Program. Since July 2001, eight start-up and existing companies from North Liberty to Des Moines and Ames are optioning five ISU-developed technologies for further commercial development

and/or seeking product and market research. These first-year strides are important as PCE and CATD are targeting at least 40 new high-tech jobs and start-up of 15 new companies in the state by 2004.

Des Moines Start-up Forms Working Relationship with ISU through TCAP

A new Des Moines firm seeks to commercialize **in Iowa** new technologies developed **in Iowa,** and a priority project right now is its option on the ISU and Ames Laboratory's superabrasive alloy of aluminum, magnesium, and boron known as "BAM." The firm, in collaboration with ISU, is researching the market applications for this material, identifying commercial users, and developing a scale-up process for production of the material. The company is leveraging a $22K research and development investment with $17K in cost sharing funds from CATD. PCE is directing the marketing effort with of an investment of $3,325 matched equally by Technology Commercialization and Acceleration Program (TCAP) funds.

IPRT Initiates University Program to Support Iowa and U.S. Companies' International Contracts

International contracts often require an investment by the U.S. firm in the industrial infrastructure of the country where the contract is executed. In response, IPRT initiated a program to expand university collaboration with industry by providing specialized support, training, and collaborative research activities to U.S. companies conducting business overseas. Contract activities are underway with a major aircraft manufacturer and nondisclosure agreements to support other discussions are in place with an Iowa-based electronics manufacturer and another multi-national aircraft component manufacturer. The first initiative supports the company's Brazil activities and is composed of 19 ISU representatives from seven colleges and two research institutes.

Conclusion

This report on the 2002 Technology Transfer Accomplishments of Iowa State University highlights its technology transfer and economic development data and accompanying highlights of activities throughout the State. This information emphasizes that the University has made and continues to make substantial contributions to the State of Iowa.

- Iowa State University has become one of the nation's leading institutions for technology transfer as evidenced by its license and options activities, its R&D 100 awards, and its cooperative agreements with the federal government.
- Nearly $13 million in annual sales by Iowa companies were generated by licensed ISU technologies.
- The ISU Research Park has become a major incubator for start-up companies, creating over 120 companies over the years.
- Last year, the SBDC has helped create over 750 new jobs, CIRAS staff has provided assistance that resulted in over 400 new jobs, and the Research Park has helped create employment for nearly 1,400 individuals.
- SBDC clients generated $32.1 million in incremental sales (an increase of 18.4% versus an increase of 1.1% by the average Iowa business).
- Technical assistance was provided to Iowa industries in 96 counties in 2000 and 2001.
- The Pappajohn Center has contributed 7,291 hours of professional and student consulting assistance to start-up and existing companies in 2001, serving 343 clients. The Iowa SBDC assisted 12,211 clients with 95,582 hours of service.
- The Pappajohn Center and SBDC involved over 2,000 students and 42 faculty/staff in their activities. Over 110 students and over 90 faculty/staff participated in projects by CATD and the Center for Transportation Research and Education (CTRE).

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These are impressive numbers in times of a nationwide recession and almost all major categories show further progress compared to last year.

The challenges before us require new approaches as well as continued attention to proven programs. The technology transfer units at Iowa State University will continue to work with businesses and institutions in the State, specifically with the crucial sectors of advanced manufacturing, biotechnology, and information technology. ISU's new venture support system continues to assist entrepreneurial ventures in four primary areas: intellectual property, technology development, business development and facilities. New approaches are being developed to position the University to better develop the intellectual property that is crucial for economic development in the State: Gregory Geoffroy, President of Iowa State University, has announced five new campus-wide initiatives, many of which will directly impact technology transfer. This includes initiatives on food safety and security, biorenewable products, human computer interface program, and information infrastructure. A collaborative effort of all economic development institutions and agencies in the State is needed to take full advantage of these new initiatives in support of the economic development in the State of Iowa.

2002 Technology Transfer Report
Iowa State University of Science and Technology

Impact of State Budget Cuts

I. Status of Technology Transfer and Economic Development

Iowa State University, as part of the higher education system in the State, is charged with advancing technology transfer and economic development activities that promote growth and benefit all citizens. The University evolves these goals by contributing to workforce development, creating intellectual property and advancing ideas to the stage of market readiness, supporting creation of new companies, offering assistance to existing companies, and attracting new companies to the State. The University's technology transfer support system includes the ISU Research Foundation (ISURF), the Pappajohn Center for Entrepreneurship and the Small Business Development Center (SBDC), the ISU Research Park (ISURP), the Center for Industrial Research and Service (CIRAS), and the Institute for Physical Research and Technology (IPRT), including the Center for Advanced Technology Development (CATD), The activities are coordinated through the Coordinating Council on Technology Transfer (CCOTT).

The 2002 Technology Transfer Report provides an overview of the accomplishments of ISU's technology transfer support system, including:

- ISURF currently has over 1000 active license/option agreements – ISU ranks 2nd in the nation in licenses and options executed on its intellectual property.
- Nearly $13 million in annual sales by Iowa companies were generated by licensed ISU technologies.
- SBDC clients generated $32.1 million in incremental sales (an increase of 18.4% versus an increase of 1.1% by the average Iowa business).
- SBDC clients generated 765 new jobs in 2002 (an increase of 51.2% versus an average increase of 2.6% by average Iowa businesses).
- Technical assistance by the Iowa Procurement Outreach Center with CIRAS staff resulted in 420 new jobs in the state.
- Technical assistance was provided to Iowa industries in 96 counties in 2000 and 2001.
- In the first six months of 2002, Iowa companies have won $4.23 million in federal SBIR/STTR awards with the help of CATD.
- ISURP has helped create more than 120 companies over the years employing nearly 1400 individuals statewide.
- The Pappajohn Center has contributed 7,291 hours of professional and student consulting assistance to start-up and existing companies in 2001, serving 343 clients. The Iowa SBDC assisted 12,211 clients with 95,582 hours of service.
- The Pappajohn Center and SBDC involved more than 2,000 students and 42 faculty/staff in their activities. Over 110 students and over 90 faculty/staff participated in projects by CATD and the Center for Transportation Research and Education (CTRE).

The drastic budget cuts of FY03 to the economic development program in the State of Iowa, specifically to the Regents' universities, jeopardize all these activities. Iowa consistently ranks low in all national surveys on business climate, economic development, and venture capital support. Budget cuts in the crucial area of economic development will further aggravate the situation and create new road blocks for developing intellectual property and advancing ideas to the stage of market readiness, supporting creation of new companies, offering assistance to existing companies, and attracting new companies to the State. Severely reduced funding of technology transfer activities at the Regents' institutions reduces their ability to comply with the mission of economic development and jeopardizes the leveraging of state investments with large amounts of federal and industry funding that is crucial for sustaining momentum in building new ventures and improving existing ones.

II. Impact of State Budget Cuts on Specific Technology Transfer Units

Creating New Business - Iowa State University's New Venture Support System

Iowa State University has historically assisted entrepreneurial ventures in four primary areas: intellectual property, technology development, business development and facilities. The tasks are largely accomplished with assistance from the ISU Research Foundation (ISURF), the Center for Advanced Technology Development (CATD), the Pappajohn Center for Entrepreneurship and the Small Business Development Center (SBDC), and the ISU Research Park. To fully appreciate the impact of the budget cuts, it is necessary to understand that these entities comprise a system that fosters and aids in the development of new business ventures. As an ISU technology evolves from a discovery to a business opportunity, it is likely that all four entities have had some impact in preparing the venture.

The fuel that powers the technology transfer system comes from the University and its research centers, which create the intellectual property that attracts existing companies and creates the seed for the creation of new companies. If the University and its research centers are unable to retain and attract the best and brightest researchers, the production of intellectual property that drives economic activity will be reduced. Over the past ten years, the ISU system of support for new technology companies has grown and matured, demonstrating success through venture-funded start-ups such as CombiSep, Proplanner.NET, Advanced Analytical Technologies Inc., Palisade Systems, Bioforce Nanosciences, Phytodyne, NewLink Genetics, and several others. Each of these companies has utilized the services of the ISU support system.

The Center for Advanced Technology Development has played an integral role in the process of technology transfer targeted at new business creation. CATD has provided funding for technology development by providing economic support that focuses technology development on real world applications. Application of technology moves research toward products and markets, the foundation of any potential business.

The Small Business Development Center funding expands the resources available to the Pappajohn Center for Entrepreneurship to develop new businesses. Together, these Centers work with researchers to define the technologist's role in the company, evaluate markets, assist in the creation of a business plan and help the company develop connections with accountants, attorneys and investors.

In a typical year, CATD and the Pappajohn Center will identify 25 prospective new technologies. Experience suggests these technologies can take six to 36 months to develop sufficiently to justify the formation of a business. During this time, CATD assists the researcher in moving the technology from

the researcher's bench to the marketplace. The Pappajohn Center helps the researcher develop the model for the business and establish the network of resources necessary to implement the plan. These resources can include business assistance, students, or capital.

Near the time a venture is launched, facilities become an issue. The Iowa State Innovation System (ISIS), ISU's technology incubator, provides an ideal first home for companies. ISIS offers connections to the University, affordable space with reception services, office equipment (copiers, fax machines, and computers), conference rooms, and other amenities at a very reasonable rate. The Pappajohn Center is located in the Incubator and continues to provide mentoring to the companies as well as the opportunity for companies to utilize students as interns and researchers. ISIS will generally attract five new companies each year. Companies typically spend one to three years in the Incubator moving from product development to product sales. Once sales are established, companies grow out of the Incubator. Some companies remain within the Research Park and continue to receive development assistance, while others move on to commercial space elsewhere.

As companies mature, the University provides opportunities for collaboration between researchers at the University and in the companies. Students provide cost-effective labor and are potential employees. The Research Park provides expansion space, often financing the space and improvements. The Center for Advanced Technology Development provides support for contract research and assistance with SBIR and STTR applications. The Pappajohn Center/SBDC continues to provide a referral network and facilitates the recruitment of students including access to internships.

The State of Iowa has enacted legislation that is expected to increase the availability of venture capital over the next five years. Availability of funds, however, is not the only necessary condition for a flourishing entrepreneurial economy; there must be prospective businesses that are capable of attracting venture capital. In the past five years, the vast majority of equity capital raised in Iowa has flowed to businesses with ties to the University of Iowa and Iowa State University. Given the development that has occurred in San Jose, Boston, New York, North Carolina and Austin, areas that have leveraged their university centers as key players in economic development, it seems essential for the universities in the State of Iowa to continue to play a significant role in economic diversification and expansion. It is therefore critically important to understand that the collective budget reductions to University economic development capacity will have a negative impact on the supply of new high-growth technology companies.

Impact of Loss of Funding for Technology Start-ups

The loss of State support will individually impair each of the entities involved in supporting technology start-ups. Collectively, these cuts will have a devastating impact on the process of creating new technology start-up companies at Iowa State University.

A faculty member considering forming a new technology business today is faced with the following scenario:

1. No CATD funds available to assist in the development of their technology. To capitalize the pre-venture, the faculty member must instead secure grants, which typically are extremely competitive and take up to 12 months or more to produce funding. Given this lack of development resource, the researchers will be more likely to pursue corporate sponsors for their research. The technology would then be transferred to an existing larger company instead of toward the launch of a new start-up venture.
2. A 50 percent reduction in services available to the potential company to develop its business model. This results in longer development times for projects and research performed by the

business assistance center. Fewer researchers will consider starting companies, and center staff time normally dedicated to encouraging faculty to consider starting a company will be reduced.

3. If a company is formed, it will cost the company more to obtain space in the incubator. The company will also have to use their precious supply of cash to fund development of their technology and business. If the company cannot raise additional cash, it cannot survive. One of the most beneficial aspects of the current support system is the ability to provide services to companies that help them preserve cash.
4. If the company grows beyond the Incubator, they can move into space at the Research Park (if it is available) or they can leave the Park. If the company requires laboratory space, the Research Park is generally their only option. The Research Park has, in the past, financed costly laboratory improvements; the companies do not have the financial strength necessary to borrow the money to build laboratory space independently. The Park's ability to provide this form of financing in the future has been substantially reduced.

In total, the loss of State funds will severely reduce the number of technology companies formed at ISU. Those companies that are formed will take much longer to develop; and in an industry where time to market is critical, these companies will face a greater risk of failure.

Impact of Loss of Funding for Specific Technology Transfer Units

Iowa State University Research Park/ ISIS Incubator:
The Research Park and ISIS received $357,000 in State funds in FY 2001-02. The legislature reduced state support by $223,880 for FY 2002-03. The State budget reductions will impact technology companies at the Research Park by:

1. Increasing rent and service fees tenants pay by $123,600 in FY 2002-03 and increased fees the next three years.
    a. Reduces cash available to companies for development and growth.
    b. Increases the likelihood of poor decision making because companies will have to forego needed expenses, e.g., legal services due to lack of cash.
2. Reducing funds available to the Research Park to finance an estimated $501,240 in new buildings and improvements. The loss of $100,280 in income reduces cash available to the Research Park to leverage borrowing the $501,240 required for planned expansion and improvements.
    a. Lack of available space could limit expansion or result in companies locating in other states.
    b. Reduced ability to finance tenant expansion could limit or preclude their expansion.
3. Reducing or eliminating a wide range of services currently available to tenants, and other services will become fee-for-service.
    a. See 1a and b.

The Iowa State University Pappajohn Center for Entrepreneurship/Small Business Development Center

The Pappajohn Center and SBDC at ISU operate jointly, providing business development services to technology companies at the Research Park and to new and existing companies in seven Central Iowa counties. The ISU SBDC budget has been reduced the past two years by $75,000. The impact of this reduction means support to companies will be substantially decreased. The severe budget cut has left two

SBDC centers closed (Creston and Council Bluffs) and the Burlington area office is operating at half time. The southwestern part of the State is left largely uncovered. In addition, market research projects are curtailed and less one-on-one time is spent with clients; they are asked to attend workshops instead. It is anticipated that 125 clients will be served this next year compared to 457 clients seen 2 years ago. Specifically, the centers will:

1. Eliminate five part-time student positions. Students performed market research and assessment, developed financial projections and assisted staff with the development of business plans for both technology and non-technology clients in the state.
    a. The only remaining business consultant will have 70% fewer resources available to assist clients.
    b. Fewer students will receive experience assisting start up and early stage technology companies.
2. Eliminate a business consulting position that was not yet filled.
    a. Non-technology clients will be reduced by 50%, a screening system will make access to a consultant very limited, and in most cases individuals will have to rely upon self-help.
3. Eliminate funds available to hire outside consultants to assist companies. In preceding years, contract consultants typically provided 500 hours annually to assist companies.
    a. Clients will be given access to a much narrower range of expertise.
    b. Cost to clients will rise, as they must pay to access outside resources.
4. Eliminate a full-time program coordinator who assisted in the promotion and management of the Center's outreach activities and the youth entrepreneurship program for 5th and 6th grade students across the state.
    a. Statewide visibility of all Center programs will be reduced, substantially limiting awareness of programs and services.
    b. The youth program will not continue to expand.

The Center for Advanced Technology Development (CATD)
The mission of CATD remains to engage Iowa industry to: 1) establish collaborative contract research projects at ISU; 2) commercialize technologies; and 3) assist small businesses to win SBIR/STTR funding. The second component will be extremely limited this year since there are now no IPRT de-risking funds to support faculty efforts. The Technology Commercialization and Acceleration Program (TCAP) provides Iowa entrepreneurs (including ISU faculty and student start-up companies) funding for technology development and market research to commercialize technology. In order to maintain the maximum possible efficiency under these circumstances, CATD will have to focus its efforts and target exclusively private, for-profit, small- to mid-sized companies (< 500 employees) in these technology transfer efforts.

The Iowa Companies Assistance Program (ICAP)
ICAP will focus on materials science-related projects only. The 40 hours of no-cost service will be limited to first-time customers only. Repeat customers will pay fees for required analytical services (e.g., SEM, metallography) but not for staff time. Non-materials-science projects need to be referred to other campus units. In addition, the Iowa Demonstration Laboratory (IDL) may be forced to charge fees depending on the services required and potential economic impact for the company.

III. Impact of Overall Budget Cuts on Iowa State University

The fuel that powers the technology transfer system comes from the University and its research centers, which create the intellectual property that attracts existing companies and forms the foundation for the creation of new companies. If the University and its research centers are unable to retain and attract the best and brightest researchers, the production of intellectual property that drives economic activity will be reduced. During the last five years, the University's faculty FTE has declined from 1,664 (in 1998) to 1,612 (in 2001) and to 1,577 (estimated) in Fall 2002. This is a drop of over 5%. At the same time student enrollment has increased from 25,585 (in 1998) to 27,823 in Fall 2001, and the Fall 2002 numbers are expected to be similar. This represents an increase of about 9%.

Faculty resignations to join other universities or industry contribute substantially to the decrease in faculty numbers. In fact, we are losing some of the best and brightest researchers in areas in which ISU has a strong tradition of generating intellectual property, disclosures, and licenses. This includes computer engineering, biological sciences, and applied science and mathematics.

ISU performs exit interviews with all faculty that resign to take up professional opportunities elsewhere. Some of the main reasons for leaving ISU include: salaries (since 1998 ISU salaries have been left behind those of the peer land grant universities in all three categories of assistant, associate, and full professors), research and laboratory facilities, and perceived lack of commitment to higher education and technology transfer by the State of Iowa and consequently the University. Some of the most outstanding faculty leave ISU without even asking for a counter offer – they feel that, given the current lack of commitment by the State, the University will not be able to adequately support their work.

At the same time, it has been difficult to attract excellent young talent to ISU. We do not collect data from faculty candidates who turned down offers, but anecdotal evidence indicates that the reasons are mostly the same as those of the faculty who leave the University.

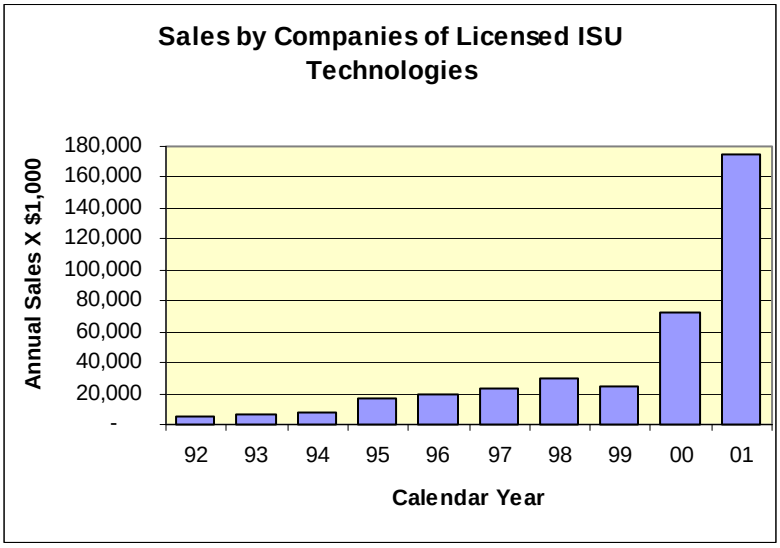
The retention and recruitment shortfalls show some effect in the technology transfer data for 2002, but their real impact will show up in future years. It is very difficult to reverse such a trend once it has started and is known nationally. Recent budget cuts to the Regents' institutions and specifically to the technology transfer and economic development sectors will affect the University and its statewide programs for many years to come.

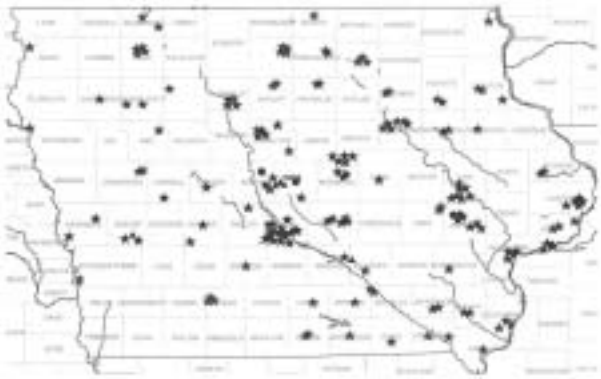
IV. Data

The 2002 Technology Transfer Report contains a wealth of data related to ISU's support of technology transfer and economic development in the State. We refer specifically to Section I.A. about sponsored funding, Section I.B. about intellectual property, Section II.A. on company assistance and creation, and Section II.C. on the ISU Research Park. These data include a historical perspective of trends over the last years.

V. Proof that Technology Transfer and Economic Development Efforts at the Regents' Institutions Make a Difference for Iowa

Technology transfer and economic development data over the last years show that the Regents' institutions have made and continue to make substantial contributions to the State of Iowa. Iowa State University has become one of the nation's leading institutions for technology transfer as evidenced by its license and options activities, its R&D 100 awards, and its cooperative agreements with the federal government. The ISU Research Park has become a major incubator for start-up companies. Last year, the SBDC has helped create over 750 new jobs, CIRAS staff has provided assistance that resulted in over 400 new jobs, and the Research Park has helped create employment for nearly 1400 individuals. These are impressive numbers in times of a nationwide recession.



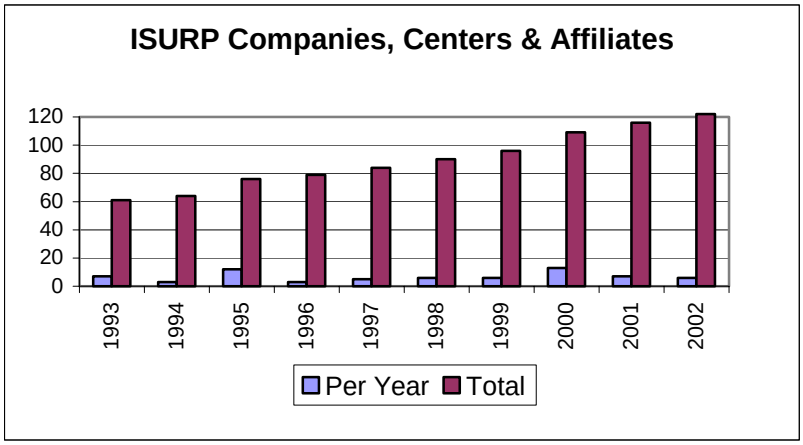


Legend: ★One Project ● Five Projects ▲Ten Projects

Iowa Companies Assistance Program (ICAP)—117 projects

Iowa Demonstration Laboratory for Nondestructive Evaluation (IDL)—41 projects
Center for Advanced Technology Development (CATD) —44 research contracts
IPRT Centers—36 research projects or interactions

Section I of this report summarizes other accomplishments that highlight the impact ISU and its technology transfer support system has on the economy of the State. The 2002 Technology Transfer Report lists the pertinent facts, statistical data, and notable accomplishments during the year.



The loss of State funding puts all these efforts at risk and is likely to damage technology transfer and economic development in Iowa for many years to come. It is crucial that funding be restored to the Regents' institutions to continue and even step up their economic development programs. In addition, several important collaborative industry projects of high visibility are currently underway that need continued momentum. Two of those, related to the emerging bioeconomy in Iowa, are presented in the next section.

VI. Important Projects Underway That Need Continued Momentum

The 21st century will see many petroleum-derived products replaced with less expensive, better-performing biobased products made from renewable materials grown in farm fields, costal waters and managed forests. The opportunity for the U.S., and especially for Iowa is clear: Biomass resources are a strategic option to meet the growing need for industrial materials and energy. Developing biobased industries can help Iowa and the nation maintain both a leadership position in science and technology, as well as a path for continued economic development and high standard of living. For the State and its universities this means continued development and refinement of existing crops as well as new uses for Iowa agricultural products such as biomaterials, biofuels, biopharmaceuticals, and others.

At ISU, the Bioeconomy Initiative is one of five broad scientific initiatives announced by President Geoffroy in September 2002. The initiative emphasizes core research and outreach strengths of the Plant Sciences Institute, the Center for Crops Utilization Research, the Center for Sustainable Environmental Technologies, the Iowa Energy Center and other related efforts on campus.

Building on this research strength with its associated intellectual property development, ISU is pursuing two industry projects that will help establish Central Iowa as a key biotechnology region in the country, a Protein Extraction Facility and a Korean Biotechnology Center at the ISU Research Park.

- Korean Biotechnology Center

The ISU Research Park and Office of the Vice Provost for Research and Advanced Studies, together with the Greater Des Moines Partnership (GDMP) continued to make progress in the effort to recruit Korean biotechnology companies to the ISU Research Park. Members of GDMP and the Vice Provost made a recruiting visit to Korea that was followed by three separate Korean delegations visiting Iowa/ISU. These delegations included governmental officials, academic researchers, and representatives from more than 30 Korean biotechnology companies. Included in these visits was a business proposal for the formation of a Korean Biotechnology Center Incubator to be located in the ISU Research Park.

- Protein Extraction Facility

During the past year considerable effort has been directed toward the construction of a Biologics Facility at the Research Park. It is hoped that this center will initiate the growth of an industry in Iowa focused on the generation and production of animal- and plant-derived proteins for a variety of uses. These efforts have resulted in the raising of significant financial support for the project as well as the identification of a company that is seriously considering becoming the Facility's first tenant.

Both initiatives are at a critical stage in their development. A coordinated effort by the University, the State legislature, and State and local agencies could ensure that these programs will be established in the Research Park. Most importantly, this success could serve as a critical nucleus for attracting other biotechnology companies to Iowa. These efforts could considerably accelerate the development of new products and markets for agricultural products. The increased sales of value added products will enhance Iowa’s economy, improve the quality of the environment, and help to revitalize rural America.

University of Northern Iowa

Technology Transfer and Economic Development

Report to the Board of Regents

October 2002

October 2002

I. Status of Technology Transfer and Economic Development at Iowa's Regent Universities

Technology transfer and economic development are important objectives for the University of Northern Iowa and part of our mission to meet the needs of businesses, entrepreneurs and communities throughout Iowa and beyond. As a comprehensive university, UNI's outreach programs focus on leveraging the intellectual capacity and technical expertise of faculty, staff and students to meet the needs of our external constituents while providing experiential learning opportunities for students. Since the 1980s, UNI has focused its outreach programs in niche areas of academic excellence. Each of these mission-specific programs was designed to meet the needs of Iowa's businesses or communities and to help them become more competitive. During this timeframe, economic development appropriations were provided by the General Assembly to start the Institute for Decision Making, the Metal Castings Center, the Ag-based Industrial Lubricants program and to support the statewide SBDC network. Other funding sources were provided by the General Assembly to launch the Iowa Waste Reduction Center. All of these outreach programs have been successful in providing hands-on technical assistance to businesses and communities in all of Iowa's 99 counties.

Unfortunately, state funding for Regent economic development programs was reduced for fiscal year 2002 and an alarming 60 percent was cut from Regent programs for fiscal year 2003. The amount of economic development funding appropriated to UNI from the General Assembly was reduced even further. The total economic development appropriation for the current year is approximately $350,000, a cut of nearly 75 percent. This has forced substantial reductions in staffing and technical assistance for the Institute for Decision Making, the Ag-based Industrial Lubricants research program, the Small Business Development Center and the Metal Castings Center.

Summary of UNI Technology Transfer and Economic Development Outcomes

Even with three consecutive years of reduced state funding, UNI's Business and Community Services outreach programs continued to accomplish some impressive outcomes in fiscal year 2002. This is demonstrated by the nearly $8,430,500 in federal, state, business-derived and private support dollars for the University's technology transfer and business/community development activities. Nearly 85 percent of these dollars were obtained from sources outside the Iowa General Assembly. Funding of outreach programs from external sources (non-general fund) increased by 25 percent during the past year.

In other measures of success, the UNI outreach programs in technology transfer and economic development activities have collectively served nearly 3,900 businesses and 465 community clients involving approximately 33,560 employees and community leaders in all 99 of Iowa's counties. More than 275 training workshops were also conducted this past year.

UNI outreach programs provided opportunities for 975 students and 67 faculty members to actively participate in economic development and technology transfer projects. Several of these projects were conducted with other Regents Universities, community colleges and state agencies. Outreach and assistance programs have also directly benefited the citizens of Iowa.

The following summary highlights each of the outreach programs that actively pursue the objectives outlined in UNI's Technology Transfer and Economic Development Plan.

The **Ag-Based Industrial Lubricants** (ABIL) Research Program (established in 1991) is committed to providing research and technology transfer activities that stimulate commercialization of soybean-based industrial lubricants and greases, leading to the expansion of market opportunities for Iowa while making America more energy independent. To date, UNI-ABIL has developed and licensed to market some 13 soy industrial products and 4 base oils (a total of 28 product categories). The ABIL program continues to receive national and international attention resulting in a variety of cooperative partnerships with academia, industry and state and federal agencies.

The **Institute for Decision Making** (IDM) has provided hands-on technical services to 465 community clients, which reported the creation of 1,500 jobs, a result they credited in large part to the efforts of IDM. However, due to severe budget cuts, IDM has reduced staff and moved to a fee-based program. IDM will also supplement its state funding with contracted research projects for state government departments and utility companies.

The **John Pappajohn Entrepreneurial Center** (JPEC) provided research, consultation and services to 70 businesses, seed capital support to three new businesses, and 345 individuals participated in JPEC educational programs.

The **Small Business Development Center** (SBDC) continues to gain prominence in downtown Waterloo as a 'one stop shop' for small business technical assistance and training in Northeast Iowa. The Regional Business Center's Business Accelerator Program at the SBDC houses and assists seven early stage companies with technical assistance and facilities. A waiting list was established early in the year for new accelerator tenants. The facilities at the Regional Business Center offer the region's only small business library, business computer lab, virtual offices and low and no cost counseling from professional SBDC consultants and SCORE volunteers. Clients served by the center started or expanded 102 small companies in 2002.

The Iowa Waste Reduction Center (IWRC) serves small businesses throughout Iowa with free and confidential environmental assistance. The IWRC provides assistance with environmental regulations, waste reduction and the latest environmental technologies. Its technology transfer is conducted primarily through hands-on training of small businesses and is supplemented through an on-line database, manuals and a mobile education unit. The Iowa Waste Reduction Center has provided compliance assistance or conducted on-site reviews with more than 2,200 businesses. IWRC's programs and services have received national attention and awards through the years and have become highly sought as models for replication across the country.

The UNI New Iowans Program (NIP) NIP has distributed over 9,000 copies of *Welcoming New Iowans: A Guide for Citizens and Communities* since its first publication in 2001. The publication has been distributed to economic development professionals, elected officials, local government professionals and community groups. The guide serves as a reference for Iowa communities and businesses as they accommodate immigrant and refugee newcomers living and working in Iowa.

Welcoming New Iowans: A Guide for Managers and Supervisors – The Best Practices of Iowa Employers, Immigrants and Refugees in the Workplace is being published to assist employers, managers and supervisors with the unique challenges associated with hiring, training and integrating immigrant and refugee workers. The guide's purpose is to promote proactive engagement of newcomer workers to assure the vitality of Iowa business and the state's long-term economic and social health.

The **Metal Casting Center** (MCC) focuses on providing educational services and technology transfer activities to promote increased productivity for the metal casting industry allowing 32 Iowa foundries to economically compete in the global arena. The applied research program, with national foundry suppliers coupled with the business outreach activities with Iowa foundries, streamlines cutting edge technology, increases productivity, improves process efficiency and reduces foundry wastes and environmental emissions. The MCC program continues to receive national and international attention in innovative applied research and technology transfer activities resulting in the continuation of a variety of collaborative partnerships with academia, industry and governmental agencies.

The **Recycling and Reuse Technology Transfer Center** (RRTTC) is an interdisciplinary research, education and outreach center serving Regents researchers and students, Iowa citizens, business and industry. Through a competitive grants program, the RRTTC has funded over 30 in-depth research projects and provided research, outreach and other educational opportunities to over 90 student interns. Over 150 RRTTC publications and research reports are available. Through publication of RRTTC reports and outreach to the business/industry community and citizens supportive of recycling in Iowa, RRTTC information reaches several thousand individuals each year.

The **Center for Energy and Environmental Education** (CEEE) provides outreach to the public, educational and civic institutions and businesses on issues related to energy efficiency and the environment. Currently 13 projects, spanning a wide variety of issues, are supported within CEEE. Over 17,000 K-12 students and nearly 300 K-12 teachers have participated in CEEE outreach programs. Counting adult education, CEEE programs extend to 163 communities throughout Iowa.

The **Management and Professional Development Center** (MPDC) conducted 115 workshops enrolling 2,162 business professionals from 53 businesses during the past year. Three open enrollment certificate programs were offered, including Leadership Development, Business and Management Essentials and Business and Technology. Customized certificate programs were also designed and delivered to individual businesses in Eastern Iowa.

The **Iowa Training Opportunities Program** (ITOP) has assisted 47 companies by training more than 400 of their incumbent workers. Funding for this training program was provided by the U.S. Department of Labor. Training was provided in the areas of Quality Technician, Understanding Bindery Operations and Computer Numerical Controls (CNC) Programming. ITOP provides short-term, highly focused technical training to meet the needs of incumbent workers and their employers. Improving the skills of workers results in increased productivity, which translates into better wages, better jobs and increased job satisfaction.

Strategic Marketing Services (SMS) assisted 26 businesses throughout Iowa and the Midwest with 45 client projects related to market research and analysis this past year. In addition, the SMS student experiential learning program provided hands-on training for 14 students.

The **UNI Intellectual Property Committee** (IPC) to date has reviewed 28 patent disclosures and 19 patent applications. In addition, ten license agreements and related royalty agreements have been established and one new patent was issued this past year and three are still pending. The UNI Research Foundation has also taken an equity position in a spin-off business created from research conducted by ABIL.

II. Impact of State Budget Cuts on Specific Tech Transfer and Economic Development Units

General Assembly funding for four UNI outreach programs was either eliminated or drastically reduced for FY 2003. The following paragraphs describe the impact of these cuts.

A. Small Business Development Centers –

The sudden 60 percent budget cut to the statewide system of SBDCs during the May special legislative session would have crippled the UNI SBDC and caused the closing of the Regional Business Center if not for a short-term federal grant recently received by the Center. As a result of the state budget cut, one staff position was eliminated and two other positions will be eliminated upon completion of the federal grant (unless funding is restored). The result will be one full-time staff person at the UNI SBDC in an operation designed for four professional staff. The negative impact of the cuts has been immediate and difficult for clients and staff. For example, only five workshops are scheduled for this fall, compared to 35 workshops conducted in the fall of 2001. Outreach to rural clients has been severely curtailed, except for the counseling provided through the rural grant. Based upon requests for services in 2000 and 2001, the RBC expected over 1,300 small businesses to seek assistance this year. In July and August, over 50 would-be new clients faced a three-week or longer wait just for the initial consulting services, resulting in frustration for both clients and staff. All fees for classes and workshops have been raised substantially, which has effectively eliminated access to services for some of the SBDCs lower-income clients.

B. Applied Technical Assistance – Metal Castings Center

The budgetary cut backs in the last few fiscal years by the state have severely impacted the Metal Casting Center's ability to perform services for the Iowa metal casting industry. The cuts have forced the center to restructure their operations, reducing 2.6 FTE in the P&S staff and 0.5 FTE in Merit staff. Of the P&S staff retained, 1.6 FTE will be funded for the current year from the fee-for-services and external grant funds with a permanent 1.0 FTE lost. This has placed a heavy burden on the Metal Casting Center to increase these services at a time of an unpredictable and unstable economy in addition to a reduction in availability of federal grants.

Not only has the reduction in personnel hurt the Metal Casting Center's ability to service the foundry industry, the supplies, equipment, travel expenses and necessary foundry supplies has decimated the center with a loss of over 80% of its funding from the recent cuts. This substantially affects the academic support provided to the Industrial Technology Department. There are no travel funds to provide assistance to the foundry industry or to represent UNI at important national and regional conferences. All travel expenses must come from the Center's already financially strained fee-for-services account. The greatest fear in this precarious financial situation is equipment breakdown or expensive repair costs. This could have a serious impact on our ability to support the state's foundry industry.

C. Research and Applied Research - UNI Ag-Based Industrial Lubricants Research Program

Due to Iowa's current economic climate and resulting funding cuts by both state agencies and associations, the ABIL Program is struggling to continue to offer the same quality of client support, while continuing to meet market acceptance objectives of soy products. Unfortunately, due to this lack of resources (both human and material), the ABIL will need to minimize support services, while initiating a fee for others (i.e., technical support and training, laboratory and quality assurance testing and product sample fees). While these fees may not have a great impact upon our corporate clients, ABIL expects to see a reduction in participation from our smaller, rural business clients who have, in the past, benefited from ABIL's support services (many of these businesses being Iowa-based and include farmers).

In addition, the publishing of a quarterly newsletter, the *ABIL Advocate* (circulation 7,500), will be reduced and offered in an electronic format to conserve funds. This newsletter has served as the cornerstone to the programs marketing efforts. Many clients and constituents ask to receive and appreciate this communication tool. Over the years the newsletter has informed the public to the benefits of and established vital support for new soy products and processes

ABIL has found it necessary to reduce the number of cooperative partnerships (projects with Europe, India and US clients have been placed on hold) specifically designed to explore new uses for soy products, due to this lack of resources. In most instances, these joint field projects often led to the adoption of soybean-based products.

D. Community Assistance -Institute for Decision Making

The Institute for Decision Making (IDM), UNI's community economic development outreach program, had its state appropriations cut by 50% during the May 27th special session of the General Assembly. This cut is in addition to the approximately 30% funding cut that occurred during the previous two years. IDM will be operating on an equivalent of only 1/3 of its FY01 budget. Reductions of this magnitude have resulted in both fundamental changes to IDM and immediate impacts on its clients. Most noticeable will be the reduction in IDM's professional staff, operations and student experiential learning opportunities funded by state monies. At least five positions have been eliminated or transferred to other programs and will not be available to provide direct economic development services to Iowa communities. Another impact will be longer lead times for community client sessions and the probable elimination of some technical assistance programs and services. In addition, IDM has begun charging fees for its technical assistance and seeking other sources of revenue to support its core services. Many of IDM's 465 clients are rural communities and they rely extensively on IDM's technical assistance and guidance for their community and economic development programs. This client base represents nearly one-half of the communities in Iowa that have relied on a Regent's technical assistance program to assist their local development efforts. Reducing IDM's technical assistance will have a direct and immediate impact on local economic development success and at the same time substantially reduce the presence of Regent programs in Iowa communities.

III. Impact of overall budget cuts on Regent Universities

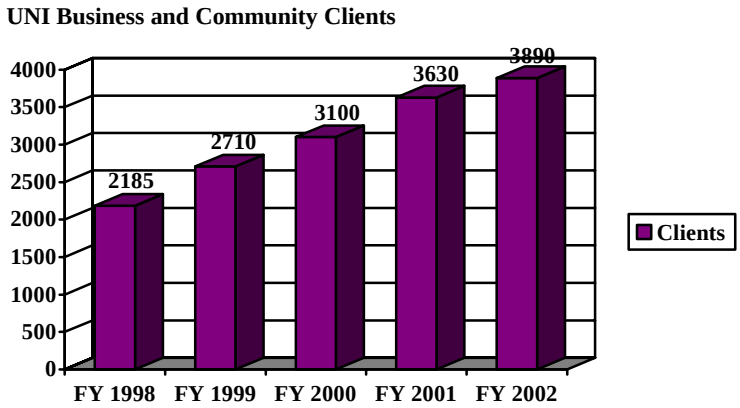
A. Iowa's Regent universities have absorbed a disproportionate portion of the state budget cuts during the past two years. An even larger portion of cuts has been forced upon the Regent economic development programs. Extensive publicity of the budget cuts and generalized statements made regarding the relative value of Regent economic efforts have resulted in public speculation of the future of UNI's outreach programs. Economic development is not a series of events, but instead is a long-term commitment to a sustained process of involving applied research, technical assistance and knowledgeable implementers at the community level. A sustained and long-term commitment to Regent economic development programs is critical to Iowa's economic future.

B. UNI outreach programs have reduced expenses, eliminated positions, implemented fee structures, pursued new contracts and grants and reduced services. This negative impact has not been limited to outreach programs. Student and faculty have also shared the burden of these cuts.

C. Student experiential learning opportunities were reduced by nearly 25 percent in FY 2002 and will be reduced further in FY 2003.

D. Faculty participation in outreach projects will be reduced by nearly 30 percent this year. In addition, both faculty retention and recruitment have been crippled by the deep budget cuts.

IV. Data (5 year summary for aggregated report)



Regent University Corporate-Sponsored Research
Number of Agreements/Dollar Value (in Millions)
FY 1998 to FY 2002

	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002
UNI	$0.7 (27)	$0.1 (31)	$1.4 (46)	$1.7 (55)	2.1 (68)

Regent University Patents Issued
FY 1997 to FY 2002

	FY 1997	FY 1998	FY 1999	FY 2000	FY 2001	FY 2002
UNI	0	3	12	5	2	1

V. Positive Proof that Regent Technology Transfer and Economic Development efforts make a difference

UNI takes an integrated approach to meeting the needs of businesses, entrepreneurs and communities throughout Iowa and beyond, placing an emphasis on applying university-developed technologies to meet identified needs. The past year has been one of measurable success for UNI as the following examples substantiate.

Overall Impact

- $8,430,500 in federal, state, business-derived and private support dollars were obtained.
- Nearly 3,900 business and 465 community clients were served, involving 33,560 employees and community leaders.
- UNI provided business and community assistance programs in all 99 counties.
- 275 training workshops were delivered.

- 67 faculty and 975 students were actively involved in business and community outreach services.

Technology Transfer

- UNI-ABIL has developed and licensed to market some 13 soy industrial products and 4 base oils (a total of 28 product categories). The ABIL program continues to receive national and international attention resulting in a variety of cooperative partnerships with academia, industry and state and federal agencies.
- The **Iowa Waste Reduction Center** provided compliance assistance or conducted on-site reviews with more than 2,200 businesses. IWRC's programs and services have received national attention and awards through the years, and have become highly sought as models for replication across the country.
- The Metal Casting Center (MCC) focuses on providing educational services and technology transfer activities to promote increased productivity for the metal casting industry, assisting 32 Iowa foundries to economically compete in the global arena.

Economic Development

- The Institute for Decision Making (IDM) has provided hands-on technical services to 465 community clients, which reported the creation of 1,500 jobs, a result they credited in large part to the efforts of IDM.
- The John Pappajohn Entrepreneurial Center (JPEC) provided research, consultation and services to 70 businesses, seed capital support to three new businesses and had 345 individuals participate in JPEC educational programs.
- The Regional Business Center's Business Accelerator Program at the SBDC houses and assists seven early stage companies with technical assistance and facilities. A waiting list was established early in the year for new accelerator tenants. Clients served by the center started or expanded 102 small companies in 2002.
- Strategic Marketing Services (SMS) assisted 26 businesses throughout Iowa and the Midwest with 45 client projects related to market research and analysis this past year. In addition, the SMS student experiential learning program provided hands-on training for 14 students.

Technology and Professional Training

- Over 17,000 K-12 students and nearly 300 K-12 teachers have participated in CEEE outreach programs. Counting adult education, CEEE programs extend to 163 communities throughout Iowa.
- The Management and Professional Development Center (MPDC) conducted 115 workshops enrolling 2,162 business professionals from 53 businesses during the past year.
- The Iowa Training Opportunities Program (ITOP) has assisted 47 companies by training more than 400 of their incumbent workers. Training was provided in the areas of Quality Technician, Understanding Bindery Operations and Computer Numerical Controls (CNC) Programming.

VI. Important UNI Programs In Critical Need of Enhanced State Support

A. SBDCs – The UNI SBDC is part of a Regional Business Center (RBC), an innovative and seamless approach to meeting the needs of small businesses in Northeast Iowa. Client activity has grown more rapidly than the other Iowa SBDCs. However, due to reduced state funding and the reduced ability to leverage external funds, the RBC and SBDC will not be able to meet the needs of hundreds of businesses and entrepreneurs. In addition, the future of the highly successful business accelerator is in jeopardy. The best economic opportunities for Iowa in the future are through small business growth. Unfortunately, small businesses and entrepreneurs cannot typically afford the type of counseling services and guidance needed to enhance their probability of success. State funding has historically provided the basis for SBDC funding. Restoration of these funds is vital to the growth of small businesses in Iowa.

B. Institute for Decision Making (IDM) – State of Iowa support for IDM, which had provided the majority of its funding, was reduced by more than $400,000 for FY 03. These budget cuts have caused a reduction in professional staffing, reduced services to clients and created the need for a new fee structure for Iowa community clients. The cuts have led to an immediate and dramatic impact to the ever-growing number of clients that IDM has served over the past 15 years. The value and impact of IDM on the state of Iowa has been achieved through its technical assistance offered by experienced professionals and the personal relationships that have evolved with community clients. IDM has been the constant and stable force in many community's economic development efforts. It is not uncommon for IDM to have assisted local development leadership through four to five changes in professional staffing. Time is of the essence if rebuilding IDM is to be accomplished. It will be difficult for IDM to quickly rebuild or replace the professional team that has been in place for the past several years if most of the reduced funding is not restored this year. Many of IDM's 465 clients have depended on IDM's expertise and guidance for more than a decade. Since development happens at the local level, it is essential to restore funding for IDM to continue its provision of hands-on technical assistance to local development groups.

C. Ag-Based Industrial Lubricants (ABIL) – Restoration of funding is critical in order for ABIL to continue to provide the types of services and support that Iowa's farmers and small businesses need in order to explore new ag-based processes and products. ABIL has been successful in leveraging state support by 3-to-1 with Federal funding, corporate sponsorships and fees for services. Without the core state support, basic services provided to small business across Iowa will not be available, especially product testing and research. Small businesses cannot afford to direct a portion of their budget toward a new endeavor/process or solely initiate a conversion to a new product - though they often realize a benefit in doing so. Soy industrial products and processes need an "advocate" to continue to educate and demonstrate the benefits of their use, which ABIL will continue to do, even if at a reduced rate.

D. The Metal Casting Center provides numerous services to the Iowa foundry Industry and manufacturing community.

- The center performs applied research programs sponsored by numerous metal casting suppliers to improve their products and materials. In turn, the research benefits the Iowa foundry industry to improve the quality of their product, reduce waste and conserve energy.
- The center provides a variety of training programs for the foundry industry to enhance the value of highly qualified foundry personnel. Highly trained, skilled personnel allow the Iowa foundry industry to be more productive and competitive on the national and global

scale. Higher productivity permits the foundry to pay higher wages that in turn retains these people in the industry and state.

- The center also provides valuable services to the manufacturing community. The center assists manufacturers in selecting the appropriate and most economical metal casting process for their product. The center then assists the manufacturer in locating Iowa foundries to meet their production and lead-time requirements.

In summary, the financial support from the state for the Metal Casting Center is critical to improve the competitiveness and productivity of not only the foundry industry in Iowa, but also manufacturing in general. These manufacturers can then provide competitive wages to retain highly sought after skilled workers that maintain or increase Iowa communities' job and tax base. Unfortunately, state funding has been reduced to less than $100,000, severely limiting the Metal Casting Center's ability to maintain a set of core services for the foundry industry and its ability to leverage private support.

VII. Examples of Collaborative Projects

ITOP Collaboration with Community Colleges

The ITOP formed a marketing partnership with all of Iowa's community colleges to assist in marketing ITOP and delivery of training to more than 400 incumbent workers in Iowa.

RRTTC Collaboration with Organizations

The RRTTC has important working relationships with national and state of Iowa Recycling Industries, Industry Associations, Governmental Agencies and private citizens supportive of Recycling in Iowa. This would include but is not limited to the Iowa Recycling Association, Iowa Waste Exchange, Recycle Iowa, Iowa Society of Solid Waste Operators, Beautify Iowa, the National Recycling Association and the Solid Waste Association of America.

MCC and CIRAS

The Metal Casting Center played an active role in the development of the *Industries of the Future Roadmap: Iowa Metal Casting Industry*, subcontracted through Iowa State University's CIRAS under their grant from the Department of Energy Office of Industrial Technology. The roadmap has been distributed throughout Iowa to 55 foundries, casting end-users, foundry material suppliers, purchasing agents and state agencies. In addition to the roadmap, CIRAS and MCC have developed a homepage (www.ciras.iastate.edu/iof) listing metal casting resources, research initiatives and best practices case studies used in the foundry industry.

Economic Impact for IDED Board

The Iowa Department of Economic Development (IDED) evaluates many projects each year that apply for financial assistance. Board members have placed additional emphasis in 2002 toward assisting projects within Iowa's three targeted cluster groups. IDM staff offered assistance to the IDED staff and board by conducting 11 economic impact assessments for major development projects. The economic impact analyses also provided details of the upstream/downstream linkages of the project and related impacts on other sectors of the area economy.

Fast Trac Entrepreneurial Training Program

The SBDC partnered with North Iowa Area Community College and the University of Iowa to deliver the Kauffmann Foundation's Fast Trac Entrepreneurial Training program in Eastern Iowa. Since UNI SBDC entered into this partnership in 1999, 215 Eastern Iowa companies have completed training.

CEEE-Helping Iowa DNR to Improve Iowa's Water Quality

Mainly because of its vast agricultural enterprise, Iowa has the most polluted water of any state in the U.S., and improving water quality is cited as the state's most urgent environmental need. The resources required to satisfy this need, however, are woefully lacking. Thus, beginning three years ago, the DNR became a partner and a strong supporter (but not financially) of our work. The UNI research team, at the request of the DNR, conducted an extensive analysis of the causes of pollution in Silver Lake in Delhi, Iowa, and recommended various remediation strategies. The DNR accepted CEEE's analysis and boosted Silver Lake to the highest priority for remediation in Northeastern Iowa.

ABIL – ISU's Center for Transportation Research and Education

ABIL is partnering with Iowa State University's Center for Transportation Research and Education (CTRE) to investigate transportation applications of ABIL-developed rail curve lubricants. An investigation of potential markets, impact on the economy and rural Iowa and the identification of additional needs that can be met by agriculture-based products are a few of the activities being pursued under this collaborative partnership.

IDM Completes Major Database Project for IDED

Iowa's communities have long collected information about themselves. IDED has created various programs such as I-Media and Info-To-Go to help them format the data. However, the need for nationwide standards for community information has become even more important recently. Paramount among the concerns regarding collecting community information is the difficulty users of that information have in making meaningful community-to-community comparisons when considering potential business locations. In addition, the burgeoning reliance on the internet and the World Wide Web as the tool of choice in obtaining information about potential locations has led to a time compression that demands more and better information to be provided more rapidly. IDM has completed an initial database of 800 data points for all 99 counties in Iowa.

ABIL – ISU Center for Crops Utilization

ABIL again partnered with Iowa State University (specifically ISU-Center for Crops Utilization Research) to explore potential non-food, ag-based forestry products. The collaborative research program will investigate new methods for using vegetable oils and derivatives for wood impregnation, lubrication and preservation (patent-pending).

IWRC – STAR Training with Community Colleges

To date, the Iowa Waste Reduction Center (IWRC) has collaborated with 16 community colleges within Iowa and other states to transfer the Spray Technique Analysis and Research (STAR) Training Program. This collaboration entails community college instructors training at the IWRC applied research facility followed by the purchase of necessary equipment by either the community college itself or, in some instances, the IWRC. The IWRC staff travel to the community colleges to aid the instructor in initial training.

New Iowans Program Assists Businesses and Industries

The NIP is currently developing a program to help Iowa businesses and industries ensure that immigrant and refugee employees become well trained for their positions and oriented to the mission and goals of their respective employer. The program directly assists employers in creating workplace environments that effectively and efficiently accommodate for the unique challenges and needs of New Iowans, while addressing the questions, uncertainties and expectations of traditional workers and managers related to their new coworkers.

New Iowans Program Publications

Welcoming New Iowans: A Guide for Christians and Churches is being published in collaboration with Ecumenical Ministries of Iowa. The purpose of this guide is to aid Iowans in learning more about the state's growing immigrant and refugee population. Readers will be guided in discovering ways to welcome these newcomers, accommodate them into communities and churches, provide important social linkages for the newcomers and maintain/reestablish the viability of their organizations.