The University of Iowa
2011 Annual Economic Development Report

EXECUTIVE SUMMARY

Research drives innovation at The University of Iowa. In FY11, The University of Iowa generated impressive extramural support of $456.5 million. This outstanding productivity continues to place the UI among the nation's elite public research universities and is especially significant in the face of challenging economic conditions in Iowa. This robust research enterprise and integrated economic development activities at the UI have a significant and far reaching impact on the state of Iowa's economy. The IOWA Centers for Enterprise (ICE) provides infrastructure and services to enhance technology transfer and commercialization of UI technologies, new company formation, support of Iowa companies and workforce development. ICE currently includes the following departments.

- The University of Iowa Research Park (formerly Oakdale Research Park) (UIRP)
- The University of Iowa Research Foundation (UIRF)
- The John Pappajohn Entrepreneurial Center (JPEC)
- BioVentures Center (BVC) and The Technology Innovation Center (TIC)
- The University of Iowa Small Business Development Center (SBDC)

In September 2010, the UI released its Economic Impact Study that highlighted and emphasized the impact of research and economic development programs on the state of Iowa. The report is available at http://www.uiowa.edu/impact/ and reiterates both the opportunities and challenges related to successfully translating basic research funded by the federal government to viable economic impact locally.

> *The impact of research often is not shown in the economy until years after its initiation. Based upon current research funding of $429.5 (FY09) million, the economic impact of spin-off businesses and commercialization of research in existing companies is estimated to be between $1.4 billion (conservative) and $2.4 billion (aggressive) on the state's economy by 2020.*

FY11 proved to be an outstanding year for economic development activities at the University of Iowa. Our most notable accomplishments include:

- The UIRF executed 8 option and license agreements to startups based on UI intellectual property, and assisted in forming 3 new startup companies based upon UI Intellectual Property. At year-end, 20 UI initiated startup companies remained viable with 14 of these residing in Iowa. In FY11 the funding and financing of these startups ($33M) doubled over the FY10 total ($16M), which had doubled over the FY09 total ($7M). Eleven startups were successful in securing funding and financing, and numerous startups that received funding in FY10 continued to secure additional funding in this year
- The Iowa Medical Innovation Group (IMIG).is a rapidly growing student oriented interdisciplinary program involving students from the Colleges of Medicine, Engineering, Business and Law focused on the identification of solutions to clinical problems and focused in Health IT and medical devices. Under the auspices of JPEC and UIRF, senior faculty mentor interdisciplinary student innovation teams. In FY 11 two viable technologies emerged for further development. In the current academic year, 20 technologies were initially explored and 4 of these are moving forward.
- The UI Research Park companies and affiliated labs report 1618 employees living in 161 communities in 45 Iowa counties, a regional labor shed covering almost one-half of the state. Average individual salary of $63,000 which translates into an annual payroll of nearly $100 million, resulting in an estimated $9.0 million in state income taxes in 2011. The BioVentures Center currently has 9 tenants, 6 of which are spun from UI technology, for an

occupancy rate of 65%. The Technology Innovation Center (TIC) currently houses 11 tenant companies for an occupancy rate of 77% with two new tenants (Angel eCare and Brain Image Analysis) this year. Since TIC opened in 1989, 23 of the 41 companies affiliated with TIC are still in business in Iowa today.

- The University of Iowa's John Pappajohn Entrepreneurial Center (JPEC) offers one of the most comprehensive entrepreneurial education and business support programs in the nation. Featured programs supporting economic development in FY211 include: providing business consulting services to small companies located across Iowa through its student field study program (55 companies assisted); hosting/sponsoring elevator pitch and business plan competitions to support innovation and new venture creation (5 competitions held); supporting the creation and launch of student-based business through the Bedell Entrepreneurship Learning Laboratory (17 offices at full capacity, plus 8 businesses on a waitlist); and delivering entrepreneurial education through academic courses across campus and online (103 sections taught on campus and 33 sections taught online), workshops/seminars (24 workshops held), and high school teacher training and curriculum.
- In FY11, the Small Business Development Center served 306 clients, assisted in 30 business startups, helped clients raise over $3,800,000 in financing and created 103 jobs.
- In September, voters passed bond referendum that will enable the construction of a unique STEM education innovation center which will serve high school students from 7 surrounding school districts through joint UI, Kirkwood and Local High School faculty.

The following sections of this report will directly respond to specific areas as requested by the Board of Regents. These include: the impact of the University of Iowa activities on the economic growth in Iowa, institutional activities and services that indirectly promote economic development, quantitative information regarding economic development activities in FY11, a summary of outreach and service activities, direct economic development assistance to Iowa communities, summary of GIVF expenditures, and emerging trends in the area of economic development.

IMPACT OF UI ECONOMIC DEVELOPMENT ACTIVITIES ON THE ECONOMIC GROWTH IN IOWA

Job creation and wealth in Iowa

University of Iowa Research Park (UIRP)

UIRP, formerly known as the Oakdale Research Park & Oakdale Research Campus, is a blended campus consisting of a multitude of commercial ventures and a variety of university academic programs and infrastructure assets. As of June 2011, 8 established companies, 20 startup companies and 6 University anchor laboratories were located in the park. These companies have access to University research infrastructure including internet access and access to libraries and research facilities, core facilities to support chemistry, biology, computation and instrumentation. Importantly, companies have access to faculty collaborators and to students as interns or employees.

In FY 2011 the 41 active Iowa companies affiliated with UI Research Park and Technology Innovation Center[1] reported 1,618 employees earning an average salary of $63,000. The 1,618 employees of companies and laboratories affiliated with the UI Research Park and business incubator reported living in 161 communities in 45 Iowa counties, a regional labor shed covering almost one-half of the state. The annual payroll nears $100 million resulting in an estimated $9.0 million in state income taxes in 2011. The affiliated companies and laboratories also reported employing 34 UI students, and 50 employees had earned doctoral degrees.

BioVentures Center (BVC)

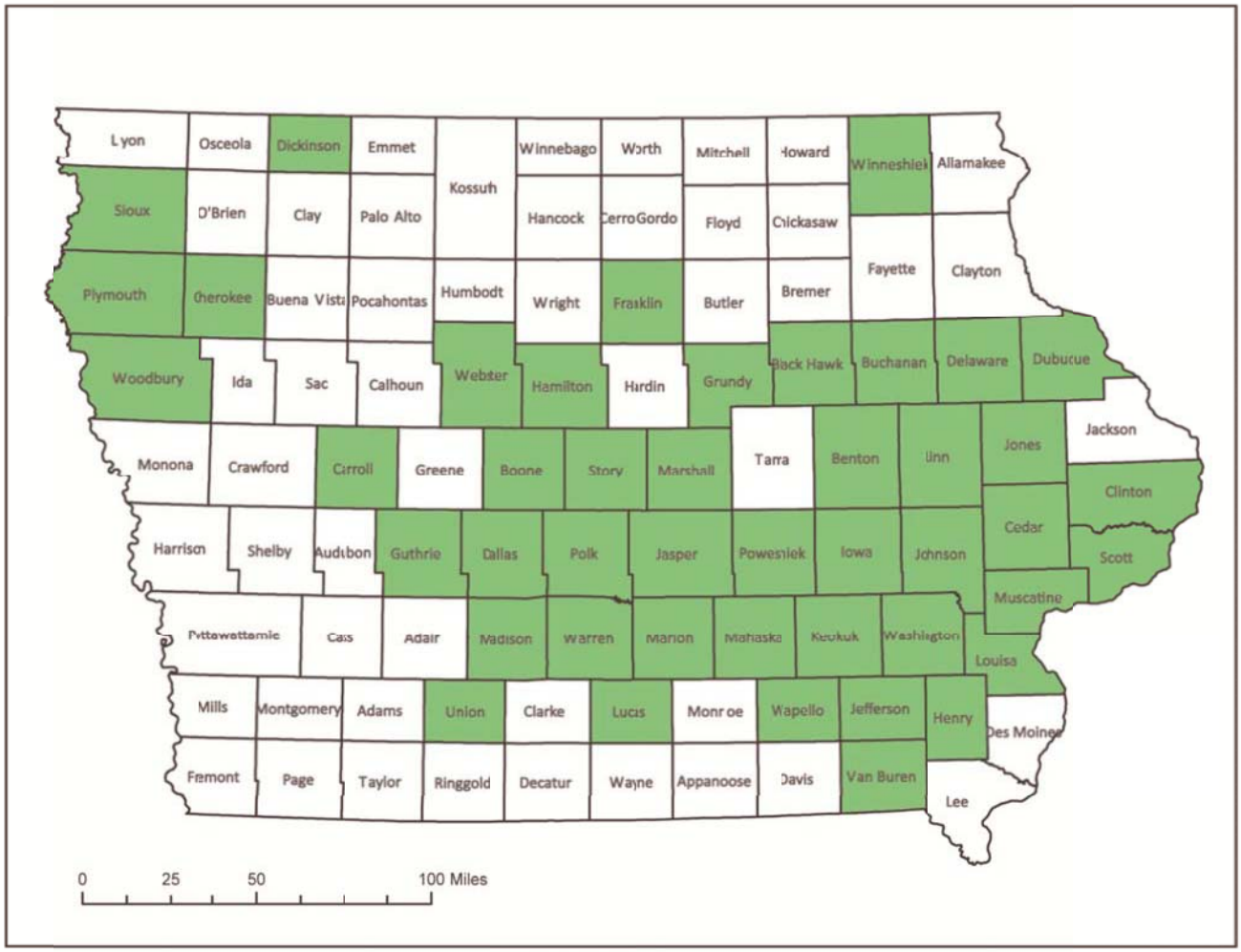
The UI BioVentures Center at the Research Park opened in November of 2008. This 35,000 sq. ft. state-of-the-art biosciences incubator facility allows the University to provide laboratory facilities to support technology based companies emerging from the commercialization of faculty research as well as other startup companies drawn to the area by the substantial R&D assets of the University. We have 7 resident companies and have leased 10 of the 20 laboratories in this facility to startup companies, 6 of which were formed from technology created by UI faculty. GIVF funding was critical in enabling the design and construction of this facility, which now allows us to capitalize on University assets. Nine companies (ASL Analytical, Bio::Neos, Inc., Cellular Engineering Technologies, CQM Systems, Exemplar Genetics, KemPharm, Inc., Terpenoid Therapeutics, Inc, Vertex Pharmaceuticals, VIDA Diagnostics) occupy 10 laboratories and 19 offices in BVC, accounting for 65% of leasable space. Two floors of the west wing of the BioVentures Center have been fit out for those UI units previously housed in Oakdale Hall. These units are associated with research centers reporting to the Colleges of Public Health, Pharmacy and Office of The Vice President for Research.

Technology Innovation Center (TIC)

The Technology Innovation Center provides office space and a nurturing business environment to new technology-based ventures that do not require wet laboratories. In FY11, TIC reported two new tenants (Angel eCare and Brain Image Analysis), for a total of 11 companies. The occupancy rate for the TIC is at about 77%, 27 of the 35 offices are currently rented. Since TIC opened in 1989, 23 of the 41 companies affiliated with TIC are still in business in Iowa today.

[1] This includes active companies at the Technology Innovation Center and/or at the UI Research Park, and graduate companies located in Iowa that are still in business.

FY11 Labor Shed for Affiliated Companies and Anchor Laboratories
UI Research Park, BioVentures Center and Technology Innovation Center



Institutional activities and services which indirectly promote economic development

University of Iowa Research Park, BioVentures Center and Technology Innovation Center

A variety of educational and training programs are offered for UIRP/BVC/TIC tenants and faculty investigators including company marketing techniques, SBIR grant writing workshops, and other entrepreneurial workshops and boot camps. Quarterly round ables are held at the BioVentures Center. These roundtables are initiated by the Research Park companies. Agenda items cover Park and BVC updates as well as company issues and concerns. The Multi-Purpose Room at the BioVentures Center was also made available in FY 2011 to over 50 outside groups.

The John Pappajohn Entrepreneurial Center (JPEC)

JPEC offers one of the most comprehensive entrepreneurial education and business support programs in the nation. Featured programs supporting economic development include: providing business consulting services to small companies located across Iowa through its student field study program (55 companies assisted last year); hosting/sponsoring elevator pitch and business plan competitions to support innovation and new venture creation (5 competitions held); supporting the creation and launch of student-based business through the Bedell Entrepreneurship Learning Laboratory (17 offices at full capacity, plus 8 businesses on a waitlist); and delivering entrepreneurial education through academic courses across campus and online, workshops/seminars, and high school teacher training/curriculum.

- ✓ JPEC is one of the nation's top undergraduate entrepreneurship programs. The Center combines academic course work with experiential learning and is open to all UI students. Each year, over 2,000 students enroll in entrepreneurship courses and, since the program launched in 1997, over 1,800 students earned one of the certificates offered by the Center.
- ✓ The Bedell Entrepreneurship Learning Laboratory has been operating over its capacity of 17 offices, housing a total of 24 businesses throughout the past year. A total of 211 students from nearly every College have been impacted by the facility and received assistance on their business plans since its inception in 2004.
- ✓ The Jacobson Institute for Youth Entrepreneurship is a comprehensive program that enriches K-12 students' lives through classroom and practical educational experiences. During FY2011, the Jacobson Institute impacted over 800 youth and worked with nearly 350 teachers including 29 newly trained high school teachers in Iowa who are using the YouthBiz Central online curriculum. 116 students participated in summer camps held across Iowa.

IOWA Centers senior staff participated in economic development organizations in FY11.

STATEWIDE:

- Iowa Department of Economic Development (IDED)
  - Board, Bioscience Alliance of Iowa (BAI)
  - Board, Iowa Information Technology Council (ITC)
- Iowa Biotechnology Association, Board of Directors
- Technology Association of Iowa, Board of Directors
- Technology Association of Iowa, Panelist Reviewer for TAI annual awards
- Prolog Ventures, Iowa Deal Flow Committee
- Iowa Venture Capital and Entrepreneur Conference, Planning Committee
- Iowa First Capital Fund, Advisory Board
- Entrepreneurial Development Center Board, Member

LOCAL AND REGIONAL:

- Priority One, Board of Directors
- Corridor Business Alliance
- Iowa City Area Development Group, Board of Directors
- Iowa City Area Chamber of Commerce, Member
- Dubuque Sustainable City initiatives

NATIONAL:

- AUTM- Association for University Technology Managers Board of Directors, Assistant VP of Finance
- AUTM Foundation Board of Directors, Member
- National Science Foundation (NSF) SBIR program, Mentor for Phase I-II awarded startups

- NSF SBIR program, Panelist for Proposal Reviews
- NBIA National Business Incubator Association
- AURP Association of University Research Park and Association of University Midwest Research Park Directors
- COGR – Council on Governmental Relations

METRICS DESCRIBING UI ECONOMIC DEVELOPMENT ACTIVITY FY11

a. Number of disclosures of intellectual property	68
b. Number of patent applications filed • U.S. Applications • National Applications • Patent Cooperation • Total Applications	 62 21 7 90
c. Number of patents issued	43
d. Number of license and option agreements executed on institutional intellectual property (The 24 license/option agreements were for a total of 48 different UIRF disclosures) • In Iowa	24 5
e. Number of license and option agreement yielding income	94
f. Revenue to Iowa companies as a result of licensed technology	$1.99 million
g. Number of startup companies formed • In Iowa (Memcine, Mencuro, Tansna)	3
h. Number of companies in research parks, incubators and graduates located in Iowa	41
i. Number of new companies in research parks and incubators	2
j. Number of employees in companies in research parks and incubators	1618
k. Royalties and license fee income	$6.28 million
l. Total sponsored funding	$456.5M
m. Corporate sponsored funding for research and economic development • In total • In Iowa	 $44.7 million $1.5 million
n. Iowa special appropriations for economic development in the following categories • Annual state appropriations for ongoing programs (TIC, ORP and CADD) • Grow Iowa Values Fund appropriations	 $222,372 $1,459,200
o. Estimated jobs created by SBDC clients	103

DIRECT AND HANDS-ON TECHNICAL ASSISTANCE TO BUSINESSES, FACULTY INVESTORS & ENTREPRENEURS

The University of Iowa Research Foundation

- The UIRF aspires to maximize public benefit through commercial use of UI technologies, excellence in commercialization and long term sustainability. In pursuit of this vision, UIRF's primary functions are:
- Licensing - finding suitable partners for commercializing UI technologies and inventions
- New Ventures - identifying and developing new high growth UI technology spinout companies suitable for venture capital financing
- Intellectual property services which include protecting UI inventions through patents and copyrights, advising on intellectual property terms for Clinical Trials and Sponsored Research and executing out-going material transfers
- UIRF's economic development emphasis is heavily focused on startup formation. Working directly with UI faculty, entrepreneurs, and investors in selecting, evaluating and developing new companies, these activities include: IP analysis for viability of proposed company products and IP protection strategies and execution; UIRF fronts the cost of IP protection.
- Due diligence on the viability of UI spinout companies
- Business model development for UI spinout companies
- Provide *Entrepreneurs-in-Residence* for high new priority UI companies
- Provide gap funding for highest priority projects
- Licensing to UI spinout companies
- Extensive mentoring and education of faculty in new company formation

UIRF continued a pilot program called the "seeker" function, with the intention to find and work with key faculty with commercialization potential. The seekers met with 122 faculty members and have recommended continued work with 79 which have potentially commercially viable technologies. To date, the activities have led to 3 additional disclosures and the formation of 3 new companies. As part of this work, UIRF - in collaboration with the ICE and commercial partners (The Entrepreneurial Development Center and Startup Midwest) managed to vet new projects, and fund proof of concept projects that could lead to new company formation. A summary of projects evaluated and forwarded in FY11 is indicated in the first table below. A Historical View of GIVF Commercialization Funding that Stimulated Start Up Activity is also provided in Appendix A.

2011 Commercialization & Business Development Funding Awards Potential of New Projects Evaluated & Supported

No.	Project	Lead Faculty	Funding Awarded $(K)	Cumulative Awards $(K)	Type of Award
1	Improved vaccine efficacy	Gail Bishop	40	40	Commercial. Grant
2	New, improved Anticonvulsants	**Max Baker**	47	87	Commercial. Grant

3	Service model and method for more accurate, rapid, and lower cost genomic sequencing	**Harsha Doddapaneni**	31	118	Commercial. Grant
4	Rapid bone prototyping for surgical repair of bone fractures	**Donald Anderson**	48	166	Commercial. Grant
5	Service model and method for rapid identification of disease-causing gene mutations	**Josep Comeron (John Manak)**	48	214	Commercial. Grant
6	Back pain management	Matthew Howard	25	239	Commercial. Grant
7	Natural cancer therapeutics	Zhendong Jin	Up to 2	241	Further Evaluation
8	Prostate cancer therapeutics	Paloma Giangrande	Up to 2	243	Further Evaluation
9	Biomass hydrocarbon fuels	Gary Aurand	Up to 2	245	Further Evaluation
10	Automated verification of industrial software	Cesare Tineli	Up to 2	247	Further Evaluation
11	Driving simulator for emerging markets	Rangaswamy Rajagopal	Up to 2	249	Further Evaluation
12	Production of lower cost xylitol (natural sweetener)	Michael Louie (Shuvendu Das)	Up to 2	251	Further Evaluation
13	Lower cost production of value-added chemicals and ingredients	**Shuvendu Das (Michael Louie)**	Up to 2	253	Further Evaluation
14	Nanoparticles for improving vaccine efficacy	Ali Salem	Up to 2	255	Further Evaluation
15	Improving photovoltaic efficiency	Johna Leddy	0	255	Not Funded
16	Diagnostics for alcoholism	Rob Philibert	0	255	Not Funded
17	Radiation hard silicone	Ugur Akgun	0	255	Not Funded
18	Patient stand enabling weight-bearing for improved imaging of foot and ankle abnormalities	Phinit Phisitkul	0	255	Not Funded
19	Mobile phone app for the magazine "*The Iowa Review*"	Russell Valentino	0	255	Not Funded
20	Mobile phone app for highlighting Iowa City UNESCO features	Jon Winet	0	255	Not Funded

JPEC provides one-on-one counseling to technology based entrepreneurial companies. JPEC also uses undergraduate and MBA student teams to conduct product assessments, strategic marketing assessments, and other components of an entrepreneurial business plan. Some 55 consulting projects were conducted in FY11. In addition, JPEC supports the efforts of the UIRF to vet and spin out companies based on faculty technology by providing strategic business advice and participating in business development assessments. Several programs related to hands-on technical assistance are described below.

- **FastTrac Entrepreneurial Training Program –** JPEC delivers the nationally acclaimed FastTrac® entrepreneurial training programs of the Ewing Marion Kauffman Foundation of Kansas City. The initiative prepares aspiring entrepreneurs to launch new ventures and existing companies to grow their businesses. Two classes were held in Iowa City in FY11.

- **Seminars/Workshops/Lecture Series –** JPEC hosted over 24 different opportunities last year for students, faculty and persons from the community. In FY11, over 2,100 attendees came to learn from experienced entrepreneurs on a variety of topics including: Technology Export Roundtable, various tax workshops and Entrepreneurial Boot Camp.

- **Entrepreneurial Ventures Group –** JPEC conducts a seminar series, the Entrepreneurial Ventures Group, aimed at aspiring entrepreneurship in students, faculty and members of the community at-large.

- **Wellmark Venture Capital Fund –** JPEC is the regional administrator of the $5M Wellmark Venture Capital Fund that supports the creation and growth of new businesses throughout the state. JPEC screens applicants, performs due diligence, evaluates business concepts, and assists applicants with their business plans. JPEC partners with area angel investors, equity fund managers, lenders, the Iowa Department of Economic Development, and the Small Business Administration to help business owners secure additional venture funding.

- **Elevator Pitch Competitions** – Two Elevator Pitch Competitions were held with $67,000 in cash prizes awarded. One contest was open to any current University of Iowa Faculty, Staff, or Graduate Assistant and 35 teams participated in the competition and the winners received $50,000 in funds. A separate competition was held for UI students in which $17,000 was awarded to 50 student teams.

- **New Venture Challenge** – The John Pappajohn Entrepreneurial Center and the University of Iowa Research Foundation hosted the Spring 2011 New Venture Challenge with over $65,000 in cash prizes awarded. The New Venture Challenge was open to all University of Iowa Faculty, Staff and Students, as well as startup companies with principal addresses at the UI Research Park. Over 58 participants registered for this event.

- **Iowa Medical Innovation Group** – This unique student led program focuses on identification of solutions to clinical problems through collaborations in the Colleges of Medicine, Engineering, Business and Law. Students work on creating medical devices and/or Health IT solutions with the assistance of staff form JPEC and the UIRF and to date over 20 interesting technologies have been identified and reviewed and 4 are currently moving forward in advanced phases of development in anticipation of forming startup companies. This program, now in only its 2nd year, has attracted more than 40 students who meet weekly with faculty, staff and external business mentors.

The Small Business Development Center (SBDC)

SBDC offers one-stop assistance to small business owners by providing high quality, one-on-one counseling that is tailored to the needs of individual clients. The SBDC conducts research, counsels, and trains business owners in management, financing, and operating small businesses, and provides comprehensive information services and access to experts in a variety of fields. Educational programs are offered on topics that include taxes, accounting systems, and business planning. It also offers a wide range of training seminars concerning business skills and issues, and assists small businesses in securing Small Business Administration backed loans. In FY2011, the SBDC served 306 clients, assisted in 28 startups, and helped clients raise $3,800,000 in financing and create 103 jobs.

DIRECT ECONOMIC DEVELOPMENT ASSISTANCE TO IOWA COMMUNITIES

John Pappajohn Entrepreneurial Center

- **Distance Certificate in Entrepreneurial Management –** The Certificate in Entrepreneurial Management is available online to students across the state of Iowa as part of Iowa Community College partnerships. Many online students combine The Certificate in Entrepreneurial Management with the UI's Bachelor of Applied Studies (BAS) or Bachelor of Liberal Studies (BLS) in order to earn their undergraduate degree from The University of Iowa. These online opportunities are offered through UI Division of Continuing Education.

- **Business Consulting Services –** JPEC offers business consulting services to entrepreneurial and startup companies around the state.

- **Okoboji Entrepreneurial Institute** – JPEC conducts an annual institute at UI's Lakeside Laboratories at Lake Okoboji that provides hands-on experiential learning for 40 undergraduates from UI, ISU, UNI, Buena Vista College and Iowa Lakes Community College about what it takes to launch an entrepreneurial enterprise.

Corridor Business Alliance

The Corridor Business Alliance was created in December 2009 and is composed of, leaders from the Cedar Rapids Area Chamber of Commerce, the Entrepreneurial Development Center, Iowa City Area Chamber of Commerce, Iowa City Area Development Group (ICAD), Kirkwood Community College, MidAmerican Energy, Priority One, Kirkwood's Small Business Development Center, the University of Iowa's Small Business Development Center, Research Foundation and Pappajohn Entrepreneurial Center. More information on this regional approach is available at http://corridor2020.com/2009/11/corridor-business-alliance/. The overarching goal is to identify and leverage the region's unique educational, business development and industrial assets to enhance recruitment of new companies, development of innovative startup companies and retention of existing industry.

ECONOMIC DEVELOPMENT SERVICES PROVIDED BY THE RESEARCH PARKS, INCUBATORS SIMILAR SERVICE/ UNITS

The University of Iowa Research Park, BioVentures Center and Technology Innovation Center

Corporate tenants of the Park benefit from sustained relationships with UI in the form of access to specialized research facilities, library access, faculty consultation, research collaboration and access to students as interns and employees. UI resources also provide smaller companies with assistance in business planning, identifying professional service providers, introductions to local and state government agencies and the regional business community, help in identifying potential sources of investment and other funding and communications. For a list of companies and developers associated with the Research Park, BioVentures Center and Technology Innovation Center see Appendix C.

Research Park Core Facilities

In addition to campus based core university facilities, four specialized UI laboratories reside within the Research Park. These facilities provide technical support services critical to the growth of startup companies as well as University and existing industry partners. These units provide Iowa with unique capabilities that IDED and local economic development entities have utilized in recruitment of outside companies to the Park, the region and the state.

These facilities include:

Center for Advanced Drug Development (CADD)

The Center for Advanced Drug Development (CADD) is a division of the University of Iowa College of Pharmacy that offers contract analytical and quality assurance services to the pharmaceutical and biotechnology industry. CADD is U.S. Food and Drug Administration (FDA) registered and current Good Manufacturing Practices (cGMP) compliant and works closely with the University of Iowa Pharmaceuticals, housed on the central University campus. The focus of both CADD and UI Pharmaceuticals is the manufacture and control of clinical supplies of new drugs entering initial Phase I clinical trials. They are particularly attractive to smaller pharmaceutical/biotechnology companies that have new drugs moving into the clinic but have not developed their own manufacturing capabilities.

CADD and UI Pharmaceuticals have an extensive recurrent client base of mainly smaller biotechnology companies, manufacturers of pharmaceutical excipients, and a growing pool of U.S. and foreign pharmaceutical firms. CADD and UI Pharmaceuticals are particularly well positioned to work directly with discoveries from Iowa university research laboratories, thereby providing an opportunity to hasten technology transfer and shorten the time to market. The presence of these FDA registered facilities along with the Center for Biocatalysis and Bioprocessing makes UI unique among US universities to facilitate the development of new therapeutics from pharmaceutical and biotechnology based companies as well as serving to enhance the translational science research occurring within the University of Iowa.

Center for Biocatalysis and Bioprocessing (CBB)

The Center for Biocatalysis and Bioprocessing is a microbial research, pilot plant and education center reporting to the Vice President for Research and Economic Development. The center links university scientists from 6 different colleges who focus on biocatalysis and bioprocessing. The Center also performs process research and development including fermentation and bioprocessing of food products, biofuels, bio-pharmaceuticals and other products of biotechnology. The center collaborates with industries and is capable of working from small molecules to complex proteins, including such products as alcohols, vaccines, antibiotics, anticancer drugs, polymers, biochemicals, enzymes, pharmaceutical intermediates and derivatives of bioactive compounds. In the Research Development and Process Laboratory, we can conduct extensive process research including first level production from the bench-scale to 1000 liter fermentation. The center also has a current Good Manufacturing Practices (cGMP) production facility for biotherapeutics (products produced under cGMP conditions can be used in Phase I human clinical trials) at a scale of up to 300 liters.

The CBB is central to the University's efforts to attract Biotechnology R&D and industrial fermentation companies to Iowa. CBB has worked with ICE, IDED and other Iowa economic development agencies to recruit companies to Iowa. The GIVF funded cGMP laboratories has already put CBB as the leading bioprocessing facility in a US university setting. In 2008, CBB opened the GMP, a state-of-the-art fermentation and bioprocessing laboratory to produce biotherapeutics for Phase I human trials. This new facility will position UI on the cutting edge of biotherapeutics production. In FY11, CBB began technology transfer for production of pyruvic acid based upon patented processes developed at the CBB and this has since been licensed to a major Iowa Bio Based company.

National Advanced Driving Simulator (NADS)

The National Advanced Driving Simulator (NADS) is a center for driving simulation excellence located at the University of Iowa's Research Park. Development and research conducted at the NADS – sponsored by government, military, and industry partners – saves lives, improves quality of life for motorists, advances the state of the art in driving simulation, and improves the efficiency and productivity of the vehicle manufacturing

sector. This facility is home to the world's most advanced research driving simulator, the NADS-1, as well as a collection of specific and general purpose driving simulators, including the MiniSim™. Recent research at NADS has focused on electronic stability controls systems, detection of impaired drivers, distracted driving, novice driver education, remedial safety training of fleet drivers, at-risk populations (older and younger) and assessment of the effects of pharmaceuticals.

State Hygienic Laboratory (SHL)

The State Hygienic Laboratory (SHL) has provided health and environmental laboratory services to the state of Iowa for more than 100 years. The SHL performs 175 different clinical laboratory tests in maternal screening, newborn screening, virology, serology, microbiology, molecular biology, blood lead screening and biological and chemical terrorism response. SHL uses state of art chemical, biologic and enzymatic analytical methods. These laboratories also serve as important training facilities and can perform fee for service analyses for companies at the UIRP and throughout Iowa and the Midwest. The new 113,665 sq. ft. State Hygienic Laboratory facility opened in the fall of 2010. The State Hygienic Laboratory also offers unique training facilities for companies and personnel associated with the clinical laboratory specialties, as an experiential education site for community college students studying clinical laboratory chemistry and will serve as a training headquarters through live and distance learning for public health professionals across Iowa.

COLLABORATION FOR ECONOMIC DEVELOPMENT WITH IOWA ENTITIES

Startup Company to Commercialize Animal Models of Human Disease

UI, Trans Ova Genetics of Sioux Center and the IDED have collaborated to support a startup company that will develop animal models of human disease, an important tool for the research community in its effort to discover and develop new cures for diseases. The effort began with the work of UI's Michael Welsh, MD, an investigator who has studied the development of cystic fibrosis (CF) for more than 15 years. Dr. Welsh developed an animal model for this disease as a part of his investigation. The collaboration with Trans Ova Genetics will allow a mechanism for translation for broader use as a research tool. A $400K Battelle award also supported a part of this development. A new company was formed, Exemplar Genetics, in which Trans Ova owns a minority share. The IDED supported further development of the business with a $1M forgivable loan awarded to UI to support three related projects: 1) development of a small pig facility to support the work, 2) development of a molecular biology laboratory to support the work, and 3) further R&D into the CF model and perhaps one additional animal model of human disease. In FY11, Exemplar raised over 2.4 million dollars in SBIR/STTR funding and has begun selling the pigs developed at the UI to researchers throughout the country. In addition to cystic fibrosis, Exemplar is developing models of cardiovascular disease, cancer, neurodegenerative disease, and muscular dystrophy, among others.

Shovel Ready Site Initiative/Certification

The Shovel Ready Site Program initiative was spear-headed by the Iowa City Area Development Group. The program is designed to give the UI Research Park a competitive edge in the site selection marketplace. The goal of the program is to have selected sites shovel ready, connections to utilities and other physical infrastructure, clear swift procedures for permitting and incentive programs that can be quickly applied to a project. The UI Research Park, along with two other area sites, was chosen as a pilot project site. Gaining shovel ready certification provides a very positive boost to recruitment of technology based companies to UI Research Park and multiple additional sites are nearing shovel ready classification as the interest in locating within the Park continues to grow.

IAWind

The University of Iowa, and particularly the College of Engineering, took the lead in working with IDED to create the Iowa Alliance for Wind Innovation and Novel Development (IAWind), a virtual organization established to promote the wind energy industry in boost to Iowa. This collaboration includes:

- The Regents Universities
- Iowa Community Colleges
- State Agencies (IDED, DNR, Office of Energy Independence)
- Federal Agencies (NSF, DOE)
- Iowa Wind Industries
- Community Partners (Iowa Energy Center, Iowa Wind Energy Association)

The organization comprises components related to policy, research, training and education, and testing facilities. The impetus for this organization arose as the College of Engineering was assisting the Iowa Department of Economic Development in its efforts to recruit wind energy companies to the state, and the need to identify and integrate the state's wind energy assets became obvious. For more information: http://www.iawind.org

Iowa NSF EPSCoR

The 3 Board of Regent Institutions, working with state government, the community colleges and industry led a successful effort to win a highly competitive 5 –year, $24M year grant from the National Science Foundation. The program, known as EPSCoR (Experimental Program to Stimulate Competitive Research) is focused on enhancing the quality of faculty and their competitiveness for additional federal funding, focusing on enhancing the state's renewable energy goals, leveraging linkages with industry and Iowa economic development entities and increasing the pool of Iowan's well trained in the Sciences to allow to compete in the 21st century global economy. A state EPSCoR coordinating committee comprised of University, Community College, Industrial, Governmental and legislative leaders will oversee the ongoing programs and identify new directions as well as leveraging opportunities where Iowa communities can benefit directly from the work on the grant. The link to renewable energy, competitiveness. STEM education and workforce development also fits well with Governor Branstad's vision for innovation, economic development and STEM education on a statewide level.

The University of Iowa linkages to the Dubuque Sustainable City Program

The University of Iowa's strong commitment to community economic development is illustrated in two major projects with the City of Dubuque.

Sustainable Dubuque Watershed Network – this joint research project led by Professor Jerry Schnoor at UI utilizes high frequency sensing of water resources using an embedded sensor network to develop a watershed network and intelligent digital watershed for the North Fork of Catfish Creek in Dubuque with an eye towards understanding, modeling and predicting the infiltration and inflow to the sanitary sewer system which creates unwanted by-pass flows.

University of Iowa Sustainable Dubuque Initiative – this joint effort between the City of Dubuque and The UI School of Urban and Regional Planning is focused on helping Dubuque validate and actualize the specific approaches they plan to take going forward and involves graduate students from UI working local college students and city leaders on several projects over the next two years which include:

2011-12 Projects

- Indicators and indicator measurements for the 11 sustainability principles.
- Renewable energy asset mapping
- Portrait of poverty in Dubuque

- Local foods and local institutions
- Design of Green and Healthy Homes program

2012-13 Projects

- Survey of best practices for land pricing and general plans for redevelopment of port areas
- Commercial/residential redevelopment plan for Washington neighborhood
- Opportunities for integrating city, school, and regional transportation systems.
- Determination of real housing need

Additionally Urban and Regional Planning students have had ongoing projects in Decorah, Wellman, Anamosa, and Columbus Junction in the past and have ongoing projects in Burlington, Decorah, Oskaloosa and Charles City in addition to the Dubuque projects.

University of Iowa/Kirkwood Community College STEM Innovation Center

Joint planning of an innovation campus to identify new models for STEM education and workforce development for Iowa by the University of Iowa, Kirkwood Community College and the Iowa City School District has led to a recent voter approved bond referendum which will enable the construction of such a center on the University of Iowa Research Park Campus. To our knowledge, this is the first of its kind where faculty from all three education sectors will work together to develop and evaluate new models of STEM education. High school and community college students will have access to Advanced College courses in STEM and will benefit from internships and other experiences in our state-of-the-art park facilities (NADS, SHL, CBB, and select other companies) as well as the rich laboratory and clinical resources on the UI campus.

GROW IOWA VALUES FUND (GIVF)

GIVF Impact for the University of Iowa and the Iowa Centers for Enterprise (ICE)

Over the past 6 years, GIVF has provided UI critical support to build the infrastructure needed to better transform UI faculty discoveries into new businesses and/or licensing opportunities. Funds have been used in the following general categories:

- to stimulate commercialization and provide proof of concept funding for promising UI research
- create an infrastructure through personnel and facilities to support growing startup companies within the University the UI Research Park campus
- provide comprehensive entrepreneurial education and business support programs
- lead regional economic development strategy for the Cedar Rapids/Iowa City/Coralville corridor and work closely with existing industry in terms of science and business development

Success Stories Based on UI Technology with GIVF Proof of Concept Support

ASL Analytical, Inc. was provided GIVF funding proof of concept funding in 2005, the company was established in 2006 and are currently located at the BioVentures Center at the UI Research Park and currently has 7 total employees. http://asl-analytical.com/

Mark Arnold and Gary Small were researcher collaborators in the Department of Chemistry. Their idea was to develop chemical sensing technology that can be used to monitor the concentrations of critical chemical constituents within a process of interest. The key is the ability to monitor these concentrations accurately, non-destructively and in real-time, thereby providing a means for feedback control and enhanced productivity. Their plans are to develop this technology for a multitude of sensing applications in the biopharmaceutical industry, include protein expression by E. coli and CHO cells. They are also exploring the translation of this sensing technology into the intensive care unit (ICU) to improve medical treatment of critically ill adult, pediatric and neonatal patients. Since 2006, ASL has secured over $2.6 million in funding from a variety of sources including private investors, SBIR funding from NSF, NIH, and the U.S. Army, and industrial grants and contracts. Efforts to match NSF SBIR Phase IIB funding are underway as a way to fund employee expansion.

Terpenoid Therapeutics was provided GIVF funding proof of concept funding in 2005. The company is currently located in the University of Iowa Research Park in the BioVentures Center Incubator and currently has 6 employees. http://www.terpenoid.com/ Terpenoid Therapeutics, Inc. is a spin off cancer drug discovery and development company based on the intellectual property from the research of Drs. David Wiemer and Raymond Hohl in Chemistry and Oncology, respectively. The company has been successful in multiple SBIR grant applications, the IDED DEMO fund as well as in raising significant private capital and has two lead compounds approaching Phase I human clinical trials. Since 2005, the company has raised over $2M in external funds including IDED demonstration funds ($150K), Series A funding ($1.5M) and SBIR/STTR ($414K).

Grow Iowa Values Fund projects for FY 2010 – FY2011

GIVF Program Summary	Description of Program	FY11 – GIVF Expenditures From FY10 and FY11 Match Funds Source	Progress through June 30, 2010 ROI DATA
VP for Research	These funds have been instrumental in enabling UI to expand the economic development infrastructure. These funds supported critical economic development functions associated with University Research Park, BioVentures Center, Technology Innovation Center and IOWA Centers for Enterprise.	**FY 2011 $879,349** **MATCH:** **Ryan Companies, UI Biology Department and UI Research Park Corporation in- kind contributions $449,704**	Satellite offices for ICE units have been established at BVC. This will provide tenant companies direct access to experts to help move their business development goals. Preferred vendors selected for critical UIRP infrastructure including a fitness facility and a day care facility for park companies, Our collaborative internal economic development organization is leading efforts of the Corridor Business Alliance to create a regional economic development strategy for the Cedar Rapids/Iowa City/Coralville corridor Staff support for UIRP, BVC and TIC Annual entrepreneurial education and celebration event that highlighted ICE accomplishments as well as recognize UI faculty, staff and students for entrepreneurial awards.
BioVentures Center and University of Iowa Research Park	The BioVentures Building was made possible by a collaborative partnership between Ryan Companies and the University of Iowa. The new building provides critical space and services for life science startup companies at the University of Iowa Research Park. The BioVentures Center will use these funds to pay debt associated with the construction of the new BioVentures Building. .	**FY 2011 $492,500** **MATCH:** **UI BioVentures Center in-kind contribution $246,250**	65% of leasable space at the BVC and 77% of leasable space at TIC. Nine companies (ASL Analytical, Bio::Neos, Cellular Engineering Technologies, CQM Systems, Exemplar Genetics, KemPharm, Inc., Terpenoid Therapeutics, Inc., Vertex Pharmaceuticals and VIDA Diagnostics) New shared lab space built out in BVC to support early stage companies in their pursuit of external funding including SBIR The University of Iowa Research Park has achieved shovel ready certification.

John Pappajohn Entrepreneurial Center	To fund expenses associated with training, consultation and outreach for Iowa entrepreneurs. JPEC continues to expand outreach programs for Iowans: 1) Support the development, implementation, and expansion of entrepreneurship programs; 2) Enhance support for faculty and area technology and high potential startup and early stage companies through one-on-one consulting, education seminars and workshops, and student/faculty field study projects and 3) Continue support for elevator pitch and business concept competitions for UI-based new and emerging ventures.	**FY 2011 $376,393** **MATCH: JPEC in-kind contribution $175,307**	Employed a Project Manager to work with UI faculty / staff / students in the areas of strategic business planning, market research, operations and financial assessment. Project manager also identified and managed projects for existing Iowa-based companies to work with UI student consulting teams. JPEC hosted over 24 different opportunities last year for students, faculty and persons from the community. In FY11, over 2,100 attendees came to learn from experienced entrepreneurs on a variety of topics including: Technology Export Roundtable, various tax workshops, and Entrepreneurial Boot Camp JPEC held various elevator pitch and business plan competitions for UI faculty, staff and students. 308 entrepreneurs participated and 55 received a total of $80,000 in seed funding.
Center for Biocatalysis & Bioprocessing	To expand into a dedicated bioprocessing support for industrial biotechnology companies at the CBB. Currently, CBB is deficient in performing these operations, which have the potential to convert soy and corn residues to fuels and chemicals. CBB has experienced a surge in these activities. This reflects the surge in DOE and Venture funding into companies involved in this area.	**FY 2011 $549,758** **MATCH: CBB in-kind contribution $274,879**	CBB achieved $2.5 million in revenue in FY11. Several 30 L fermenters and recovery equipment have already been installed as a first step towards establishing full capability in the industrial biotechnology area. In FY11, CBB began technology transfer for production of pyruvic acid This technology has been licensed to an Iowa company. The company is further scaling up this technology for large scale production.
University of Iowa Research Foundation (UIRF)	UIRF focused on two primary activities: 1) continue its contribution to the integrated model of new company formation and 2) educate faculty in key colleges and departments towards identifying viable technology that has potential to create intellectual property that can be protected and lead to new companies and/or licensing opportunities. Since University derived intellectual property is by nature very nascent in terms of its readiness for forming companies and attracting additional investment capital, GIVF has been critically important to assist in establishing proof of concept in several of our most exciting technologies in advance of forming companies. These funds also are very helpful in helping attract additional proof of concept funds from federal and private sources	**FY 2011 $828,215** **MATCH: UIRF in-kind contribution $414,000**	Funds were utilized to support existing projects that continue to demonstrate commercial merit. This support included specialized entrepreneurs-in-residence, technology experts, external grant identification and application, intellectual property evaluation and strategy, external partnership development and assistance in securing investment. GIVF Seed Grant Program. GIVF funding has been critical in creating a culture of commercialization and enabling the creation of highly innovative startups based on faculty research. GIVF investments can be directly linked to 13 existing local startups as of FY10, 2 more were formed in FY11 and 4 others are in formation stages for a current running total of 19. See Appendix A for Historical perspective of GIVF funding that Stimulated Start Up Activity

EMERGING TRENDS IN UNIVERSITY ECONOMIC DEVELOPMENT AND TECHNOLOGY TRANSFER

Emerging Trends- There has been a clear focus among major research universities to enhance their infrastructure to more effectively move important research findings towards commercialization for the benefit of society as well as to maximize economic value. National conferences held by early stage investors and conferences held by university tech transfer groups are merging. Experienced business and new venture development professionals are becoming common place in university tech transfer organizations, and university tech transfer conferences are presenting relevant business and new venture sessions. Successful university research parks have vibrant laboratory- based business incubators that provide both facilities and active business support programs for their startup companies. Most successful university business incubators are constructed debt free, or very close to it. Graduate space for incubator companies – sometimes called accelerator space – is becoming a mainstream program to support companies as they graduate from life science and IT incubators.

Available Capital- Due to the very early stages of most technology based University Research, the access to proof of concept capital investment remains a critical element for continued success. GIVF funding has been critical to UI success to date and has enabled us to build an infrastructure to enhance our ability to identify high value technologies that could lead to commercialization in the future. Aside from this type of state funding, federal support through SBIR/STTR programs remains a vital program that enables competitive vetting of new ideas and technologies and in some states matching programs to federal support has enhanced technology transfer greatly. Without this early stage investment many of our nascent technologies and very early stage companies will fail in one of the many Valleys of Death along the technology transfer pipeline as most other investments, including some of Iowa's existing programs are focused on more established companies and technologies to insure financial viability.

New Programs- Most universities see only a few percent of technologies commercialized, typically because of lack of proof of concept for these innovations. As such, this is an area of growing focus for universities. New programs are focused on establishing the means for proof of concept that can lead to an interested commercial partner and the required capital to bring innovations to market. One example is to extend the concept of Entrepreneur-in-Residence which is applied to new startups, to Commercialization. These individuals are being attracted to universities for their combined technology and business expertise to help faculty invent for specific market needs, versus the more historical serendipitous approach. Another innovative program is the Iowa Medical Innovation Group. This is an interdisciplinary endeavor between JPEC, the TCOB, Carver College of Medicine, College of Engineering, and College of Law. The primary objectives of this program are to provide advanced students a working knowledge of all phases of medical device / technology development and to commercialize new medical innovations.

Alignment with State and Regional Priorities and Cluster industries – working closely with the IDED as they develop their Innovation Council universities are strategically positioned to support the state's three science and technology platforms of biosciences, advanced manufacturing and IT. They are also working across all 3 Regents institutions to develop strong infrastructure to support renewable energy. This alignment is crucial for Iowa's success in terms of science and technology infrastructure, workforce development and alignment with state and regional economic development assets need to create and recruit key companies in targeted areas. In the case of UI our local targeted industry clusters include Wind Energy, Food Processing and Biotechnology and the university continues to align itself to support growth in these areas.

Faculty Cluster Research Priorities – As a major strategy to focus our investments on our most successful research programs we have initiated hiring strategy revolving around clusters of faculty focused on societal problems of major importance and with high probabilities for attracting external funding. Thus in 2010 a faculty cluster hires in Water Sustainability were made across 6 colleges and we have current clusters forming in Aging, Obesity, Genetics and Public Humanities, all involving multiple colleges, and in some cases also linking with ISU and UNI. In each of these areas we were working to identify faculty who will also have as a high priority an interest in motivating their colleagues to focus on commercialization and technology transfer related to this "grand challenges".

Appendix A

Summary of Historical GIVF Commercialization Funding Stimulating Startup Activity

2011	GIVF Funded Projects	Potential Startup Identified	Startup Formed	Year	Company Name	Startup Is On-Going	Remains Under Consideration for Startup	GIVF stimulated What Result
Anderson	1	√	√	2011	FxRedux LLC	Yes	√	Startup Formation
Baker	2	√	√	2010	Memcine	Yes	√	Startup Formation
Doddapaneni*	3							
Manak*	4	√					√	Startup Interest
Bishop	5	√	√	2010	Mencuro	Yes	√	Startup Formation
Howard	6	√					√	Startup Interest
2010								
Schultz	7	√	√	2009	ViewPoint Mole. Diag.	Yes	√	Startup Formation
Adams	8	√					√	Startup Interest
McCray	9							
Lim	10	√	√	2007	JL Meditech	No		
Leddy	11	√	√	2009	Voltesla	No	Techs licensed to partners	Startup Formation
2007								
Abramoff	12	√	√	2009	IDX	Yes	√	Startup Formation
Arnold	13	√	√	2005	ASL Analytical	Yes	√	Industry Partner
Hohl	14	√	√	2005	Terpenoid Therapeutic	Yes	√	Private Financing
Welsh	15	√	√	2007	Exemplar Genetics	Yes	√	Startup Formation
Wolgennaunt	16	√	√	2006	OMR Sensors	No		
TOTAL	16	14	11			8	11	

1. *Original company is no longer viable*
2. *Voltesla performed technology proof of concept work; technologies were subsequently licensed to other commercial partners; the startup co. is no longer needed. Original company is no longer viable*

Appendix B

Name of Business or Other Entity Served	City and County where this Project is in Place		University Unit that interacted with business or other entity
	City	County	
BUSINESS INCUBATOR TENANTS			
AMBI Group	Coralville	Johnson	Technology Innovation Center
ASL Analytical	Coralville	Johnson	BioVentures Center
Bio::Neos, Inc.	Coralville	Johnson	BioVentures Center
Cellular Engineering Tech.	Coralville	Johnson	BioVentures Center
Componica, LLC	Coralville	Johnson	Technology Innovation Center
Digital Artefacts, LLC	Coralville	Johnson	Technology Innovation Center
Exemplar	Coralville	Johnson	BioVentures Center
Innomatix, LLC	Coralville	Johnson	Technology Innovation Center
Corvida Medical	Coralville	Johnson	Technology Innovation Center
KemPharm, Inc.	Coralville	Johnson	BioVentures Center
Ramaanchar Technologies, Inc.	Coralville	Johnson	Technology Innovation Center
Terpenoid Therapeutics, Inc.	Coralville	Johnson	BioVentures Center
The Thomas Group	Coralville	Johnson	Technology Innovation Center
Vertex Pharmaceuticals	Coralville	Johnson	BioVentures Center
VIDA Diagnostics	Coralville	Johnson	BioVentures Center
Kepa Services	Coralville	Johnson	Technology Innovation Center
SantosHuman, Inc.	Coralville	Johnson	Technology Innovation Center
RESEARCH PARK TENANTS			
LMS North America	Coralville	Johnson	UI Research Park/TIC Graduate
Stanley Environmental, Inc.	Coralville	Johnson	UI Research Park
Vangent, Inc.	Coralville	Johnson	UI Research Park
Integrated DNA Technologies, Inc.	Coralville	Johnson	UI Research Park/TIC Graduate

Pearson Educational Measurement	Coralville/Iowa City	Johnson	UI Research Park
Noel-Levitz	Coralville	Johnson	UI Research Park
Cargill International	Coralville/Cedar Rapids	Johnson	UI Research Park
Brighton Group	Coralville/Des Moines	Johnson/Polk	UI Research Park
OTHER BUSINESS INCUBATOR GRADUATES ACTIVE IN IOWA			
Ecolotree, Inc.	Lowden, North Liberty	Cedar, Johnson	Technology Innovation Center
Accredo Therapeutics	Iowa City	Johnson	Technology Innovation Center
Corcoran Communications, Inc.	Iowa City	Johnson	Technology Innovation Center
Innovative Software Engineering	Coralville	Johnson	UI Research Park/TIC Graduate
Bio-Research Products, Inc.	North Liberty	Johnson	Technology Innovation Center
aJile Systems, Inc.	Cedar Rapids	Linn	Technology Innovation Center
CompuTerra, Inc.	Cedar Rapids	Linn	Technology Innovation Center
Sustainable Science	Iowa City	Johnson	Technology Innovation Center
Caviforce Technologies, Inc.	Des Moines	Polk	Technology Innovation Center
Sebesta Blomberg & Assoc., Inc.	Coralville	Johnson	Technology Innovation Center
HomeSafe	Coralville	Johnson	Technology Innovation Center
Integrated DNA Technologies, Inc.	Coralville	Johnson	UI Research Park/TIC
The Patient Education Institute	Coralville/Iowa City	Johnson	UI Research Park/TIC
Police Law Institute	Coralville/North Liberty	Johnson	UI Research Park/TIC
Goldfinch Diagnostics	Coralville	Johnson	Technology Innovation Center
Corridor Media Group	Coralville	Johnson	Technology Innovation Center
DEVELOPERS			
Myriad Developers, Inc.	Cedar Rapids	Linn	UI Research Park
TMD, L.L.C.	Solon	Johnson	UI Research Park
Midwest Development & Invest.Corp.	Fairfield	Jefferson	UI Research Park
Liberty Growth	Iowa City	Johnson	UI Research Park
Hunter Companies	Cedar Rapids	Linn	UI Research Park
S & S Developers	Iowa City	Johnson	UI Research Park
EMRICO	Iowa City	Johnson	UI Research Park
Ryan Companies, US	Cedar Rapids	Linn	UI Research Park
LMC, LLC	North Liberty	Johnson	UI Research Park

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FY11 Board of Regents, State of Iowa, Annual Economic Development and Technology Transfer Report

PRESENTED BY SHARRON QUISENBERRY, VICE PRESIDENT FOR RESEARCH AND ECONOMIC DEVELOPMENT

September 20, 2011

FY11 Board of Regents, State of Iowa, Annual Economic Development and Technology Transfer Report

1. Please briefly describe the relationship of your institution's economic development activities to the enhancement of economic growth in the state. The description should cover, but not necessarily be limited to the following:
A. the relationship between institutional activities and creation of jobs and wealth in Iowa
B. Institutional activities and services which indirectly promote economic development, such as training provided to staff of local economic development agencies

1A. Enhancement of Economic Growth through Job Creation and Retention, Investments, Sales, and Cost Savings

Iowa State University engages in several activities that have direct impact on both the creation as well as the retention of jobs in Iowa. The ISU Research Park is a technology community that encourages commercialization of university research. Likewise, the Innovations Development Facility, part of the Plant Sciences Institute, incubates new companies. In addition, the IPRT (Institute for Physical Research and Technology) Company Assistance Program, ISU Extension's Outreach Center for Industrial Research and Service (CIRAS), the Small Business Development Center (SBDC) and the ISU Pappajohn Center for Entrepreneurship interact with companies across Iowa to solve production and management problems. These interactions lead to the resolution of problems related to product development and business management. As a consequence of the improved production resulting from these interactions, businesses have been able to retain and often expand their work force. Some examples of the direct impact that these ISU units have had this past year are as follows:

- The ISU Research Park continues to be successful in initiating as well as nurturing numerous new businesses. Nine new companies and affiliates have joined the Park in FY11, bringing the historical total to 210 companies, research centers, and affiliates. Currently, there are 53 companies, research centers, and affiliates located in the Park, employing 839 people.

- There are currently four faculty-affiliated start-up companies located in the Innovations Development Facility, the on-campus business incubator in the Roy J. Carver Co-Laboratory under direction of the Plant Sciences Institute. The PSI met with three entrepreneurs interested in forming Limited Liability Corporations involving plant science. They are currently working with these individuals and ISURF (Iowa State University Research Foundation) to develop SBIR phase I proposals to be submitted to USDA and NIH. A total of 15 companies have used this business incubator space since the facility opened in September 2003.

- A summary of project evaluation data clearly shows that Iowa companies with technical problems and research and development needs continue to find important technical help through the services of IPRT Company Assistance. Companies report positive impacts affecting their sales, investments, and operating costs despite the economic recession of 2009-2011. Of the IPRT clients responding to the survey, the estimated impact of projects conducted in FY10 was $16.9 million; the average impact over the last 5 years is $12.8 million

per year. Companies also estimated over twenty-four jobs were created or retained each year from 2005-2010, with twenty jobs retained or created from projects surveyed in the past year. The satisfaction rating given by clients during the past year is 4.8 (1-5 scale, with "1" being "is not satisfied" and "5" being "very satisfied).

- BodyViz, a spin-off company from IPRT's Virtual Reality Applications Center, was named Breakout Company of the Year for 2011 at the Technology Association of Iowa's Prometheus Awards ceremony in April. The awards are recognized as Iowa's largest and most prestigious awards devoted to promoting and celebrating the innovation and high-tech excellence in Iowa. The company, founded in 2007, is the maker of BodyViz software that creates 3D MRI, CT scan visualizations, unlocking medical imaging for the practicing surgeon, diagnostics and treatment. The company is located in the Iowa State University Research Park. It has 3 full-time and 4 part-time employees.

- Catilin Inc., a spin-off of IPRT's Center for Catalysis (CCAT), has been acquired by Albemarle Corp. of Baton Rouge, LA. Catilin, founded in 2007, is a technology leader in development and application of heterogeneous biodiesel catalysts. The company will restart Catilin's pilot plant operation at the Iowa Energy Center's Biomass Energy Conversion (BECON) Facility in Nevada, Iowa, to test catalysts on different feedstocks for reducing the cost of producing biodiesel, with the goal of running the facility 24 hours a day, seven days a week. Two former students of the late Victor S.-Y. Lin, Catilin founder, director of CCAT, and a professor of chemistry at Iowa State University, will be staying with the company.

- The Extension and Outreach Center for Industrial Research and Service (CIRAS) has a mission to improve the quality of life in Iowa by enhancing the performance of industry through applied research, education, and technical assistance. Cumulatively, over the past five years, CIRAS and its partners have reported impact from companies totaling more than one billion dollars (new investments $331 million, costs saved or avoided $83 million, sales gained or retained $960 million) with 18,255 jobs added or retained as a result of the assistance they received.

- In FY11, 1,235 businesses from 95 counties in the state received assistance on projects or attended educational workshops from CIRAS staff or partners. Companies responding to surveys reported $43 million in new investments, $19 million in costs saved or avoided, and $331 million in sales gained or retained. Company executives stated that 6,037 jobs were added or retained as a result of the assistance they received from CIRAS and partners.

- Over 750 participants were trained in FY11 by attending conferences and workshops offered through a partnership of CIRAS, Civil, Construction, and Environmental Engineering, Electrical and Computer Engineering, Alliant Energy, Black Hills Energy, CIPCO, the Iowa Association of Electric Cooperatives, Iowa Association of Municipal Utilities, Iowa Energy Center, MidAmerican Energy, and the Iowa Office of Energy Independence. Energy short courses educated participants on motor systems management with a goal of improving energy efficiency in facilities. Continuing education was provided for civil engineering practitioners in engineering survey, structural engineering, transportation

engineering, geotechnical engineering, water resources and flood management, and environmental engineering. Attendees were able to obtain professional development hours towards retention of their Iowa engineering licenses.

- CIRAS government contracting specialists work with Iowa businesses, from one person operations to some of the state's largest employers to help them understand the government procurement process and to secure contracts. As the only organization in the state of Iowa providing contracting assistance at all three levels of the government market segmentation – local, state, and federal – CIRAS staff provided counseling to more than 800 companies. Companies reported over $203 million (an eight percent increase over FY10) in government contract impact due in part to the assistance they received. The Defense Logistics Agency, which funds CIRAS to provide assistance to Iowa companies, indicated this impact helped create or retain over 4,000 jobs.

- In 2011 CIRAS, working with the U.S. Department of Agriculture (USDA) and ASTM International, developed and initiated the USDA Biobased Product Certification and Labeling Program. The new label makes it easier for customers to identify biobased products, as well as serving as a valuable marketing tool for the manufacturers and vendors of the products.

  As the manager of the biobased product certification and labeling program, CIRAS facilitates the label usage applications from manufacturers, vendors, and industry associations. Staff also implements quality control and corrective action procedures to maintain the level of excellence expected of the USDA brand.

  In addition to the labeling and certification program, efforts by CIRAS staff increased the database of biobased products available for consideration under the BioPreferred program to 483 Iowa products sold by over 90 Iowa manufacturers and vendors. Nationally 26,654 products sold by over 3,300 companies have been identified.

- CIRAS is working with the BEST of Iowa (Business Expansion and Strategic Trends), a partnership of Iowa utility concerns, Iowa Department of Economic Development, Iowa Workforce Development and Iowa Department of Education to provide a statewide coordinated business retention and expansion program. Economic Developers throughout the state use the Synchronist data system to interview executives of Iowa industries to create a Competitive Capacity Scorecard for the state. CIRAS worked with this group to include interview questions concerning research and development and product design. Comparison of industry segments to other states has begun. This information will assist economic developers in focusing on high value, high growth companies that may be facing challenges with their mature products.

- During FY11, the Small Business Development Center (SBDC) provided business assistance to companies, involving 2,786 clients and 11,641 counseling hours. They also conducted 351 training workshops in which 4,017 individuals participated.

- The ISU SBDC, along with the ISU Pappajohn Center for Entrepreneurship, provided 571 hours of counseling assistance to start-up and existing companies;

served 127 clients with one-on-one counseling; educated 404 attendees through workshops; provided advice to several hundred clients via telephone and email; and advised 7 technology companies in the areas of licensing, equity based financing, market entry, and numerous operational areas.

- Every year the SBDC commissions Professor James J. Chrisman to review the economic impact of the SBDC's clients who receive five or more hours of counseling from the SBDC, which account for only 20% of the total SBDC client base. In a report on this client segment published by Professor Chrisman, *Economic Impact of Small Business Development Centers (SBDC's)*, it was shown that for every $1.00 in state and federal funding in FY09, the total tax dollars returned to the State of Iowa and the federal government by SBDC clients in 2010 was $.94. Among these clients there were 831 jobs retained, 403 jobs created, and nearly $12 million in new sales. The SBDC helped these clients raise over $70 million in financing for their businesses.

- Technologies originating at ISU and licensed to Iowa companies have resulted in over $86 million in sales by those companies in calendar year 2010. Total sales of ISURF-licensed technologies were $627 million, not including germplasm.

- The Office of Intellectual Property and Technology Transfer began supporting SBIR (Small Business Innovation Research) and STTR (Small Business Technology Transfer) outreach efforts in FY06. Since then, SBIR and STTR funding in Iowa has rebounded. In FY11, eighteen different Iowa companies won twenty-seven new or continuing SBIR and STTR awards worth $7.1 million. This is a slight decrease from FY10, but the figure remains significantly higher than in FY06 and FY07 and is the second year it has surpassed $7 million. An emphasis has been placed on outreach and training activities. This includes a monthly newsletter and workshops presented by Federal program managers. In addition, comprehensive proposal preparation support has contributed to an increasing number of companies applying for funding. Twenty-two Iowa companies were assisted in the preparation of twenty-five proposals during FY11, including five Iowa State faculty or staff-related companies. The funded projects reflect Iowa's strengths in biotechnology, information systems, materials development and agriculture. Over $2.8 million in support was awarded by NIH for diverse projects that range from the development of medical devices and vaccines to new cancer drugs and new animal models for human diseases. An additional $2.3 million was received from the National Science Foundation for projects that include bioreactors, novel sensors, improved quality control for medical imaging procedures and electricity generation.

- The ISU Grow Iowa Values Fund program has a competitive research component that pairs ISU faculty members with Iowa industries to create economic benefit for the companies. Surveys completed by companies on projects funded from June 2006 – June 2009 (surveyed one year after project completion) documented more than 100 jobs created or retained and an annual sales impact of more than $14 M impact due to the research projects conducted in partnership between ISU and the companies.

1B. Training Opportunities for Staff of Local Economic Development Agencies and Other Activities that Indirectly Promote Economic Development

- As part of the College of Engineering efforts to help grow the wind industry in Iowa, the college hosted a training session on Vistagy FiberSIM, a design and manufacturing software for composite layup. The session was attended by ISU researchers, engineers from TPI Composites, and Sandia National Laboratories.

- The College of Engineering and ISU Extension and Outreach Center for Industrial Research and Service (CIRAS) in partnership with the Iowa Alliance for Wind Innovation and Novel Development (IAWIND) acquired metrology equipment to support Iowa industry. The Faro laser tracker is used in student courses, to support research, and to assist Iowa companies. Support to industry will be enhanced by the recent acquisition of an articulated arm with a laser scanner.

- CIRAS developed and delivered a training curriculum for Iowa businesses to provide education on new compliance requirements regarding the Federal Funding Accountability and Transparency Act (FFATA). The FFATA legislation requires information on federal awards be made available to the public via a single, searchable website for the purpose of increasing government accountability. Five workshops and one-on-one counseling sessions were held throughout the state with over 100 businesses receiving assistance. This training provided companies with the necessary tools to meet their reporting requirements as federal vendors.

- As flooded rivers throughout the Midwest strained levees to the breaking point, CIRAS educated businesses regarding the importance of flood emergency planning. A flood emergency planning checklist was distributed directly to over 300 western Iowa companies. In addition, Safeguard Iowa, Iowa Workforce Development, Iowa Innovation Gateway, Iowa Association of Business and Industry, North and South Dakota Manufacturing Extension Partnership, Nebraska Manufacturing Extension Partnership, Nebraska Procurement Technical Assistance Program, and the Siouxland Chamber of Commerce provided the checklist to over 2,000 additional business leaders and company executives.

- In 2011 CIRAS was engaged in nine significant research projects in support of the biobased products industry. Efforts were focused on two major areas of importance to industry: economic impact and barriers to development and adoption.

  Collaborating with faculty from the Colleges of Engineering and Design, CIRAS researched improvements in performance and processing of biobased products as well as breaking down barriers to consumer adoption. Outcomes included the development of a methodology for cutting and welding biobased plastic film using ultra sonic energy, resulting in a patent disclosure being filed with ISURF, and the development of testing resources at ISU for evaluation of compostability of plastics.

Using the expertise of faculty and staff from the Survey and Behavioral Research Services, the College of Agriculture and Life Sciences Department of Economics, and the College of Liberal Arts and Sciences Sociology Department, CIRAS research focused on developing benchmark data, industry input, and increased knowledge of potential growth and impact of the biobased products industry. Reports on the analysis of the biobased products industry survey data and the biobased manufacturer index pilot survey were released.

Ongoing research in consumer acceptance of biobased products, recycling impacts for biobased products, and continuing industry input surveys will help expand and improve the growth and impact of this important economic sector.

Nearly 500 people attended Iowa's Advanced Manufacturing Conference: Manufacturing in the Global Economy. CIRAS partnered with the Iowa Association of Business and Industry (ABI), the Des Moines Area Community College (DMACC), and Rockwell Collins to provide education and discussion on a broad range of issues affecting manufacturing in the Midwest.

- The Electric Power Research Center (EPRC) is a consortium of eleven utilities that sponsor multidisciplinary power systems research at Iowa State University. Nine of the eleven companies provide services in Iowa; the remaining two are international. Funds provided by the companies are used to conduct research on the reliable and economic operation of power systems. In addition, the research deals with the integration of increasing amounts of wind energy into the grid and the implications of the electrification of transportation. EPRC research helps assure that Iowa, the U.S., and the world have a supply of electric power that is cost-effective, reliable, and sustainable.

- Keeping the pipeline full of youth interested in STEM fields is a key component of Iowa's economic development plans. Participants from every Iowa county engaged with the College of Engineering and its industrial partners to inspire the next generation of Iowa's STEM workforce. The College of Engineering plays a vital role in this effort because of the need for engineers in Iowa companies. The College provides leadership for K-12 efforts, including Project Lead the Way, FIRST Lego League, Junior FIRST LEGO League, engineering kids camps, Mom's Night out for STEM, and more. In FY11, over 620 K-12 students engaged in summer camp activities, 242 FIRST LEGO League teams were formed, and over 143 Project Lead the Way sites offered pre-engineering curriculum to middle and high school students.

2. Please provide the following information for FY11: (If your institution utilizes additional metrics specific to your institution's specialized areas of research or service, please include them here)

Note: Unless noted, the data provided below are FY11 data.

a. Number of disclosures of intellectual property: 106
b. Number of patent applications filed: 47
c. Number of patents awarded: 25

d. Number of license and option agreements executed on institutional intellectual property, in total and in Iowa: 49 total, 19 in Iowa
e. Number of license and option agreements yielding income: 217
f. Revenue to Iowa companies as a result of licensed technology: $86 million (CY10)
g. Number of startup companies formed, in total and in Iowa (through licensing activities): 2 total, 2 in Iowa
h. Number of companies in research parks and incubators: ISU Research Park: 40 private and 13 university-related; Plant Sciences Institute Innovations Development Facility (IDF): 4 (all university-related or affiliated)
i. Number of new companies in research parks and incubators: ISU Research Park: 4 private,1 university-related & 4 affiliates; Plant Sciences Institute IDF: 1 (university-affiliated)
j. Number of employees in companies in research parks and incubators: ISU Research Park: 618 private and 221 university-related; Plant Sciences Institute IDF: 7 FTE (all university-related or affiliated)
k. Royalties and license fee income: $11.3 million
l. Total sponsored funding received: $342.3 million of which $197.4 million is for research
m. Corporate sponsored funding received for research and economic development, in total and in Iowa: $24.9 million total, $12 million in Iowa
n. Iowa special appropriations for economic development in the following categories:
   - Annual state appropriations for ongoing programs (such as research parks, SBDC, IPRT, IDM, Metal Casting Center): $2.5 million—includes $894,929 SBDC (includes state-wide programs), $130,010 ISU Research Park & $1,451,043 IPRT
   - Grow Iowa Values Fund appropriations: $1,459,200
o. Research expenditures (including state appropriations and external (funding) $250.1 million—Note that this is an FY10 number, most recent number available
p. Licenses and options executed per $10 million research expenditures: 4 (est.)—Note that this is an FY10 figure, most recent number available
q. Sales of licensed products by Iowa-based companies: See d. above
r. Number of employees for current Research Park tenants and incubator, as well as former tenants that are still in existence in basic form world-wide 2,993

3. Please describe the ways in which your institution is engaged in the following activities (For example, what is the nature of the outreach and service activities? Which units provide it? What kinds of people and organizations benefit?)
A. Direct and hands-on technical assistance to businesses and entrepreneurs
B. Direct economic development assistance to Iowa communities
C. Economic development services provided by research parks, incubators or similar service units

3A. Direct and Hands-on Technical Assistance to Businesses and Entrepreneurs: ISU System for Innovation

Iowa State University is charged with advancing economic development and technology transfer activities that promote growth and benefit all citizens. While creation of knowledge remains the basic responsibility of a research university, the way we share knowledge determines our success. ISU shares knowledge and expertise with students (learning and teaching), communities (engagement), and business and industry (technology transfer and economic development). ISU ranks as one of the most successful universities nationwide in several categories of technology transfer and economic development. The activities of the colleges, institutes and centers are coordinated through the Research and Economic Development Council that advises the Vice President for Research and Economic Development. The Vice President and this Council continuously communicate with economic development entities within the State such as the Iowa Department of Economic Development, the Iowa Innovation Council, the Iowa Business Council, the Greater Des Moines Partnership, the Ames Economic Development Commission and other local and regional agencies.

The Iowa State University "System for Innovation" was developed to focus on the transfer of university technologies into commercial applications in start-up or existing companies. Functions of the ISU System for Innovation include:

- **Business Development & Assistance and Entrepreneurial Activities**: Efforts related to start-up companies, including business assistance services & SBIR/STTR applications.
- **Technical Assistance & Technology Development**: Solving technical problems, assisting in product development and process improvement projects for existing businesses. This includes the current efforts of no-cost technical assistance and cost-sharing projects.
- **Industry Relations**: Facilitation of a multitude of interactions between ISU and its industry partners, including the management of research relationships and interactions with economic development groups, legislative groups, and other third parties.
- **Community Development**: To disseminate and develop programming, facilitating community organizations, fostering community planning, and coordinating with community and regional economic development networks and organizations.
- **Technology Transfer and Licensing:** The transfer of intellectual property (patentable inventions, copyright works and proprietary materials) to business and industry through license agreements.
- **Physical Space:** Physical space for business incubation is available in the ISU Research Park, the Plant Sciences Institute, and the Center for Crops Utilization Research.
- **Research and Instrumentation Facilities:** Iowa State University maintains more than 20 central research facilities that also serve communities and businesses on a fee-for-service basis.

- Senior capstone design projects are the culmination of engineering education for undergraduate students. Iowa companies, through a partnership between CIRAS and the College of Engineering, provide students the opportunity to apply their

engineering knowledge to real-world applications as a final step in preparation for joining the workforce.

As Iowa experienced the second highest net out-migration of young, single, and college educated residents (only behind North Dakota) from 1995 to 2000, this program has a further goal of slowing the Iowa brain drain. Students are able to obtain a better understanding of job opportunities within the state and businesses discover the value of making an investment in their workforce by providing higher level, higher wage jobs.

By working with the students, companies gain a new perspective on difficult engineering problems with many achieving innovative solutions that enhance productivity and lower costs. Companies have a heightened understanding of the value engineers bring to an organization and are able to showcase their company to students nearing graduation.

In addition to the senior capstone design projects, engineering students have worked with companies on projects related to cellular lean, materials, and facility planning.

In FY11, students worked on 33 projects with 22 different companies. Companies reported impact of nearly $10 million for these projects.

3B. Direct Economic Development Assistance to Iowa Communities

- In FY11, CIRAS was awarded a 3-year grant under the Economic Development Administration (EDA) University Center program to develop and implement the Sustainable Economies Program in the state of Iowa. This program provides Regional Trade Centers (RTCs) in rural Iowa with an in-depth economic assessment of the financial, social, and environmental "triple bottom line" well-being of the region coupled with technical assistance to the critical organizations and businesses of the region.

  The program provides sustainability assessments, technical assistance, and mentoring within the communities and businesses that drive the regional economy. During the first year of the program, CIRAS staff, Extension Community and Economic Development staff, and College of Agriculture and Life Sciences economists researched, developed and launched a pilot implementation in the region of Carroll, IA.

  Through the Sustainable Economies Program, applied research is ongoing in business and economic sustainability, employee wellness and supply chain sustainability.

3C. ISU's Key Units Engaged in 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, 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 economic development/technology transfer support system includes the following units that are coordinated through the Research and Economic Development Council:

- **Pappajohn Center for Entrepreneurship and the Small Business Development Center at ISU (SBDC)**. These units work with researchers to define the technologists' role in the company, evaluate markets, assist in the creation of a business plan and help the company develop connections with a network of business resources including consultants, accountants, attorneys, prospective employees and investors. In a typical year, the Pappajohn Center, working with IPRT, the Plant Sciences Institute, ISURF/OIPTT and other research centers, identifies approximately 25 prospective new technologies. These technologies can take six to 26 months to develop sufficiently to justify the formation of businesses. During this time the researcher receives assistance from, among others, the Small Business Development Center at ISU 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. The Pappajohn Center/SBDC also continues to provide a referral network and facilitates the recruitment of students including access to internships.

- **Institute for Physical Research and Technology (IPRT).** Through IPRT's Company Assistance Program, Iowa companies can leverage the expertise of the IPRT research centers and other ISU capabilities in order to solve technical problems, create new products and processes, and increase productivity and quality. IPRT Company Assistance provides help through both its Research and Development cost-sharing program and through short-term, no-cost technical assistance. IPRT actively collaborates with Iowa companies on technology development projects. Many successful businesses have emerged from IPRT technologies, including Mechdyne of Marshalltown, BodyViz of Ames and PowerFilm, Inc. of Ames.

  The staff members of the Materials Group and the Nondestructive Evaluation Group within Company Assistance provide significant and broad expertise to help Iowa manufacturers address material and inspection issues. These programs offer state of the art knowledge to business, and both groups have expanded their capabilities and facilities to keep pace with research advances and modern industrial needs. This direction allows them to interact with various industrial clients and tackle an increasingly wide range of challenges.

- **Iowa State University Research Park.** The Iowa State University Research Park is a 230-acre development with over 325,000 square feet of building space and is located south of the Iowa State University campus. The ISU Research Park is more than just land and buildings; it is a technology community that encourages commercialization of University research.

- **Extension and Outreach Center for Industrial Research and Service (CIRAS)**. CIRAS provides applied research, education, and technical assistance to Iowa industry through partnerships with Iowa's universities and community colleges, government agencies, and business associations. Account managers throughout the state meet with clients to assess needs and provide links to resources that companies can use to increase their competitiveness. Solutions are offered through a combination of direct assistance from center staff, university faculty, partner organizations, and outside consultants.

  CIRAS staff has expertise in engineering, biobased products and biorenewables, energy systems, management practices, government contracting, productivity, growth services, supply chains, quality systems, and community-business economic development. Service to industry includes technical assistance in conjunction with ISU College of Engineering labs, regional economic development studies to better understand rural economies, engineering workshops for utilities, county and city engineers, educational workshops and mentoring for small to medium sized businesses.

  CIRAS manages the statewide National Institute of Standards and Technology's Hollings Manufacturing Extension Partnership (MEP), a program of the Department of Commerce. The MEP mission is to act as a strategic advisor to promote business growth and connect manufacturers to public and private resources essential for increased competitiveness and profitability. The objective of the program is to enhance productivity, technological performance, and strengthen the global competitiveness of small-medium sized manufacturers. CIRAS provides companies with the training, tools, and connections to accelerate innovation, leading to new opportunities in domestic and export markets.

  The USDA BioPreferred program, enacted as part of the 2002 and 2007 Farm bills, has a goal of increasing the purchase of biobased products by the federal government. CIRAS has helped USDA build this program since its inception in 2002. CIRAS staff manages implementation of the program by gathering industry input, developing government focused marketing strategies, testing biobased content, and facilitating participation in the program. Staff educates public and private stakeholders, manages the biobased product certification and labeling program, and assists with the development of programmatic infrastructure and policy.

  The Defense Logistics Agency, on behalf of the Department of Defense, administers the Procurement Technical Assistance Program (PTAP). The purpose of the program is to generate employment and to improve the general economy by assisting business firms in obtaining and performing under federal, state, and local government contracts. CIRAS is responsible for this program in the state of Iowa. Staff helps businesses determine if they are suitable for government contracting, provides workshop training and outreach events, assists businesses with capturing government sales, and provides post award contract assistance.

  CIRAS manages the Economic Development Administration (EDA) University Center Program in Iowa. The EDA's mission is to lead the federal economic

development agenda by promoting innovation and competitiveness, preparing American regions for growth and success in the worldwide economy. In FY2011, CIRAS was awarded a 3-year grant to develop and implement the Sustainable Economies Program. This program integrates detailed economic studies with financial, social, and environmental technical assistance to communities and businesses in rural trade centers across Iowa. This integrated, scientific-based approach to sustainability and the triple-bottom line helps the businesses, communities, and overall regional economy begin the process of reliable, long-term growth.

- **ISU Research Foundation (ISURF) and the Office of Intellectual Property and Technology Transfer (OIPTT).** ISURF owns and ISURF and OIPTT jointly manage, market and license the intellectual property for Iowa State University. ISURF/OIPTT works with faculty members in regard to the reporting and protection of innovations, including patenting inventions. It markets the innovations to find commercial partners interested in licensing. It also funds projects within the University that have potential for broadening the intellectual property protection or providing value for its commercial potential. ISURF also provides assistance to Iowa companies, including ISU faculty start-ups with SBIR and STTR applications.

- **Innovations Development Facility (IDF).** This is a business incubator operated by the Plant Sciences Institute to promote the commercialization of plant biotechnology. IDF encourages ISU faculty, staff, and students to commercialize their research in the plant sciences and promotes the development of start-up companies among aspiring entrepreneurs. IDF is housed in the Roy J. Carver Co-Laboratory and consists of six well-equipped laboratory modules. The facility offers an environment to transition research from a university to a business setting. The IDF facility is a productive research location where scientists from academe and industry can work together to advance the mission of the Plant Sciences Institute and to promote economic development in Iowa.

- **Extension to Communities and Economic Development (CED)**

<u>Iowa's Living Roadways Community Visioning Program</u>

For 15 years, the Community Visioning Program has helped rural communities plan transportation enhancements using state funds from the Iowa DOT. To-date, 180 Iowa towns have completed the process and collaborated with design teams to create conceptual transportation enhancement plans. Documented impacts of the program since 1996 include:

- Ninety-four percent of participating communities complete at least one project.
- Internet research of state funding shows that to date, 124 visioning communities received funding from five state programs to do 285 projects. Seventy-seven percent of the projects were directly related to visioning concept plans and 27% were not directly related to the program.
- More than $16.9 million in state funds was awarded to visioning projects and $12.4 million to non-visioning projects for a total of nearly $30 million.
- Estimated cash matches from awardees exceed $12.6 million for an estimated $42 million generated.

West Liberty Economic Area Development (WE-LEAD)

WE-LEAD is a non-profit 501(c)(3) corporation organized in 2006 to create, develop, and maintain strong business relationships, and to establish a climate in which new and existing businesses can flourish. As part of this initiative, the City of West Liberty (75%) and ISU Extension Community and Economic Development (CED) (25%) jointly hired a community development specialist. In 2010, WE-LEAD worked with 173 clients, including shareholders, entrepreneurs, local leaders and elected officials, community residents, and students. In 2010 WE-LEAD assisted with 11 business plans, five of which were completed, and added more than 35 jobs in West Liberty. Leadership West Liberty is a community-focused leadership program designed to grow the next generation of leaders in West Liberty. Twenty-nine students have graduated from the four-year-old program. Completion of a community project is a requirement and more than 15 projects have been completed. Keokuk and Jones County are considering the WE-LEAD model. Extension CED is in the process of negotiating a similar contract with the City of Keokuk.

Tourism

ISU Extension CED specialist Diane Van Wyngarden, Ph.D. developed a model travel program for Iowa and marketed it to a national audience through Road Scholar. Current programs include: Exploring Uncommon Communities: a Touch of History, a Taste of Utopia; Upper Mississippi River Reflections: Historic Towns, Trails and Tales; and Missouri River Reflections: a Ribbon of Legends through Four States. Nationally, the Road Scholar program has suffered due the recession, with roughly half of its scheduled programs canceled. None of ISU Extension's programs have been canceled, and most were sold out with waiting lists. In 2010:

- 229 people from 42 states and two foreign countries participated in the Road Scholar Program. Tuition is $1,000 to $1,500 per participant.
- The program has affected more than 100 businesses, and the estimated dollar value of those impacts is $288,915. The program is self-supported, and the money generated goes directly to travel-related businesses along tour routes.

Sustainability

The ISU Extension and Outreach began a "green initiative" in 23 counties four years ago and has been working with Fairfield on sustainable living and energy-efficient technology. Part of an Iowa Power Fund partially funded a sustainability specialist position shared between ISU Extension and Outreach and the City of Fairfield. The sustainability specialist serves the 9,200 Fairfield residents, as well as southeast Iowa and the state, facilitating community sustainability programs initiated by businesses, industry, and other organizations.

- For example, Fairfield's Green Commission set goals to process 75% more recyclables with a corresponding 25% decrease in waste going to landfills by December 2012.
- After two months of the new program, recyclables increase 67% from the previous monthly average, and in December 2010 the increase in recyclables was 132%. This spring the contract with Fairfield was extended five years.

Extension CED has been approached by the State of Iowa to expand this program.

Local and Regional Housing Trust Funds

The Iowa Finance Authority (IFA) administers a state housing trust fund offering forgivable loans to rehabilitate existing housing; however, many Iowa communities do not have the structure in place to apply for and administer such loans. Through an agreement with IFA, ISU Extension CED is helping communities, counties and regions develop local housing trust funds (LHTF), with which they can apply for seed money from the state to use for affordable housing.

Existing housing trust funds cover 52% of Iowa's population. Primary clientele include counties and regional COGs. Extension CED has incorporated the LHTF development format into regional housing trust fund development. The following regions applied for certification on October 1:

- Region 6 Housing Trust Fund, Inc.—Hardin, Tama, Marshall and Poweshiek Counties
- Northeast Iowa Regional Housing Trust Fund—Allamakee, Clayton, Howard and Winneshiek Counties
- Northwest Iowa Regional Housing Trust Fund, Inc.—Emmet, Lyon, O'Brien, Osceola and Sioux Counties

Lake Delhi Alternative Futures

In summer 2010, the Delhi Dam on the Maquoketa River collapsed under pressure from rising floodwaters. The breach drained a nine-mile lake behind and dam and the resulting flash flood destroyed 16 homes, caused damage to more than 70 others, and released tons of accumulated sediment downstream. In response, the Governor created the Lake Delhi Recover and Rebuild Task Force to develop strategies to assist in the recovery and rebuilding of the area. With ISU Extension Community and Economic Development, the community design studio in the ISU landscape architecture program presented a plan to IDED to collect public input, conduct community and economic analyses of the area, and create scenarios for future development of the Lake Delhi area. The class presented three development scenarios for the area and a final report was presented to the state task force in December 2010.

- **Extension to Families**

Horizons

Thirty-six Iowa communities with populations under 5,000 and poverty rates over 10% trained 301 local facilitators to lead 1,538 community members in a discussion, "Thriving Communities – working together to move from poverty to prosperity for all" discussion.

- 29 communities addressed food insecurity,
- Dunlap's food pantry served 300 people in 2010.
- Eleven Volunteer Income Tax Assistance (VITA) sites completed over 500 returns without charge and claimed over $250,000 in Earned Income Tax Assistance to eligible families.

- Twelve communities prepared 434 youth for academic success with mentoring, tutoring or early learning programs. Elma built an early learning center which now serves 70 children.
- Ten communities engaged entrepreneurs to increase family income.
- 105 local trained volunteers taught leadership skills to 923 participants. Some became mayors, city council members or provided leadership to local boards, commissions, clubs and organizations thus building stronger communities and families.
- 8,829 community residents shared their thoughts as part of a local visioning process leading to a local action plan to help reduce the local effects of poverty.

Community Volunteers Help Reduce Poverty and Return Dollars to Economy

The Earned Income Tax Credit (EITC) augments the wages of low- and moderate-income workers and, in turn, this flow of income makes a substantial economic impact in local communities. EITC recipients circulate their refunds through the local economy, creating a ripple effect many times the size of the original refund. This money strengthens neighborhoods, assists small businesses, and spurs local economic development. ISU Extension worked with community partners to recruit and train 84 volunteers to provide free tax preparation services to low- and moderate-income families through the Volunteer Income Tax Assistance (VITA) program. In 2011, VITA volunteers working at 37 VITA sites helped 1,875 low- and moderate-income Iowans complete income tax returns. Special efforts were made to increase awareness of the EITC and VITA in rural Iowa. Nine of the VITA sites were established in underserved rural communities that are part of the Horizons project, a Families Extension initiative to reduce poverty and build assets. Twenty Horizons communities conducted EITC awareness campaigns to inform eligible residents about this refundable tax credit. 601 of the filers who qualified for the Earned Income Tax Credit (EITC) received $816,635 in the 42 counties that participated in the Extension-community partnerships to expand VITA programs in rural Iowa.

Early Childhood Programs

Iowa currently ranks 2nd in the nation for the percentage of young children with all parents in the household employed. An estimated 75 percent of Iowa's children under six-years of age need early care and education while their parents work. The 2009 Iowa Early Care and Education workforce study, found that only 7% of child care center assistant teachers and only 34% of teachers had a bachelor's degree in early childhood or related field. A turnover rate of 31% for assistant teachers and 14% for teachers coupled with low education levels, meant that many of Iowa's children were constantly in the care of a poorly educated, constantly changing workforce. The Better Kid Care New Staff Orientation program has been adopted by Iowa as a key component for stabilizing workforce turnover and providing a basic level of knowledge for new early childhood teachers and assistant teachers who may have limited education and experience. This outstanding program provides new teachers with 30-lessons over a four month period. Teachers view DVD demonstrations, practice and fulfill on-site activities and complete workbook lessons, which are sent into Iowa State University for review. Currently 733 centers and preschools (53% of Iowa licensed programs) participate in the Better Kid

Care New Staff Orientation (NSO) program. As a result of participating in NSO program, 620 new child care teachers have completed a total of 18,600 training hours and report making significant gains in knowledge and program improvements. Ninety-one child care center directors participating in the program report made significant improvements in their skills for effective supervision and support of new early childhood teachers.

- **Agriculture and Natural Resources Extension**

Drainage Professionals

Faculty and staff in ISU Extension to Agriculture and Natural Resources (ANR) provide educational leadership to drainage contractors in Iowa through annually hosting the three-day Iowa Drainage School. In 2010, 40 participants attended the drainage school. Post-meeting evaluations indicated that 75% of respondents indicated the program would help them increase revenues with their work with dollar values ranging from $50,000 to $250,000 or up to $150/acre.

Co-Products from the Ethanol Industry

Co-products of the ethanol fermentation process can be cost effective feeds but have unique characteristics and present challenges in handling storage and delivery. A comprehensive, integrated research and educational program is ongoing. Activities included cattle feeding research, feeding and long term storage demonstrations, workshops, meetings, software development, factsheets newsletters and consultations. In 2007 alone, 67 meetings were held for producers and consultants on the topic. In 2011, participants in educational programs were surveyed on changes in their knowledge, behavior and cost outcomes as a result of educational activities conducted by ISU Extension on ethanol co-product feeding for beef cattle during the period 2006-2010.

- Of those surveyed, 69% had received information or attended an educational event during that time period.
- Of those that had obtained information on this topic from ISU Extension, 88% indicated that the information improved their knowledge of effective ways to incorporate these feeds into the diets of cattle.
- During that time period, 57% of those surveyed increased the usage of ethanol co-products in cattle diets.
- Of those surveyed 91% reported either improved cattle performance or reduced costs of at least 10% as a result of the information received. Of that group, 27% reported a 10% or more reduction in feed costs without decreasing animal performance, 19% reported a 10% or greater improvement in animal performance, and 45% reported both a 10% improvement in animal performance and a 10% decrease in cost of production.
- With today's costs, a 10% reduction in feed costs has a value per animal fed of over $60. With over 2 million head of cattle fed annually this represents a significant contribution to this growing sector of the Iowa agricultural economy and their local communities.

Financial Decision Making

Beginning farmers often lack access to credit at reasonable rates and terms, to use for purchasing operating inputs and financing purchases of land, livestock, and equipment. To be eligible for financing from the Farm Service Agency, beginning farmers must show knowledge of sound financial management principles by completing an approved course in farm financial management. ISU Extension developed an Internet-based home study course titled Financial Decision Making that allows borrowers to meet this requirement. The course consists of modules covering topics such as developing financial statements to financing long-term assets. Enrollees must satisfactorily complete on-line quizzes and homework assignments.

- As of August 21, 2011, at total of 345 FSA loan applicants have completed the Financial Decision Making course.
- In January 2011 graduates of the course were asked to estimate their annual gross farm income and farm net worth before and after completing it. The average change reported was an increase of $247,101 in annual gross farm income and $381,458 in net worth.
- Based on data from the Iowa Farm Business Association, the average net farm income as a percent of gross income during the years that enrollees completed the course was 25%, and the average return on net worth was 9.8%. Applying these rates to the average increases reported results in an estimated increase in annual net income per operator of $38,182 per operator, or over $13 million annually for all the families who have completed the course.

These dollars will be reinvested in the state economy and keep more young farmers employed in Iowa agriculture.

Community Vitality Center

The Community Vitality Center (CVC) is a statewide catalyst for identifying and demonstrating new strategies for improving the economic vitality of Iowa's communities and rural areas. CVC received the 2010 Iowa Venture Distinguished Leadership Award from the Iowa Area Development Group for the creation of Iowa MicroLoan and other entrepreneurial and philanthropy development activities. Iowa MicroLoan was founded in 2008 as an independent 501(c)(3) foundation by the Community Vitality Center (CVC) to serve as a statewide microfinance. Since then, Iowa Microloan has received more than $3.5 million in grants and loan capital as an intermediary for the SBA MicroLoan Program and USDA Rural Micro-Entrepreneur Assistance Program (RMAP). Iowa MicroLoan provides a business plan "second look" and technical assistance for entrepreneurs who have been denied credit from conventional lenders.

- During 2010, IFMCV had loans outstanding to 26 businesses.
- Seventeen of the businesses were startups.
- Fourteen of the businesses were from rural counties (54%) and 12 were from metro counties (46%).
- Of the total co-signors and guarantors involves, 56% were women and 44% were men, 5% were minority, and 5% were people with disabilities.
- Of the total, 15% were below the HHS poverty level, 29% were below HHS 150% poverty level, and 46% were below the HUD low income level.

During 2010, CVC assisted IDED and Iowa Microloan in implementing the Iowa Small Business (ISB) Loan Program approved by the Iowa General Assembly and signed by the Governor in 2010. CVC provided input for the Administrative Rules, facilitated loan application and underwriting process subcontract between IDED and Iowa MicroLoan, facilitated coordination of the ISB Loan Program among IDED, Iowa MicroLoan and Iowa Small Business Development Centers, and conducted an evaluation of the program.

- During the eight months in operation from August 1, 2010 to March 31, 2011, the ISB Loan Program provided loans to 42 businesses that created or retained 130 direct jobs and generated $3,423,837 in new business financing investment by leveraging $1,639,889 in direct loans with $1,783,948 in co-financing by local financial institutions.
- As a result, it is estimated that 228 total direct, indirect and induced jobs were created and/or retained by the implementation of the Iowa Small Business (ISB) Loan Program.
- Twelve of the applications approved were for startup businesses. Applications were received from 29 of Iowa's 99 counties with 30 applications from enterprises located in rural counties and 24 from metro counties. Two of the companies receiving ISB Loans have more recently been highlighted in separate features by the Des Moines Register for innovations in their respective industries.
- CVC and Iowa MicroLoan's involvement and performance in the ISB Loan Program led to participation in IDED's recently approved application for $13.1 million from the State Small Business Credit Initiative (SSBCI) program of the U.S. Treasury Department in which $3.2 million is allocated for continuation of the ISB program.

The Office of the Vice President for Research and Economic Development (OVPR/ED) works closely with all of the above units, including the Office of the Vice President for Extension and Outreach, in promoting the University's mission related to technology transfer and economic development.

- The Research and Economic Development Council (chaired by the VPR/ED) coordinates ISU research, technology transfer and economic development activities. Members meet periodically to discuss problems, update each other on activities, assess the state and national environment for technology transfer, and propose policy and procedures to encourage technology transfer and economic development activities at ISU. This council, formed in 1993, is comprised of representatives from all units on campus that have a primary role in economic development and technology transfer as well as representatives from each of the seven colleges.

- The recently initiated comprehensive management strategy for key industrial partners is continuing to show results. This effort is co-led by the Industry Relations Team and the Corporate and Foundations Relations group in the ISU Foundation. The goal is to develop ten strategic partners during the period FY11 – FY16. Based on the established metrics, we are half way toward achieving that goal.

The above units are the key units that focus attention on economic development and technology transfer at ISU; however, significant additional related activity also occurs across campus in individual academic departments, centers and institutes, and colleges.

4. Please briefly describe two or three examples of major economic development collaborative projects with such other entities as Regent universities, Iowa community colleges, the Iowa Department of Economic Development, Iowa Workforce Development, or other state agencies.

Major Economic Development Collaborative Projects

NSF EPSCoR. ISU collaborated with UNI and the U of I on an NSF EPSCoR proposal that received funding ($20 M) in September 2011. The grant will develop a statewide energy plan for the State of Iowa, covering two renewable energy platforms--wind and bioenergy--and a third platform dealing with energy efficiency. The ultimate outcome will be an energy plan leading to energy efficiency and sustainability for the State. Other partners include the Iowa Economic Development Authority, the Iowa Energy Center, community colleges and other four-year institutions in Iowa, and industry.

Grow Iowa Values Fund. This legislation is providing the universities and private colleges financial resources to expand technology transfer and commercialization efforts. We are in the seventh year of GIVF funding, in addition to providing core support for infrastructure in the Research Park, Pappajohn Center and the VPR/ED office. Each year projects are funded that pair ISU researchers and Iowa companies. More information appears later in this report.

Innovate Iowa Proof of Concept Initiatives. Iowa State is establishing an initiative that will focus on increasing the transfer of technology while reducing the time required to commercialize it. Technology and business development will occur in parallel by engaging staff from the ISU Research Foundation, the ISU Research Park, the Pappajohn Center for Entreneurship and technology experts. This initiative will provide a single, visible interface for faculty, staff and students seeking opportunities and provide simplified, coordinated communication.

A reinvigorated process for prospect development and start-up company acceleration. The ISU Research Foundation, the ISU Research Park and the Pappajohn Center for Entreneurship are engaged in a strategic partnership to reinvigorate our approach to engaging students, staff and faculty in entrepreneurial start-up activities. Information about this new process will be available in early 2012.

State-wide committees – Many people from ISU serve on committees that promote economic development programs such as the Iowa Innovation Council, the Biosciences Alliance of Iowa, the Iowa Innovation Council's Iowa Advanced Manufacturing Committee, Iowa Meat Processors Association, Institute of Food Technologists-Iowa Section, the Iowa Lean Consortium, the Partnership for Industrial Energy Efficiency, Professional Developers of Iowa, the Iowa Business Council, the Iowa Alliance for Wind Innovation and Novel Development (IAWIND), Innovate Iowa!, etc.

5. Please provide the following information about Grow Iowa Values Fund projects for FY 2010:
A. Identify and briefly describe each project or initiative which received GIVF funding in FY 2011 including information on outcomes or progress made
B. Identify metrics which were used to measure outcomes for each project and report progress on each metric for FY 2011
C. Provide a description of the sources of the matching institutional dollars for each GIVF-funded project

The ISU Grow Iowa Values Fund (GIVF) program has a competitive research component that pairs ISU faculty members with Iowa industries to create economic benefit for the companies. See **Appendix 1 and Appendix 2** for complete report.

6. Optional: If desired, please include observations regarding:
A. Availability of startup and venture capital for technology entrepreneurs
B. Suggestions for new programs or activities that could further enhance the impact of university technology transfer and service on creation of jobs and wealth in Iowa.

6A. Iowa continues to suffer from a lack of investment capital for start up and rapidly growing technology/innovation based firms.

- The Values Funds to the universities have provided a valuable source of funding for proof of concept/early stage development funding for the innovations that will become the next generation of businesses.
- There has been an increase in the number of Angel/Seed funds throughout the state. Available capital and experience varies widely and there is little coordination between the funds. The seed funds have typically brought more individual investors into play.
- The funding provided by Wellmark through the Pappajohn Center's has been a very valuable tool for early stage investment.
- There are very few true venture capital firms located in the state of Iowa actively investing funds at this point in time. Iowa continues to suffer from a lack of investment capital for start up and rapidly growing technology/innovation based firms.
- Each fund has a particular focus, the investment profile further limiting choices and resulting in very little competition.
- Most venture firms invest with other venture firms, one as lead with the others in secondary positions to spread risk and assure the ability to continue to fund the needs of the company--this is a major problem in Iowa.
- Firms must look outside the state for significant investments of $5 million plus.

- Really good businesses with really good management teams will attract money; a major problem is the development of an experienced/skilled management team.

6B. Restoration of funds for economic development and technology transfer activities due to budget cuts in the past several years would greatly enhance the University's efforts in this area. The following is a summary of what benefits would occur if funds were restored in the units affected by budget cuts.

- **Small Business Development Centers.** The legislature cut a total of $16,373 from the SBDC budget for FY09 and another $99,436 for FY10. In FY10 the state appropriation after the 10% reduction was $894,930. In FY11, the legislature appropriated an additional $100,000 restricted solely to business counseling and for no other purpose, raising the total line item appropriation for FY11 to $994,930. The FY12 state line item appropriation was reduced to $936,345. In addition, the $266,000 the program received from the Grow Iowa Values Fund in FY11, all of which was distributed to the service centers, was reduced to $105,000. Total state resource dollars directed to the program for FY12 is $1,041,345, down from $1,260,929 in FY09. In addition, pursuant to census changes, the program's allocation of federal funds is reduced by $34,063 for FY12. The total reduction in funding for FY12 over FY11 is $195,063.

  As demonstrated by an independent study, for every Iowa tax dollar spent on the Small Business Development Center program, $2.47 is generated in increased tax collections the following year from SBDC counseling services alone. The majority of any restored and new funds would be directed toward client counseling, resulting in an increase in tax revenues over tax expenditures.

  State budget cuts for FY12 have been addressed by forcing austerity budgets on the program's service centers and requiring them to divert program funds from other uses. These budgets are too lean to allow for adequate services. Thus, if state funding is not restored to at least FY09 levels, including $350,000 originally allocated to the program through Grow Iowa Values Funds, multiple service centers will have to be closed, thereby diminishing the net beneficial impact of the program.

- **Iowa State University Research Park.** The restoration of approximately $230,000 in funding to the Iowa State University Research Park would provide direct benefit to Iowa State University efforts to establish and support new technology ventures. New funds would be utilized to support the costs of providing incubator space and the support services required by new and early stage companies. The additional funds will increase the capacity for business incubation resulting in more new companies created and higher quality support for the young companies.

- **Center for Industrial Research and Service.** CIRAS has successfully leveraged its state budget to bring in additional federal grants and fees to expand technical assistance, education programs and economic development studies to support Iowa businesses. In FY11, CIRAS helped generate an additional $2.70 for each $1 of state funds provided. Of the approximately $4.5 million of additional funding generated, more than $1.2 million was distributed to other

business outreach units on campus to help them expand their work with Iowa companies.

CIRAS has lost over $1.6 million of funds (in 2011$) from their annual budget in the past decade. This includes state appropriations and matching funds provided by the Iowa Department of Economic Development. These funds were used as match on the Department of Commerce/NIST Manufacturing Extension Partnership award and the Department of Defense Procurement Technical Assistance Program award. This loss of state funds reduces the extent of CIRAS assistance to companies and communities and limits the amount of additional funds that might be brought to Iowa via new business assistance grants.

The loss of annual funding from state appropriations and agencies equates to a reduction of approximately 13 full time staff - includes salary and fringe benefits, and associated expenses. This can cause a further reduction of roughly 13 staff due to a loss of federal awards requiring matching funds from the state. Based on an analysis of data provided by Iowa companies, these 26 staff positions might have generated nearly $60 million of impact and more than 700 jobs in Iowa companies — each year.

Using this same data, for every $100,000 of additional state funds that are made available, CIRAS would be able to leverage the funds to bring in an additional $150,000 from grants and fees and hire two new business professionals to provide services in the areas of engineering, biobased products and biorenewables, energy systems, management practices, government contracting, productivity, growth services, supply chains, quality systems, and community-business economic development. These two staff would help create nearly 50 jobs and $5,000,000 of new sales, cost savings, and investment impact in Iowa companies.

- **Institute for Physical Research and Technology (IPRT).** The IPRT economic development programs suffered losses of over $500,000 over the past three years. These losses follow $2,500,000 in budget cuts in 2003, which were never restored. Ironically, these cuts came at times when the need for IPRT's expertise by Iowa industries was rapidly growing. Although pieces of the program have survived the cuts, it now serves only a fraction of the Iowa companies it once served and the current personnel are overextended. Companies seeking help outside the core competencies of the IPRT Company Assistance staff cannot be assisted. In the past these potential clients were guided to working with faculty members via subsidized projects. Because of the budget cuts, IPRT has restricted the technical assistance it provides to Iowa companies to those services that fall within the core competencies of IPRT staff rather than pursuing these collaborative, cross-disciplinary projects. Also, fewer R&D cost-share projects that can lead to new products are pursued due to the declining funding. Over 75% of the Iowa manufacturers that IPRT serves have less than 100 employees. This means that the typical industrial client will likely not have the needed expertise internally to address their material and inspection issues.

  The materials assistance unit of the IPRT economic development program provides short-term no cost technical assistance to Iowa manufacturers and is often the first interaction that manufacturers have with the University.

Restoration of funding would allow for growth of materials assistance, enhancing their delivery of services. They seek to offer a wider scope of services directly meeting the needs of Iowa manufacturers.

The NDE (nondestructive evaluation) unit of this program functions similarly to the materials group, in that short-term technical assistance is provided to Iowa manufacturers on a no-cost basis. The focus of the NDE Group is to assist companies in areas of inspection and quality control. To that end, the NDE Group serves as an unbiased source of information, offering clients a broad range of expertise in various inspection methodologies. Manufacturers often do not have staff acquainted with these capabilities, so the group in effect complements the engineering capabilities of their clients. The group assists client companies in addressing problem areas, ensuring product development and quality. This assistance requires robust budget support to maintain the needed flexibility to successfully address the wide range of industrial concerns that are presented to it.

The technology commercialization unit administers cost-sharing, contract research projects, working with Iowa's small to medium-sized manufacturers These small companies have very limited Research and Development dollars and facilities, and now, this unit does not have the funds needed to leverage Iowa companies' limited resources. These are projects with obvious economic impact—introduction of new products, addressing manufacturing processes, and improving quality—all areas that impact Iowa's global competitiveness in the manufacturing sector. Before the budget cuts of the last several years, the staff proactively marketed the research and development strengths of ISU's faculty to potential Iowa industry partners. This outreach effort was eliminated due to constraints on staff time and funds available for these projects, which may have had other unintended consequences.

A unique feature of the economic development program in IPRT is the active participation of scientists from internationally renowned ISU centers such as the Center for Nondestructive Evaluation, the Virtual Reality Applications Center and the Center for Catalysis. These centers have excellent track records of spinning off new Iowa start-up companies in the areas in which they excel. Restoring the budget cuts to IPRT units would have a rapid positive impact on Iowa's manufacturing sector. An investment now will result in continuing benefits to Iowa's companies, important opportunities to retain our brightest students, and new start-up companies based on increased technology transfer from IPRT centers.

MID-YEAR FULL REPORT: JULY 2011
IOWA STATE UNIVERSITY GIVF PROGRAM

EXECUTIVE SUMMARY

Commercialization Program

The projects pair ISU faculty with Iowa companies to create or improve products or processes. Each project lasts two years. One year after the completion of the project (or three years after the start), the Iowa companies are surveyed for impact by CIRAS. These funds are a **critical source of gap funding**. They represent a unique resource that can applied toward the success of Iowa companies. A summary of the projects funded to date is below, followed by the list of active projects. To date, 77 projects have been funded through the Commercialization Program. Forty-one of these projects are complete and many show excellent progress in improving the competitiveness and profitability of the Iowa companies involved. 28 startup companies have been assisted; including **13 new companies that were started in the first five years as a direct result of the GIVF funding**. In total more than 50 Iowa companies have participated in the program.

Surveys are conducted by the Center for Industrial Research and Service (CIRAS) on year after project completion (true impact takes a minimum of 5-10 years).

Project Dates	Survey Year	Companies Surveyed	Jobs Created or Retained	Total Sales Increase	Total Investment & Cost Savings	Average Impact per Company
FY06-FY07	FY08	9*	71	$9,100,000	$23,500,000	$3,600,000
FY07-08	FY09	9	18	$3,700,000	2,760,000	720,000
FY08-09	FY10	8**	6	600,000	732,000	166,500
FY09 – FY10+	FY11	7**	13	675,000	967,000	234,571

* All surveyed companies were start-up companies
** Surveys were not completed for all projects (not everyone chooses to participate in the survey)
+ The sales increase was primarily from 1 successful project, but the jobs impact was spread. Many companies indicated it was too early to tell the sales impact (this is a frequent comment through the years).

Year Project Completed	Number of Projects	Number of Publications & Presentations	Number of Awards	Number of Invention Disclosures	Number of External Funding Applications	Number of Applications Awarded	External Funding Received*
FY12**	11	13	0	3	11	4	$ 1,304,000
FY11	11	46	1	3	20	6	$ 940,000
FY10	14	99	8	6	47	13	$ 2,720,000
FY09	15	53	9	4	48	20	$ 3,500,000
FY07-08***	n/a	n/a	n/a	n/a	n/a	n/a	n/a

*Some information on award amounts was not included **These projects are ongoing ***Data was not collected

Infrastructure

- ISU Research Park $200,000
- Pappajohn Center for Entrepreneurship $200,000
- VPRED Office $100,000

Note: Due to FY10 budget cuts, support to IPRT ($100,000) and the post-doc entrepreneurship program ($150,000) was eliminated.

DETAILED REPORTS

FY10 Projects (to finish May 31, 2011)

Principal Investigator	Project Title	Award Amount	FY11 Allocation
Jim Bloedel (Kanthasamy)	Testing of lead PK compounds in preclinical animal models of Parkinson's disease	$ 128,100	$128,100
Jim Bloedel (Jesse Goff)	Use of Beta-Glucuronides of Vitamin D to treat inflammatory bowel disease	$ 89,657	$89,657
Bryony Bonning	Transgenic Plant Resistance to Invertebrate Pests	$ 107,680	$107,680
Byron Brehm-Stecher	Rapid Sequence- based Detection of Human Pathogens: From Farm to Fork to Physician	$ 106,690	$106,690
Pat Halbur	Development of a novel Genetic Test fo Inherited Bovine Diseases and its application to tissues and embryos	$ 69,500	$69,500
Brad Bosworth	Prevention of swine influenza: Commercialization of replicon particle and replicon subunit vaccines	$ 146,610	$146,610
Rick Sharp	Effect of oral ATP on human muscle performance	$ 29,890	$29,890
Tanja Opriessnig	Cross Protective Immunity	$ 80,000	$80,000
Eliot Winer	Volumetric Model Analysis for Bariatric Medicine	$ 100,000	$100,000
Iver Anderson	Iowa Powder Atomization Technologies (IPAT); Titanium Atomizer Prototype Design	$ 221,499	$91,264
Mike Kessler**	Pultruded Window Frames from Agricultural Oils	$ 40,000	$28,275
David Grewell**	Naturally Controlled Gelatinization of Corn Starch	$ 34,504	$34,504
Mike Olsen*,**	Development of the Next Generation of Vortex Flow Meters for Engine Applications	$104,690	$4,804
Ted Heindel (Atul Kelkar)**	Waste Plastics, Crude Oil Sludge, and Tar Sand to Diesel – Capturing Energy from Waste	$143,814	$9,337

*Project was completed May 31, 2010 and the final report submitted in the previous report.
**Data from these projects is not included in the cumulative report above because these projects were included in final report for the FY09 projects.

FINAL REPORT

Title: Testing of lead PK compounds in preclinical animal models of Parkinson's disease

Principal Investigator: James R Bloedel / Anumantha Kanthasamy

Company Partners: PK Biosciences Corporation

Project Goal:

Our main goal is to develop oral neuroprotective drugs for the treatment of Parkinson's disease (PD) in humans. Currently we are in the preclinical stage of drug development. The ultimate success of the proposed neuroprotective technology may create many new opportunities in Iowa, including economic and job growth and a viable biotechnology industry.

Invention disclosures:

We have submitted full patent application SN 61/260,676, titled "Design, Synthesis and Functional Characterization of Rottlerin Analogs" filed on Nov 12, 2010 by ISURF. The data obtained from this proposal will augment our efforts to submit a full patent application in the future.

Publications/presentations based on project: None to date

Awards received: None to date

External funding applied for (indicate received/denied/pending):

Denied: SBIR Phase II proposal to NIH *National Institute of Neurological Disorders and Stroke* (*NINDS*). Submitted April 05, 2010 ($1 million).

Denied: SBIR Phase II proposal to NIH *National Institute of Neurological Disorders and Stroke* (*NINDS*). Submitted Dec 05, 2010 ($1 million).

Pending: SBIR Phase 1 to NIH *National Institute of Neurological Disorders and Stroke* (*NINDS*). Aug 05, 2011 ($200,000).

Progress report (300 word maximum, please focus on results in nontechnical terms and commercialization progress):

Results

In the previous funding period (Jan-Dec 2010), we had synthesized 4th generation analogs derived from PK302 structure, in which meta-phenols containing Michael acceptors were protected by methoxy groups and other chemically reactive groups were modified. In this funding period generated a new set of 12 analogs designated RM analogs against Fyn kinase a new therapeutic target that regulates PKC□ kinase activity. We identified a lead RM analog, RM101, which was neuroprotective in cell culture Parkinson's disease (PD) models, with IC_{50}s in the nM levels for its intended therapeutic target Fyn kinase at 725nm. We will these novel data to submit a new SBIR phase 1 application in Aug 2011.

Commercialization:

We have strengthened our Drug discovery and business management team by adding two new consultants with vast experience in medicinal chemistry and drug development to strengthen our drug discovery team. 1) Robert John Kerns, Ph.D., with >15 years experience in medicinal chemistry and pharmacology; and 2) Michael Crider, Ph.D., with >30 years experience in drug development. Their personal statements are included in their biosketches. Two new business development consultants, 3) John S. Kiely, Ph.D and 4) Pandi Veerapandian, Ph.D, who have over 25 years of experience each in leading biotechnology and pharmaceutical companies. We intend to recruit an industry experienced management team in order to secure partnerships and substantive venture capital as our drug discovery efforts meet certain milestones, such as meeting minimal requirements for IND filing.

FINAL REPORT

Title: Use of Beta-Glucuronides of Vitamin D To Treat Inflammatory Bowel Disease

PI: Jesse Goff (with James Bloedel, Chair, BMS)

Company Partners (company names only): GlycoMyr, Inc.; Heartland Assays, Inc

Project Goal: Develop products based on vitamin D to treat and prevent a number of human and animal diseases. The basis for these products is a plant of the *Solanaceae* family that contains a number of vitamin D-related compounds that have been shown to have unique activities affecting both calcium metabolism and cell growth and immune function. The native hormone form of vitamin D has been shown to ameliorate the symptoms or slow development of several auto-immune disorders in mice. However, the hypercalcemic effect of the native hormone precludes its use in humans. We intend to utilize glycosides of vitamin D compounds to target delivery of the vitamin D compounds to the lower gut to ameliorate inflammatory bowel disease. By delivering the vitamin D compounds only to the affected tissues we can reduce the potential for toxicity allowing use in humans.

Invention disclosures: Glycomyr, Inc., has filed a US and a PCT (European Union) patent on the use of these compounds for treating disorders in the bowel.

Publications/presentations based on project: None to date

Awards received: None to date

External funding applied for (indicate received/denied/pending): NIH Challenge Grant - Denied

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Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress):

In a mouse model utilizing dextran sodium sulfate to induce inflammatory bowel disease (IBD), we previously demonstrated our 1,25-vitamin D □-glucuronide reduced severity of disease. Though 1,25-dihydroxyvitamin D had a similar effect, it caused severe hypercalcemia. We focused on our compound's ability to "target" deliver 1,25-dihydroxyvitamin D, the active hormone, to the colon. 1,25-dihydroxyvitamin D acts on tissues to cause up-regulation of an enzyme known as 24-hydroxylase. Measuring 24-hydroxylase mRNA levels allows a very sensitive indicator of the degree to which a tissue has responded to a vitamin D compound. Administering 24 pmoles of 1,25-dihydroxyvitamin D up-regulated colon 24-hydroxylase 5-8 fold. Giving 24 pmoles of our 1,25-dihydroxyvitamin D glucuronide up-regulated colon 24-hydroxylase almost 700 fold, clearly demonstrating targeting of the drug's actions to the colon. In humans, marginal plasma vitamin D concentrations are associated with increased risk of IBD. We found bacterial numbers in the colon of vitamin D deficient mice are from 50 – 100 fold higher than in vitamin D replete animals. Cadherin is a protein that forms tight junctions between colon epithelial cells and keeps bacteria from breaching the intestinal wall. We found a 20-30% decline in cadherin mRNA in vitamin D deficient mice. It is believed two factors that "cause" IBD are an aberrant response to bacteria residing in the gut, and a loss of integrity of epithelial cell tight junctions. We will determine the dose of 1,25-vitamin D □-glucuronide required to maintain "normal" bacterial numbers in the gut and integrity of the tight junctions. We already know that at the doses we are using the native hormone causes life threatening hypercalcemia, while our compound does not. We have also done two studies looking at the effect of our compound in chronic IBD models. The results suggest a modest, but repeatable, ameliorating effect on IBD. Demonstrating the direct effects on the colon along with the therapeutic effect in several IBD models will improve the likelihood that this will be chosen for use in human Phase I clinical trials. Both Glycomyr and Heartland assays will continue to work with Goff and ISU to further these findings.

FINAL REPORT
Title: Transgenic Plant Resistance to Invertebrate Pests
Principal Investigator(s) Bryony C. Bonning and W. Allen Miller
Company Partner(s): Pioneer Hi-Bred International, a DuPont Company
Project Goal: We have developed a new technology for plant resistance to aphids based on a plant virus coat protein (CP) fused to an insect specific toxin (omega-atracotoxin Hv1a) that acts within the aphid body cavity (Miller and Bonning, 2007). The objectives of this research are to (1) test the CP-P-Hv1a resistance technology against a broad range of invertebrate pests, and (2) construct transgenic plants and determine the extent of pest resistance.

Publications/presentations based on project: None to date
Awards received: None to date
Invention disclosures: None to date
External funding applied for (indicate received/denied/pending): None to date

Progress Report:

Objective 1. As the receptor for the plant virus CP in the aphid gut is unknown, we do not know whether CP-P-toxin fusions will be specific to aphids, or whether the fusion protein will also be delivered into the hemocoel of other insects. Feeding of larvae of the tobacco budworm caterpillar, *Heliothis virescens*, with 8 ng CP-P-Hv1a and the control fusion protein (CP-P-Hv1am with a mutated, inactive toxin) resulted in lethargy of larvae that ingested CP-P-Hv1a but not those in the control treatment. This result indicates that higher concentrations of the fusion protein may be toxic to lepidopteran larvae. Transgenic plants developed in objective 2 will be used to test for resistance against other economically important pest species.

Objective 2. We constructed transgenic Arabidopsis for expression of CP-P-Hv1a, CP-P-Hv1am and CP-P-EGFP (control) with native coding sequences using standard procedures. Transgene expression was confirmed in T2 and T3 plants expressing transgenes with native codon sequences, and in T2 plants expressing codon-optimized transgenes, by western blot, RT-PCR and fluorescence microscopy of the roots for CP-P-EGPF expressing plants. Bioassays conducted with the green peach aphid, *Myzus persicae* on T2 homozygous plants with transgenes with native codon sequences showed that CP-P-Hv1a significantly suppressed aphid populations: There was a 10-fold reduction in aphid numbers per plant by day 17 compared to all three of the control treatments (transgenic plants expressing CP-P-Hv1am, CP-P-EGFP and gssHv1a – the toxin alone). Specifically, CP-P-Hv1a plants had an average of 25 aphids per plant, compared to an average of 250 aphids on each of the control plants. Paralysis was seen in aphids feeding on the CP-P-Hv1a expressing plants, and the high aphid numbers on control plants resulted in discoloration of the leaves. A preliminary bioassay on T1 plants with codon-optimized transgenes showed similar results by day 13; T2 plants with high expression levels will be used for bioassays with *M. persicae* for comparison of efficacy between transgenes with native and codon-optimized sequences. Taken together, these bioassay data indicate that this technology will be highly effective for management of aphid pests, and has particular potential for use in transgenic soybean for management of the soybean aphid.

Objective 3. To assess the potential of this technology for delivery of multiple, diverse toxins we screened an additional two toxins for oral toxicity, and for toxicity by injection. From this evaluation, we will identify additional toxins that could be used effectively with the CP-P- delivery system. We tested the toxins Cyt1Aa and LqhIT against the pea aphid, *A. pisum* and the green peach aphid, *M. persicae.* While LqhIT was not toxic by ingestion, the LC50 for Cyt1Aa was 1.56 and 2.89 μg/100 μl diet for *M. persicae* and *A. pisum* respectively. The LD50 for Cyt1Aa by injection for *A. pisum* was 13.84 ng. The LD50 by injection for LqhIT in *A. pisum* was 28 ng. The LD50 was calculated based on data for 5 dose treatments (by probit analysis using PoloPlus Version 2.0 (LeOra-Software, 1987; Russell et al., 1977). Hence, overall we identified five toxins (w-Agatoxin IVA, rCharybdotoxin, rMaurotoxin, rChlorotoxin and LqhIT) that are not toxic to aphids by ingestion. Although none of these toxins appear to be as toxic as Hv1a by injection, they provide ideal additional candidates to test the versatility of the CP-P-toxin delivery system.

References cited

LeOra-Software (1987). "POLO-PC, a user's guide to probit and logit analysis." LeOra Software, Berkeley, California.
Miller, W. A., and Bonning, B. C. (2007). Plant Resistance to Insect Pests Mediated by Viral Proteins. U.S. Patent 7,312,080, Vol. .

FINAL REPORT
Title: Rapid Sequence-Based Detection of Human Pathogens: From Farm to Fork to Physician
PI: Byron Brehm-Stecher
Companies: Advanced Analytical Technologies, The Cleveland Clinic Foundation
Project Goal: To apply home-grown Iowan technology developed by Advanced Analtyical Technologies, Inc. to effect a transformative impact on the environmental, food and clinical testing markets, allowing end users to not only quickly detect target pathogens, but also to characterize isolates and distinguish them based on minute genetic differences.

Publications/presentations based on project:

- Progress on Grow Iowa Values Fund project was reported in a University news release in May 2010: http://www.news.iastate.edu/news/2010/may/StecherAATI
- MS thesis, Brittany Porter, expected August 2010; Thesis title: "New CE tools for rapid sequence-based detection and characterization of human pathogens". **Update (01/2011):** Unexpected delay in graduation due to student's involvement in an out-of-state car accident. Graduation now expected May, 2011.
- Byron Brehm-Stecher named as chair for "High Throughput Analysis of Foods" session at the Association for Laboratory Automation meeting, January 2011 (LabAutomation2011).
- Pierre Varineau of Advanced Analytical Technologies, Inc., to present "Parallel capillary electrophoresis with fluorescence detection for sensitive, reproducible and automated analysis of DNA" in LabAutomation2011 session on "High Througput Analysis of Foods", January 2011.
- "DNA PROfiling for the detection and characterization of *Salmonella* in peanut butter" B. Porter, H.-J. Kim, H.-m. Pang, A. Oppedahl, G.W. Procop and B.F. Brehm-Stecher. Poster presentation, International Association for Food Protection's Annual Meeting, Anaheim, CA.
- "From Farm to Fork to Physician: Detection of Human Pathogens Across the Production to Consumption to Disease Continuum", Symposium proposal to International Association for Food Protection; Brehm-Stecher symposium co-convener with Dr. M.L. Tortorello, Chief, Food Technology Branch FDA/National Center for Food Safety and Technology, Chicago, IL. **Update (01/2011):** This idea accepted by IAFP for full development as a 3.5 hour symposium. Invited speakers include Dr. Gary Procop of the Cleveland Clinic Foundation, a collaborator on this grant.
- "Rapid Detection of Pathogens in Complex Food Matrices", invited talk at the 29th annual Current Concepts in Foodborne Pathogens and Rapid and Automated Methods in Food Microbiology meeting, University of Wisconsin-River Falls.
- "DNA PROfiling for Characterization of *Salmonella* spp", B. Porter, W. Wei, H. Pang and B.F. Brehm-Stecher, poster presentation P-080, American Society for Microbiology General Meeting, Philadelphia, PA.
- Byron Brehm-Stecher spoke at the "Single Cell Analysis Summit", held 28-29 October, 2010, San Diego, CA
- Byron Brehm-Stecher accepted an invitation to speak in Select Biosciences' "Advances In Biodetection & Biosensors" conference to be held in Hamburg, Germany, June 30- July 1, 2011. Will coordinate visit and presentation with Lutz Büchner, Director of European Operations, Advanced Analytical Technologies, GmbH.
- **Two abstracts** submitted to the American Society for Microbiology 2011 General Meeting (New Orleans, LA):
    a. High-Throughput Capillary Electrophoresis for DNA-Based Typing of *Salmonella* spp.
    b. Combination of Multiplex PCR and Electrophoretic Detection for Identification of *Salmonella*, with Subspecies Differentiation
- **One abstract** submitted to the 2011 International Association for Food Protection (IAFP) Annual Meeting (Milwaukee, WI):
    a. Application of Multiplex PCR for Rapid Differentiation of *Salmonella* Subspecies I, *S*. Typhimurium and *S*. Enteritidis from Biochemically-Similar Enterobacteriaceae Isolated from Layer Hen Production Facilities

External funding applied for (indicate received/denied/pending):

- **Received. Midwest Poultry Research Program (MPRP, H. Xin, PI). USDA-NIFA $438,345.** USDA grant for enhancing safety and animal welfare in Midwest Poultry production systems. **My Role:** Co-PI responsible for development of molecular detection and characterization techniques as rapid alternatives to current methods for screening of egg production facilities for the presence of *Salmonella*. Work will be carried out in close coordination with an Iowan partner company, a leading producer of layer hens to the world market.

- **Received. Assessment of Alternative Production Systems for Laying Hens to Safeguard Animal Welfare and Sustainable Egg Supply (H. Xin, PI).** USDA grant to investigate cage-free layer systems from a holistic perspective (hen behavior and health, environmental impact and food safety). **USDA-NIFA: $699,906**. **My Role:** Co-PI responsible for classical microbiological testing and development of new molecular tests for *Salmonella* spp. in environmental and aerosol samples taken from traditional and alternative layer hen housing.
- **Received. Tuning and Upgrading the Food Safety Education Curricula for BSc (TU-BE-Safe; L. Wilson, PI).** ATLANTIS grant awarded for harmonizing of EU-US food safety regulations through exchange of ideas between regulators, educators, industry and students and through tuning of Bachelor of Science food safety curricula. EU-US Department of Education**: 70,000€ ($89,000). My Role:** Co-PI serving as member of the U.S. team travelling to Romania and Slovenia to provide scientific expertise on rapid detection of pathogens and on development of educational curricula related to this topic.
- **Received.** "Pre-Analytical Concentration of Bacteria from Dairy Processing Surfaces", Midwest Dairy Association, 01/01/2010-12/31/2010, **$30,469**.
- **Denied/Pending:** Brehm-Stecher Rapid Microbial Detection and Control Laboratory named as subcontractor on NSF SBIR proposal submitted June 9th, entitled "96-Channel Pulsed Field Capillary Electrophoresis for Rapid Strain Typing of Microbes", subcontract value **$62,006**. Update (01/2011): First submission not funded. Improved proposal and applied again, November, 2010.

Awards received: None to date
Invention disclosures: None to date

Progress report (300 word maximum): This work is synergistic with our other Grow Iowa Values Fund project, *AdvanCE*s in Food Safety: Fast Fragment Analysis for Differentiation and Tracking of Foodborne Pathogens. Both projects are collaborative with Advanced Analytical Technologies, Inc. (AATI) and both focus on capillary electrophoresis-based methods for analysis of biological materials, yet each project retains distinct individual goals. Parallel work on both projects has facilitated excellent interactions with AATI and have resulted in unique opportunities to gain additional market exposure for the company. For example, AATI will present data from this project during Association for Laboratory Automation's LabAutomation2011 meeting in January 2011 in a session on high-throughput methods for the analysis of foods, chaired by Dr. Brehm-Stecher, and Dr. Brehm-Stecher will coordinate his invited talk at the European Lab Automation conference on "Advances In Biodetection & Biosensors" (Hamburg, Germany, July, 2011) with Lutz Büchner, Director of European Operations for AATI. This coordination will enable us to maximize exposure of our work with AATI's instrumentation to potential customers in Europe. Highlights of our progress during this period include:

- Receipt of external funding from the USDA and the US Department of Education (listed above) for rapid microbial detection work that will directly benefit Iowan agribusiness partners such as Hy-Line, International
- "From Farm to Fork to Physician: Detection of Human Pathogens Across the Production to Consumption to Disease Continuum", idea to International Association for Food Protection accepted for full development as a 3.5 hour symposium. Invited speakers include Dr. Gary Procop of the Cleveland Clinic Foundation, a collaborator on this grant.
- Invited by the editors of Journal of Visualized Experiments to co-author (with AATI) a video article on application of the FS-96 instrument for DNA-fragment-based analyses of *Salmonella* spp.
- Profiler instrument retrofitted with a heated capillary array box to enhance resolution.

INTERIM REPORT
Title: Development of a novel genetic test for inherited bovine diseases and its application to tissues and embryos
PI: Patrick G. Halbur
Company Partners (company names only): Ames Center for Genetic Technologies (ACGT)
Project Goal: Develop and commercialize a panel of molecular diagnostic assays for detection of genetic diseases and production traits sensitive enough to use on biopsies from bovine embryos. This will benefit the Iowa beef and dairy industries by decreasing costs associated with maintaining the pregnancies of genetically diseased animals and accelerating the selection of genetically superior seed stock Iowa cattle producers.

The update is provided under the FY11 section, the project received continued funding.

FINAL REPORT
Title: Prevention of Swine Influenza: Commercialization of Replicon Particle and Replicon Subunit Vaccines
Principal Investigator(s): Bosworth, Brad **&** Vander Veen, Ryan
Company Partner: Harrisvaccines, Inc. d/b/a Sirrah Bios
Project Goal: The goal of this project is to develop replicons that express various influenza HA genes and to determine their immunogenicity and efficacy as SIV vaccine candidates

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Awards received: None to date

Invention disclosures: None to date

External funding applied for (indicate received/denied/pending):

- A Universal Swine Vaccine for the Prevention of Transmission of Influenza Viruses, National Pork Board, 2010. Denied.
- A prime/boost strategy using a swine model to develop broadly protective influenza vaccines, which benefit both human and farm animal health, National Institutes of Health, 2010. Pending.

Publications/presentations based on project:

- Vander Veen, R., Kamrud, K., Mogler, M., Loynachan, A.T., McVicker, J., Berglund, P., Owens, G., Timberlake, S., Lewis, W., Smith, J., Harris, D.L.. Rapid Development of an Efficacious Swine vaccine for Novel H1N1. *PLoS Currents Influenza*. 2009 October 29.
- Vander Veen, R. 2009 presentation. Rapid Development of a Novel H1N1 Vaccine for Swine Using Replicon Technology. Conference for Research Workers in Animal Diseases, December 6-8, 2009.
- Vander Veen, R. 2010 presentation. Vaccination of pigs against the novel H1N1 virus using replicon technology. American Association of Veterinarians annual meeting, March 6-9, 2010.
- Erdman, M.M., Kamrud, K.I., Harris, D.L., Smith, J. Alphavirus replicon particle vaccines developed for us in humans induce high levels of antibodies to influenza hemagglutinin in swine: proof of concept. *Vaccine* 2010; 28(3):594-96.
- Bosworth, B., Erdman, M.M., Stine, D.L., Harris, I., Irwin, C., Jens, M., Loynachan, A., Kamrud, K., Harris, D.L. Replicon particle vaccine protects against influenza. *Comparative Immunology, Microbiology and Infectious Disease* 2010; 33(6): 99-103.
- Vander Veen, R. 2010 presentation. Efficacy of swine influenza virus vaccines produced using the alphavirus replicon system. 21st International Pig Veterinary Society Congress, July 18-21, 2010.
- Harris, D.L. 2010 presentation. Selection of influenza vaccine strains and rapid method for producing antigenically homologous vaccine. 21st International Pig Veterinary Society Congress, July 18-21, 2010.
- Russell, B., Mogler, M., Vander Veen, R., Harris, D.L. Induction of robust antigen-specific interferon-gamma responses in swine using alphavirus-derived replicon particles. American Association of Swine Veterinarians annual meeting, March 2011.

Progress Report

Since its introduction, novel H1N1 virus has been a concern for the swine industry. For a novel H1N1 vaccine efficacy study, we produced novel H1 replicon particle (RP) and replicon subunit (RS) vaccines within two months of the outbreak being reported. Following challenge, both H1 RS and RP vaccinated pigs demonstrated reduced viral shedding and lung pathology, and increased average daily gain, when compared to non-vaccinated pigs. In addition to homologous influenza protection, we have conducted studies demonstrating that some level of protection may be achievable from heterologous challenge when vaccinating with either conserved influenza proteins or with novel vaccination regiments.

In addition to novel H1, replicons expressing swine H1 Beta, Gamma, Delta, and cluster 4 H3 have been produced and evaluated for antibody responses in pigs. Antigen-specific antiserum from the study is used in a hemagglutination inhibition assay with swine influenza field isolates to determine antigenic cross-reactivity. These results can be used to quickly produce customizable RS vaccines via Sirrah Bios' VCP (Vet/Client/Patient) relationship. In 2009, Sirrah Bios sold 198,868 doses of SIV RS vaccine via VCP relationship, 559,500 doses in 2010, and 199,900 doses YTD May 2011. In addition, Harrisvaccines, Inc. d/b/a Sirrah Bios, has submitted an application to the Center for Veterinary Biologics (CVB) for full licensure of a cluster 4 H3 RP vaccine, expected in late 2011.

FINAL REPORT
Title: Effect of oral ATP on human muscle performance
PI: Rick Sharp
Company Partners (company names only): Metabolic Technologies, Inc
Project Goal: There is evidence that intramuscular and intravenous injection of ATP is effective in restoring muscle function after injury and as result of chronic muscle fatigue such as low-back pain. Although oral supplements of ATP are available as non-prescription dietary supplements, there is presently no evidence of their efficacy. Our purpose is to determine if providing an oral dose of ATP (adenosine triphosphate) will influence human muscle strength or endurance.

Publications/presentations based on project: None to date
Awards received: None to date
Invention disclosures: None to date
External funding applied for (indicate received/denied/pending): None to date

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Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress):

All human subject testing trials have been completed and analysis of blood samples has been completed. We are currently conducting analyses of clinical chemistry markers to document safety of the product and are conducting statistical analyses on the measures related to muscle performance (strength and endurance). In our analysis of results, we found a marginally promising effect of ATP supplementation in reducing the amount of muscle fatigue in repeated exercise muscle contractions. This finding, however, was confined to only the higher dose we studied and was barely considered significant. As a result of this finding, we have contracted with Metabolic Technologies Inc to add an additional trial to the experiment which will add additional subjects. It is hoped that the larger sample size will resolve the issue of whether our marginally significant effect of ATP is reliable. The additional testing is in process and will likely be completed by October 2011. No additional funds were requested from GIVF to perform the extra testing, but publication had been delayed until these results can be analyzed.

FINAL REPORT
Title: Cross Protective Immunity
PI: Tanja Opriessnig
Company Partners (company names only): The Center for Advanced Host Defenses, Immunobiotics and Translational Comparative Medicine.
Project Goal: The objective of the current project is to further explore a novel PRRSV vaccine candidate, and to validate the results from the previous pilot study while concurrently evaluating details of the immune response and cross protection provided by the vaccine.

Publications/presentations based on project:
Hemnani K, Trujillo JD, Opriessnig T, Messel R, Nara P. Development of a broadly protective PRRSv vaccine Presented at the research day at the University of Iowa. The Graduate student presenter (Khushboo Hemnani) won the 1st prize in the Veterinary Student Section.
Awards received: None to date
Invention disclosures: None to date
External funding applied for (indicate received/denied/pending): None to date

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Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress):
In two previous proof-of-concept studies, we have injected antibody-virus complexes using IgG purified from sera taken at various times after infection. Upon challenge with heterologous virus, the animals were examined for a variety of correlates of lessened virus replication and pathogenesis and the reductions in lung lesions observed grossly, in histopathological scores of stained lung tissues, and reduced viral RNA concentrations suggested that the AIM-treated animals had developed broadened protective responses compared to the other groups. In the last study performed in 2010-2011 utilizing AIM vaccination and heterologous virus challenge as compared to autogenously vaccinated pigs, immunization with AIM resulted in 33% vaccine efficacy in prevention from heterologous PRRSv infection. Autogenous vaccination had no efficacy in this study with regard to prevention of infection. Moreover, pigs vaccinated with AIM that were not protected from infection (66%) had a significant reduction in pulmonary viral loads and PRRSv associated histopathology in the lung. At seven days post challenge, only two AIM vaccinated pigs had detectable PRRSv in their blood as compared to all of the autogenous vaccinated pigs and all of the non-vaccinated control pigs. Immunization with AIM and autogenous vaccination resulted in a significant reduction of viral load at peak viremia; however, this reduction in peak viremia only affected disease outcome in the AIM vaccinated group. Ongoing research includes the determination of immunological correlates of immunity and refinement of AIM using antibody fragments and completion of field studies for continued translation of this vaccine and its technology into clinical practice. The focus of this work is to translate the work done in the laboratory to the field and therefore to determine whether the AIM technology can be used as a low-cost stimulator of broadly protective immunity against PRRSV.

FINAL REPORT
Title: Volumetric Model Analysis for Bariatric Medicine
PI: George Kraus / Eliot Winer
Company Partners (company names only): Visual Medical Solutions, LLC.
Project Goal: Research visualization strategies that can aid in bariatric medicine for diagnosis and treatment of patients.

Publications/presentations based on project: None to date
Awards received: None to date
Invention disclosures: None to date
External funding applied for (indicate received/denied/pending): None to date

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Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress):

We have developed multiple tools to assess the physical characteristics of patient's in diagnosis and treatment from a bariatric specialist. These advances include:

- Basic segmentation of organs and structures to allow visual examination
- Creation of tools to measure required physical characteristics such as measures of length and volume
- Heuristics to compute weight and other inferred properties necessary for proper diagnosis

In addition, a user study has been started to assess the efficacy of 3D medical planning tools compared to traditional 2D tools. This is critical to understanding what features and capabilities should be developed and how.

FINAL REPORT
Title: Iowa Powder Atomization Technologies (IPAT); Titanium Atomizer Prototype Design
PI: Iver E. Anderson
Company Partners (company names only): Iowa Powder Atomization Technologies (IPAT)
Project Goal: The primary goal of this project is to design and fabricate a novel prototype atomizer for the production of fine spherical titanium metal powder. Upon completion, this prototype will be used to demonstrate the feasibility of an innovative titanium melt pouring concept that can be coupled to a high pressure gas atomization nozzle to produce high quality Ti powder. If successful, commercialization of this atomization technique could result in the start of a new business called Iowa Powder Atomization Technologies (IPAT).

Publications/presentations based on project (includes previous related GIVF project):

- J.R. Rieken, I.E. Anderson, A. Heidloff, and D. Byrd, "Development and Commercialization of a New Titanium Gas Atomization Process," presented at the Integrated Titanium Factory Vision and Roadmap Conference, held at Rock Island Arsenal (US Army) on May 12, 2009.
- I.E. Anderson, J. Sears, D. Byrd, J.R. Rieken, A. Heidloff, M. Glynn, and M. Ward, "Development of Advanced Gas Atomization Process for Ti and Ti Alloy Powders," presented at the 2009 International Conference on Powder Metallurgy & Particulate Materials on July 1, 2009 at the Mirage Hotel, Las Vegas, Nevada.
- Editorial feature in *Powder Injection Moulding International*, Industry News section: "Lower Cost Titanium Powder Production on Track at Iowa Powder Atomization Technologies," vol. 3, No. 3, pp.16-17 (2009)
- A.J. Heidloff, J.R. Rieken, I.E. Anderson, D. Byrd, J. Sears, M. Glynn, and M. Ward, "Advanced Gas Atomization Processing for Ti and Ti Alloy Powder Manufacturing," presented at The Minerals, Metals, and Materials Society (TMS) 2010 Annual Meeting on February 16, 2010 at the Washington State Convention Center, Seattle, Washington.
- A.J. Heidloff, J.R. Rieken, I.E. Anderson, D. Byrd, J. Sears, M. Glynn, and M. Ward, "Advanced Gas Atomization Processing for Ti and Ti Alloy Powder Manufacturing," Proceedings of The Minerals, Metals, and Materials Society 2010 Annual Meeting, TMS, Warrendale, PA, February 14-18, 2010, vol. 1, pp. 257-266.
- A.J. Heidloff, J.R. Rieken, I.E. Anderson, D. Byrd, J. Sears, M. Glynn, and R.M. Ward, "Advanced Gas Atomization Processing for Ti and Ti Alloy Powder Manufacturing," JOM, vol. 62, No. 5, pp. 35-41 (2010), ***Editor's Selection*** from TMS 2010 Annual Meeting.
- I.E. Anderson, J.R. Rieken, A. Heidloff, and D. Byrd, "Development and Commercialization of a New Titanium Gas Atomization Process," presented at the QCML Launch and 2nd Annual Titanium Summit, held at Rock Island Arsenal (US Army) on April 6-7, 2010.
- I.E. Anderson, D. Byrd, A.J. Heidloff, and J.R. Rieken, "Initial Results for Advanced Gas Atomization Processing of Ti and Ti Alloy Powder," presented at 2010 International Conference on Powder Metallurgy & Particulate Materials on June 28, 2010 at the Westin Diplomat Hotel, Ft. Lauderdale, Florida.
- D. Byrd, I.E. Anderson, M. Besser, J.R. Rieken, and A.J. Heidloff, "Three Layer Composite Plasma Sprayed Pour Tubes for Titanium Atomization," presented at 2010 International Conference on Powder Metallurgy & Particulate Materials on June 28, 2010 at the Westin Diplomat Hotel, Ft. Lauderdale, Florida.
- I.E. Anderson, A.J. Heidloff, J.R. Rieken, and D. Byrd, "Initial Results for Advanced Gas Atomization Processing of Ti and Ti Alloy Powder," Advances in Powder Metallurgy and Particulate Materials, vol. 2, pp. 34-44 (2010).
- D. Byrd, I.E. Anderson, M. Besser, J.R. Rieken, and A.J. Heidloff, "Monolithic and Composite Plasma Sprayed Pour Tubes for Gas Atomization," Advances in Powder Metallurgy and Particulate Materials, vol. 2, pp. 88-100 (2010).
- A.J. Heidloff, J.R. Rieken, D. Byrd, and I.E. Anderson, "Characterization and Properties of Titanium Alloy Powder Produced by Close-Coupled Gas Atomization and of Resulting Consolidated Samples," presented at The Minerals, Metals, and Materials Society (TMS) 2011 Annual Meeting on March 1, 2011 at the San Diego Convention Center, San Diego, California.
- A.J. Heidloff, J.R. Rieken, D. Byrd, and I.E. Anderson, "Advancements in Ti Alloy Powder Production by Close-Coupled Gas Atomization," presented at the 2011 International Conference on Powder Metallurgy & Particulate Materials on May 20, 2011 at the Marriott Marquis, San Francisco, California.
- I.E. Anderson, J.R. Rieken, J. Meyer, D. Byrd, and A.J. Heidloff, "Visualization of Atomization Gas Flow and Melt Break-up Effects in Response to Nozzle Design Variations: Simulation and Practice," presented at the 2011 International Conference on Powder Metallurgy & Particulate Materials on May 21, 2011 at the Marriott Marquis, San Francisco, California.

- D. Byrd, I.E. Anderson, M. Besser, J.R. Rieken, J. Meyer, and A.J. Heidloff, "Plasma-Sprayed Pour Tubes and Other Melt-Handling Components for Use in Gas Atomization," presented at the 2011 International Conference on Powder Metallurgy & Particulate Materials on May 21, 2011 at the Marriott Marquis, San Francisco, California.
- A. Heidloff, J.R. Rieken, I.E. Anderson, and D. Byrd, "Iowa Powder Atomization Technologies: Advanced Manufacturing of Ti Alloy Powder," presented at the 3rd Annual Titanium Summit, held at Rock Island Arsenal (US Army) on May 31, 2011.
- A.J. Heidloff, J.R. Rieken, D. Byrd, and I.E. Anderson, "Advancements in Ti Alloy Powder Production by Close-Coupled Gas Atomization," **to be published** in Advances in Powder Metallurgy and Particulate Materials 2011.
- I.E. Anderson, J.R. Rieken, J. Meyer, D. Byrd, and A.J. Heidloff, "Visualization of Atomization Gas Flow and Melt Break-up Effects in Response to Nozzle Design Variations: Simulation and Practice," **to be published** in Advances in Powder Metallurgy and Particulate Materials 2011.
- D. Byrd, I.E. Anderson, M. Besser, J.R. Rieken, J. Meyer, and A.J. Heidloff, "Plasma-Sprayed Pour Tubes and Other Melt-Handling Components for Use in Gas Atomization," **to be published** in Advances in Powder Metallurgy and Particulate Materials 2011.

Awards received:

Invention disclosures and patents (includes previous related GIVF project):

- Rieken, J.R. and Heidloff, A.J., "Rare Earth Sub-Stoichiometric Pour Tube for Reactive Materials," provisional patent application submitted December 21, 2009, **utility patent application** submitted December 16, 2010, ISURF #03695.

External funding applied for (includes previous related GIVF project):

- Subcontract proposal entitled: "Generation of Fine Spherical Ti Alloy Powder for Net-Shape Powder Injection Molding of High Performance Fastners," for $240,000 as part of the full proposal, "Innovative Net Shape Manufacturing of Small Parts Using Titanium Powder," for $963,015 to the Industrial Base Innovation Fund II of the Defense Logistics Agency **(denied).**
- Subcontract entitled: "Feasibility Tests for Large Scale Advanced Titanium Powder Production," for $830,000 as part of the full proposal, "Near Net Shape Manufacturing For Current and Future Generation Munitions and Armament Systems **(awarded, 5 year term, impending project start).**
- Proposal entitled: "Design and Completion of Advanced Titanium Gas Atomizer," through the Iowa State University Research Foundation for $25,000 **(received).**
- Proposal entitled: "Supplemental Support of Advanced Capability for Titanium Melting," through the Iowa State University Research Foundation for $25,000 **(received).**
- Subcontract proposal entitled: "Development of Gas Atomization System to Produce Fine Spherical Titanium Powder," under Northern Illinois University for $30,000 **(received).**
- Supplement to subcontract award entitled: "Development of Gas Atomization System to Produce Fine Spherical Titanium Powder," under Northern Illinois University for $20,000 **(received).**

Progress report:

Task 1: A prototype close-coupled high pressure gas atomization (CC-HPGA) system with a cold wall copper melting crucible and composite refractory superheat pour tube was completed. An extended period of detailed system design was conducted and a complete set of engineering drawings was completed. In addition to the titanium atomizer, a monitoring and recording "module" and large heat-exchanger system were added to the system components.

A "slightly used" cold wall copper crucible was obtained on extended loan from Idaho National Laboratory. This fortunate assistance for our project reduced the lead time for this specialized equipment and was obtained for only the expense of shipping. The cold wall crucible is energized by an induction coil using the existing induction powder supply. A new cold wall crucible induction coil was designed through the use of electro-magnetic field (EMF) modeling and built by Fluxtrol Inc. of Auburn Hills, MI, and was introduced into the system. Additional optimizations of the existing power supply through on-site assistance of Fluxtrol, Inc.; additional capacitance was added to the system and has allowed for full power capability. Having a full 150kW of power at the disposal of the operator is an enormous milestone and greatly enhances the probability of successful operation of the prototype atomizer.

Several downstream gas halos and a shroud were designed and incorporated into the system. The combined halo/shroud system is intended to provide cooling and passivation of the powders after atomization and to prevent satellite powder particle formation. If the satellite prevention function proves to be successful, it has the potential to

generate new intellectual property. In addition to the gas halos, a liquid nitrogen chilling system was attached to the powder collection system. Thermocouple measurements indicated collection system temperatures of ~-50°C, which will also aid in cooling of the fine powders down to safe levels.

Task 2: During our recent preliminary trials, the design and operation of the new water cooling and vacuum system additions were demonstrated to be successful, providing sufficient water cooling to the interior of the system while maintaining excellent operational vacuum levels. The pour tube coil system was turned on for an initial "heat-up trial". This test was conducted without the presence of the complex and expensive atomization nozzle to protect against damage in case of unforeseen results. This test was deemed successful as pour tube interior temperatures reached ~2100°C while other components were maintained at sufficiently cool temperatures. This allowed for a subsequent "full on" heat up trial where all cooling components were circulating while all atomization components necessary for atomization were included. This run also was deemed a success, giving confidence that all components of the complex system were working properly and that sufficient cooling is present for ALL systems simultaneously.

After the Fluxtrol improvement of the main melting power supply to permit full power operation at the proper frequency, a Ti-6Al-4V charge was heated and melted in the cold copper crucible in the most recent trial. Melting of the charge occurred at ~110kW, which indicated additional power available, when required. Sensitive thermocouple measurements and local video imaging gave indications that melting of the titanium had occurred. The molten titanium charge was held within the water-cooled copper crucible in a stable thermal condition, indicating sufficient cooling capacity and control. As the power was increased, electric arcing took place between the melting coil and the atomization chamber (which is a ground source). This arcing prevented full melting and atomization of the charge despite sufficient power. The damage done to the coil is being repaired at this time and a method for arc prevention has already been determined and is in-progress at Fluxtrol.

It was determined during the melting trial described above that there was insufficient visualization of the developing melt surface. It is of primary importance that visualization of the melt be available to allow for proper charge melting and skull formation. A CCD camera with proper lenses and filters has been ordered to allow for the proper visualization of the melt to take place. A full atomization trial of the completed prototype CC-HPGA system will be conducted to produce metal injection molding (MIM) quality powder from a Ti-6Al-4V alloy charge in January 2011. Of the many obstacles for successful operation of the prototype system, sufficient power from the available power supply to melt the titanium alloy charge was the most critical. With this unknown now eliminated and the arcing sources suppressed, there are no other apparent obstacles for successful atomization in the next trial.

Task 3: The yield of the prototype CC-HPGA system for high quality titanium alloy powders will be compared to other commercial powders (derived from samples, available data, and informed estimates) in terms of purity and the portion (wt.%) of each batch that is suitable for powder injection molding (dia.<45μm). Several samples of commercial Ti powders have been obtained, as well as chemical analysis data and some information for estimating yield of PIM grade powder for these sources.

FINAL REPORT

Title: Pultruded Window Frames from Agricultural Oils
PI: Michael R. Kessler
Company Partners (company names only): Pella Corp.
Project Goal: To develop resins and composites for pultrusion manufacturing to produce fiberglass reinforced biorenewable composite window frames.

Invention disclosures:
Publications/presentations based on project:

- Y. Xia, Y. Lu, R. C. Larock: *Ring-opening metathesis polymerization (ROMP) of norbornenyl-functionalized fatty alcohols*, **Polymer**; 2010; 51, 53-61.
- Y. Xia, R. C. Larock: *Castor oil-based thermosets with varied crosslink densities prepared by ring-opening metathesis polymerization (ROMP)*, **Polymer**; 2010; 51, 2508-2514.
- M. Valverde, S. Yoon, S. Bhuyan, R. C. Larock, M. R. Kessler, S. Sundararajan: *Conjugated Soybean Oil-Based Rubbers: Synthesis and Characterization*, **Macromolecular Materials and Engineering**, Submitted.
- D. D. Andjelkovic, Y. Lu, M. R. Kessler, R. C. Larock: *Novel Rubbers from Cationic Copolymerization of Soybean Oils and Dicyclopentadiene, 2 – Mechanical and Damping Properties*, **Macromolecular Materials and Engineering**; 2009; 294, 472-483.
- W. Jeong, T. C. Mauldin, R. C. Larock, M. R. Kessler: *Bio-based Rubbers by Concurrent Cationic and Ring-Opening Metathesis Polymerization of Modified Linseed Oil*, **Macromolecular Materials and Engineering**, 2009; 294, 756-761.
- P. Badrinarayanan, Y. Lu, R. C. Larock, M. R. Kessler: *Cure Characterization of Soybean Oil-Styrene-Divinylbenzene Thermosetting Copolymers*, **Journal of Applied Polymer Science**; 2009; 113, 1042-1049.
- K. Haman, P. Badrinarayanan, M. R. Kessler: *Cure Characterization of the Ring-Opening Metathesis Polymerization of Linseed Oil-Based Thermosetting Resins*, **Polymer International**, 2009; 58(7), 738-744
- T. C. Mauldin, M. R. Kessler: *Latent Catalytic Systems for Ring-Opening Metathesis-Based Thermosets*, **Journal of Thermal Analysis and Calorimetry**, 2009; 96, 705-713.
- Mahendra Thunga, Ying Xia, Uwe Gohs, Gert Heinrich, Richard C. Larock, Michael R. Kessler "Influence of electron beam irradiation on mechanical properties of vegetable oil-based biopolymers" 1st International Symposium on **POLY**mer modification **W**ith **H**igh **E**nergy **El**ectrons (POLYWHEEL 2010), Nov. 24-26, 2010, Dresden, Germany, **Invited**.
- Hongyu Cui and Michael R. Kessler "Effect of silane coupling agent on interfacial properties of glass fiber reinforced bio-renewable resin" 47th Annual Technical Meeting of the Society of Engineering Science, October 4-6, 2010. Ames, IA.
- M. R. Kessler, X. Sheng, T. C. Mauldin, W. Jeong, J. K. Lee "Thermal Analysis of Ring-Opening Metathesis-Based Thermosets" Proceedings of the North American Thermal Analysis Society Annual Conference (NATAS 2010). August. 15-18, 2010. Philadelphia, PA.
- M. R. Kessler, R. Larock, Y. Lu "Polymer and Composites from Agricultural Oils" 68th Annual Technical Conference for the Society of Plastics Engineers, May 16-20, 2010. Orlando, FL. Bioplastics Technical Program—**Invited Keynote Lecture**.
- Mahendra Thunga, Ying Xia, Uwe Gohs, Gert Heinrich, Richard C. Larock, Michael R. Kessler "Engineering the mechanical properties of vegetable oil based biopolymers with electron beam irradiation" Midwest Biopolymers & Biocomposites Workshop, May 11, 2010. Ames, IA.
- Hungyu Cui, Michael R. Kessler "Effect of silane coupling agent on interfacial properties of glass fiber reinforced biorenewable resin" Midwest Biopolymers & Biocomposites Workshop, May 11, 2010. Ames, IA.
- David Grewell, Maria Vlad, Gowrishankar Srinivasan, Michael Kessler, Richard Larock "Investigation of processability of protein based plastics and composites for industrial applications" Pacific Rim (PACRIM) Summit on Industrial Biotechnology & Bioenergy, November 8-11, 2009. Honolulu, HI, **Invited**.
- Michael R. Kessler, Richard Larock, Yongshang Lu "Polymers and Composites from Agricultural Oils" 100th AOCS Annual Meeting and Exposition, May 3-6, 2009, Orlando, FL, **Invited.**

Awards received:

- Professor Kessler was awarded a CAREER award from the National Science Foundation to continue the science initiated by this GIVF project, July 2010.
- Professor Kessler was awarded the Elsevier Young Composites Researcher Award from the American Society for Composites, September 2009

External funding applied for (indicate received/denied/pending):

- Michael Kessler "CAREER: Multifunctional Biorenewable Polymers" National Science Foundation, July 2010-June 2015, **Received** $401,000.
- Michael Kessler with Richard Larock "Fiberglass Reinforced Polymers from Agricultural Oils", The Consortium for Plant Biotechnology Research, 2010-2011 **Received** $205,000 plus $205,000 matching contribution from Iowa State and Ashland Performance Materials.
- Max Porter and Michael Kessler "Basalt Fiber FRP Reinforcement Strength and Durability in Concrete Environments", NSF, August 2010 to July 2013, **Pending**, $387,968.
- Principal Investigator with co-PI David Grewell, Iver Anderson, and Malika Jeffries-EL "Acquisition of an Instrumented Small Scale Production Suite for Processing of Functional Nanocomposites and Bio-based Fibers" Department of Defense University Research Instrumentation Program (DURIP), 1 April 2010 to 31 March 2011, **Denied** $361,136.
- Michael Kessler, David Grewell and Richard Larock "Composites from Vegetable Oil Resins and Lignin-derived Carbon Fibers" Department of Energy EPSCoR program, 1 July 2010 to 30 June 2013, **Denied** $2,244,817.
- Co-Principal Investigator with Max Porter "Fiber Reinforced Polymer Bars with a Bio-Matrix Resin for Concrete Reinforcement", NIST Technology Innovation Program (TIP), September 2009 to August 2013, **Denied**, $5,202,636.
- Richard Larock and Michael Kessler "Replacing Petroleum in Plastics by Renewable Oil / Biofuel By-product Composites" The Consortium for Plant Biotechnology Research, 2010-2011, **Denied** $199,272 plus $199,272 matching contribution from Iowa State and Suganit Systems, Inc.
- David Grewell, Michael Kessler, Richard Larock, and Krishna Rajan "Bio-based coatings and adhesives", USDA Cooperative State Research, Education, and Extension Service (CSREES), January 2010 to December 2013, **Denied** 996,517.
- Michael Kessler, Richard Larock and David Grewell "Composites from Vegetable Oil Resins and Lignin-derived Carbon Fibers", Strategic Environmental Research and Development Program (SERDP), Department of Defense, 1 January 2010 to 31 December 2012, **Denied** $945,000.

Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress):

We are making good progress in developing and characterizing polymer composites processed by the pultrusion processing of fiberglass/bio-resin for composite window frame applications. These bio-based resins are made from soybean and linseed oils by two different processes: cationic polymerization and ring-opening metathesis polymerization (ROMP). Our initial efforts had been directed at decreasing the cure times and characterizing the cure kinetics of the resins made by the cationic polymerization of soybean oil (with different loadings of the styrene and divinylbenzene co-monomers). In that work, we found that the room temperature gel times vary from 35 to 70 min while the gel times at 160 ^{o}C vary from 40 to 80 s, depending on composition.

Our more recent effort has focused on increasing the thermo-mechanical properties of the ROMP-based resins and improving the interfacial shear strength (IFSS) between the glass fiber and ROMP-based matrix using several different silane coupling agents. With the help of a senior design team from the Department of Materials Science and Engineering, we have designed and built a table top pultrusion machine that can be used to produce small scale fiberglass/bio-resin rods which can then be characterized to see how they compare to the petroleum-based fiberglass/unsaturated polyester resin materials that are currently used by our partner company, Pella Corp., in their doors and window frames.

FINAL REPORT

Title: Protein Polymer Product Development

PI: David Grewell

Company Partners (company names only): Creative Composites, Pella Corporation, Soy Works Corporation, Vermeer Corporation, Plano

Project Goal:

The main thrust of the proposed work is to cooperate with several industrial partners to develop and commercialize novel biobased products that impact Iowa's economy. These products will include hay bale wrapping, pots for plants, dry wall application, construction panels, lubrication sticks and temporary cards.

Publications/presentations based on project:

- G. Srinivashan, S. Carolan, D. Grewell, Enhanced water stability of soy protein plastics using acid anhydrides, 68th Annual Technical Conference for the Society of Plastic Engineers Proceedings (2010), Society of Plastic Engineers, Brookfield, CT
- M. Helgeson, W. R. Graves, D. Grewell, G. Srinivasan. Zein-based bioplastic containers alter root-zone chemistry and growth of geranium. *Journal of Environmental Horticulture*, 28(2), 74-80, June 2010.
- D. Grewell, S. Carolan, G. Srinivasan, Soy protein based plastics: Improving water stability utilizing functional chemistry and fiber additives*, Polymer Engineering and Science*. Submitted December 2009
- G. Srinivashan, S. Carolan, D. Grewell, Enhanced water stability of soy protein plastics using acid anhydrides, 68th Annual Technical Conference for the Society of Plastic Engineers Proceedings (2010), Society of Plastic Engineers, Brookfield, CT
- J. Vogel, D. Grewell Comparison of beneficial and non beneficial effects of end product treatment options of bio-plastics and petroleum based plastics, Global Plastics Environmental Conference, Orlando Florida, March, 2010
- G. Srinivashan, D. Grewell, Investigation of Processability of Zein Based Plastics and Composites, *67th Annual Technical Conference for the Society of Plastic Engineers Proceedings* (2009), Society of Plastic Engineers, Brookfield, CT
- D. Grewell, The Technology of Bioplastics, Bioplastic Container Cropping Systems Conference, Iowa State University, January 2009
- D. Grewell, M. Vlad, G. Srinivasan, Investigation of Processability of Protein Based Plastics and Composites, Presentation at 25th Annual Meeting of The Polymer Processing Society, Goa, India 2009, Invited Lecture
- D. Grewell, The Technology of Bioplastics and Applications, Engineers for a Sustainable World meeting, ISU, January, 2009

External funding applied for (indicate received/denied/pending):

- $43,243 Grant to Letica Corporation (Pending)
- $60,023 Grant to United Soy Bean Board (Pending)
- $60,000 Grant to United Soy Bean Board (Funded)
- $83,595, Grant to USDA Office of Energy Policy and New Uses, Characterization of commercial Biodegradable Plastics for Biodegradation and Compostability (Funded)
- $ 996,516, Gant to USAD, Bio-based coatings and adhesives (Not Funded)
- $980,000 Grant to ARI-R² - NSF ISU Internal Pre-proposal, ISU (Not Funded)
- $1,508,998 Grant to USDA, Bioplastic Container Cropping Systems: Green Technology for the Green Industry (Not Funded)

Awards received: None to date

Invention disclosures: None to date

Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress):

Two products are currently being tested by the industrial sponsors; soy protein plastic pellets by SoyWorks and soy based lubrication sticks by Creative Composites. In more detail, we have worked with SoyWorks to develop a soy plastic formulation and pellet geometry to match their product specifications. This involved indentifying proper mixing sequence, material ratio and design, and fabrication of an extrusion die. To date, nearly 2,000 pounds of soy protein

based plastic were supplied to SoyWorks. Soy Works has indicated that our ability to accommodate several difficult specification changes requested by their customer was critical to setting the stage for commercialization. The customer has committed to sub-licensing the technology from Soy Works to build a production facility. As of this month, forecast sales are from to 20,000 to 50,000 pounds of resin in the first year of operation, climbing to a million or more pounds by 2012, three million pounds by 2015.

In addition, we have worked with Creative Composites in developing a soy reinforced lubrication stick that is soy based solid lubricant. To date we have tested a wide range of formulation and they are working with a large compounding company to produce the new product.

We have not completed the welding trials with Pella Windows however the samples are prepared and we are working with Pella to determine a date of the welding trials at their facility. In addition, we have not provided samples to Plano as they joined the project with the last few months. All of these efforts will be completed by late August, 2010 and no cost extension has been requested.

FINAL REPORT
Title: Waste Plastics, Crude Oil Sludge, and Tar Sand to Diesel – Capturing Energy from Waste
PI: Atul G. Kelkar
Company Partners (company names only): Innovative Energy Solutions, Inc., Ames, IA 50010
Project Goal: To conduct research related to thermo-catalytic conversion of Waste Hydrocarbons to useful fuels. Specific goal of this GIVF project is to enhance and fine-tune the proof-of-concept technology developed by IES for converting waste hydrocarbons to high grade fuel by investigating various catalyst and process parameters.

Publications/presentations based on project:

- Presentation to Iowa Business Plan Competition, Sept 2008.
- Presentation to AGAS International, Bahrain, March 2009.
- Presentation to Hyvee Corporate Office, West Des Moines, IA, Oct 2008.
- Presentation at Iowa Cleantech Venture Capital and Entrepreneur Event, August 2008.
- Teleconference presentation to Communications-Electronics Research Development and Engineering Center (CERDEC), 22 Feb 2010, entitled, 'Waste to Energy'.
- Invited Presentation at 2010 World Wide Energy Conference, 'Transformation of Waste to Energy', May 10-12, 2010, Gaylord National Hotel and Convention Center, National Harbor, Maryland.
- Several pilot plant demonstration in 2011 for prospective customers from all over the country.

Awards received: IES Won 2nd Place in 2009 Iowa Business Plan Competition.
Invention Disclosures: None
External funding applied for (indicate received/denied/pending):

- Agency: EPA, Title: Waste Hydrocarbons to Fuel Technology – Capturing Energy from Waste – Denied
- Agency – Iowa Power Fund, Title: Harnessing energy from waste hydrocarbons, Denied.
- Proposal submitted for Federal Appropriations – request denied in 2009. Applied for 2010. Placed on the top priority by Congressman Latham's office but House Republicans decided to boycott appropriations that year.
- IES's proposal to DLA for designing, fabrication, commissioning, and operation of Mobile Demonstration Unit at one of the Army bases. Submitted in July 2, 2010. Proposal was among the short listed but did not get awarded as IES did not pass DCAA approval due to lack of past federal funding history.

Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress):
The accomplishments to date on the project are:

1. Based on the data given by IES from their proof-of-concept trials a new set of catalyst compositions and trial matrix was developed for various feedstocks in first half of 2009. Using this matrix different trials were conducted for different feedstock combinations and catalyst combinations. More trials continue for generating more exhaustive database.
2. Several trials were conducted on two types of feedstocks – refinery residue and different types of plastics. The samples of outputs were given to Chemistry lab on campus for detailed component and mass analysis. The samples were compared with commercially available diesel sample taken from gas station. For the most part all samples compared reasonably well with diesel. Although samples contained some other carbon chains which are attributed to un-distilled samples.

3. IES made some modifications to the plant to enable quick cycle time for plant trials. In order to analyze process effectiveness for different feedstocks different industrial plastic waste generators as well as collectors were contacted and some waste plastic samples were also collected for processing.

4. In August 2009, a demonstration was arranged for various dignitaries including Congressman Latham at BECON. Other guests included potential users of the technology such as Hy-Vee, city and state officials, university personnel, and local representatives.

5. A significant progress has been made on commercialization of this technology. IES has been engaged in communication with various potential users of the technology. The list of users include refinery residue processing company in middle east, Hy-Vee, Ames and Des Moines City Officials, Waste Management, and a company in

Mauritius. Few of these potential users have asked for a formal techno-commercial offer (proposal) for a commercial scale plant to suite their need.

6. During the period Aug 2009 through March 2010, there has been close interaction with several DoD offices dealing with Waste to Energy initiatives inside DoD. In particular, the two offices of DoD who have been in close communication with Dr. Kelkar and IES team for potential R&D activity with DoD are Army Power Division, Power Technology and Alternative Energy Branch and Defense Logistics Agency, Defense Energy Support Center, Product Technology and Standardization.

7. Currently IES has submitted proposal to DLA, DESC for construction and operation of mobile demonstration unit at one of DLA's bases. If funded, IES will be responsible in designing, building, commissioning, and operating the Waste to Energy demonstration unit at one of the Army bases in U.S. for the period of 12 months. Upon successful completion of the project there is potential of military order for several such units across DoD operating bases. This will give tremendous boost to Iowa-based company and contribute to new employment and economy.

8. IES has attracted interest from foreign refinery servicing company for the purpose of investment in this new technology as well as for building a 50 metric tons per day capacity plant to process refinery residue into diesel fuel. The company has witnessed over 10 successful trials during which their refinery residue (feedstock) was processed to diesel in the Becon's Pilot Plant facility. The negotiations are still underway.

9. The experimental research on process and catalyst requirements for bio-mixed feedstock continues as the feedstock such as municipal solid waste typically contains such heterogeneous feedstock.

10. Los Angeles county has recently approached IES and seeking information on the technology for potential deployment of Waste to Fuel plants in the county.

11. Another company from Bay Area (Phoenix Fuels) has also witnessed the demonstration of plastic to diesel conversion technology and are interested in exclusive distributorship opportunity.

FY11 Projects (to finish May 31, 2012)

Principal Investigator	Project Title	Award Amount
Diane Janvrin	Market Research for Prioritizing Market Segments for Product Development	$ 40,590
Hui Hu	Development of Advanced Flow Diagnostic Techniques to Characterize Next Generation Fuel Nozzles	$ 78,305
Patrick Halbur	Development of a Novel Genetic Test for Inherited Bovine Diseases and Its Application to Embryos	$ 83,000
Rick Sharp	Efficacy of a new Delivery System for B-Hydroxy-B-Methylbutyrate	$ 99,883
Byron Brehm-Stecher	Advances in Food Safety: Fast Fragment Analysis for Differentiation and Tracking of Foodborne Pathogens	$ 106,961
Sri Sritharan*	Design Verification and Cost Evaluation of UHPC Towers for Enhancing Iowa's Wind Energy Production	$ 109,000
Vasant Honavar	Data Mining Tools for Healthcare Informatics	$ 109,243
Ayman Fayed	Battery Life Enhancement in Portable and Remotely0Deployed Systems Using Spread-Spectrum Switching Power Regulators	$ 117,944
Sanjeevi Sivansankar	Commercialization of an integrated, single molecule Atomic Force Microscope-Fluorescence Microscope for academic and industrial applications	$ 120,075
Suraj Kothari*	A Programmable Software Pattern Analyzer (PSPA); Critical Safety Improvement for Transportation Control Systems	$ 77,388
Matt Frank	Innovative methods for the manufacturing of patient specific bone implants	$ 50,000

*No update received this period

FINAL REPORT

Title: Market Research for Prioritizing Market Segments for Product Development and Marketing

PI: Diane Janvrin (Accounting); Sanjeev Agwaral (Marketing)

Company Partners (company names only): WebFilings

Project Goal: Provide WebFilings management with a broad understanding of potential markets for their product and an in-depth analysis of a single market segment.

Publications/presentations based on project:

Included high level findings (sanitized to remove all company identification) in Re-examining the Financial Close Process continuing education presentation for Contemporary Issues in Accounting workshop, December 17, 2010.

Included high level findings (sanitized to remove all company identification) in Janvrin, D., and M. Mascha. Re-examining the Financial Close Process: How You Can Benefit co-authored with M. Mascha, submitted to *Strategic Finance*, May 9, 2011.

Awards received: None to date

Invention disclosures: None to date

External funding applied for (indicate received/denied/pending): None to date

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Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress):

WebFilings is an Iowa based startup company that has developed a cloud-based software application to assist publicly traded companies with developing reports for the Securities and Exchange Commission (SEC). We were asked to identify up to twelve industry segments where significant and perpetual reporting requirements exist for regulators, customers or stakeholders. Based on discussions with WebFilings management, we were then directed to conduct an in-depth market analysis of one market segment.

We identified seven industry segments that may be able to use WebFilings' software application and presented our initial (Phase I) results to WebFilings management. After meeting to discuss our results on November 2, 2010, WebFilings management directed us to concentrate on one market segment. During late November and early December, we conducted 17 interviews with chief financial officers for firms in this market segment. The firms we interviewed ranged in revenues from less than $50 million annual sales to greater than $200 million annual sales. We analyzed the results of our interviews and submitted the final report on January 22, 2011.

INTERIM REPORT

Title: Development of Advanced Flow Diagnostic Techniques to Characterize Next Generation Fuel Nozzles

PI: Dr. Hui Hu, Aerospace Engineering Dept. Iowa State University

Company Partners (company names only): Goodrich Engine Components Division (GECD)

Project Goal: The goal of this research project is to develop advanced diagnostics to quantify spray characteristics and to elucidate important processes in spray flows, such as the breakup of liquid jets and sheets, atomization and evaporation of fuel droplets, and air/fuel mixing in order to assist GECD in developing next generation fuel nozzles for maximized energy efficiency while minimizing pollutant emissions, and maintaining the operability requirements.

Publications/presentations based on project: None to date

Awards received:$78,305

Invention disclosures: None to date

External funding applied for (indicate received/denied/pending): We are working with GECD engineer to try to submit a joint research proposal to NSF-GOALI program soon.

Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress):

This GIVF project has an official starting date of 07/01/2010 with the actual fund (account number) available to the PI on 10/08/2010. Following progresses have been made on this GIVF project since the proposed project was awarded:

1). The system design of the experimental rig needed to carry out the proposed research work has been finished. Some of the hardware parts and test models are being manufactured.

2). The theoretical framework of the proposed advanced flow diagnostic techniques has been finished. The high-energy laser system, high-speed imaging system and associated the optics and optic-mechanic devices have already been allocated for this GIVF project.

3). A comprehensive literature review of previous research work related to this GIVF research project has already been finished.

4). A GECD fuel injector/atomizer nozzle has been already been received for the preliminary measurements.

5). A research team has been formed to conduct the proposed research. The team members include: Dr. Hu Hu- the PI; Dr. Zifeng Yang- Post-doctoral Research Associate; and Mr. Daniel Dvorak - a Graduate Research Assistance.

6). A preliminary experimental study has been conducted, and some PIV measurements of the spray flows has already been conducted.

7). The measurement results of the preliminary study of the spray flows are being processed and analyzed.

8). A conference paper about the spray flow characteristics based on the measurement results of the preliminary study is being prepared.

INTERIM REPORT
Title: Development of a novel genetic test for inherited bovine diseases and its application to tissues and embryos
PI: Patrick G. Halbur
Company Partners (company names only): Ames Center for Genetic Technologies (ACGT)
Project Goal: Develop and commercialize a panel of molecular diagnostic assays for detection of genetic diseases and production traits sensitive enough to use on biopsies from bovine embryos. This will benefit the Iowa beef and dairy industries by decreasing costs associated with maintaining the pregnancies of genetically diseased animals and accelerating the selection of genetically superior seed stock Iowa cattle producers.

Publications/presentations based on project: None to date.
Awards received: None to date.
Invention disclosures: None to date.
External funding applied for (indicate received/denied/pending): None to date

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Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress):

Our partner on this grant, Ames Center for Genetic Technologies (ACGT) went out of business in May, 2011. After searching for another partner we elected to work with Radix BioSolutions Ltd. We have bought this new partner to our laboratory for a work session and in the process feel we have made substantial progress. Primer pairs and probes have been designed and tested for gender determination and genetic disorders including **Bovine Leukocyte Adhesion Deficiency, Complex Vertebral Malformation**, **Arthrogryposis Multiplex**, **Neuropathic Hydrocephalus and coat color**. We have confirmed PCR conditions and product size for each of the reactions. Using a DNA dilution series, we are able to detect samples with less than 10 fentamoles of DNA consistent with the amount available in a biopsied bovine fetus. With our new partner, we have successfully moved the testing to the Luminex bead platform and have the gender determination assay working. We are now in the process of optimizing the assays for coat color, BLAD, CVM and AGM on the Luminex platform. Our embryo biopsy technique has been further adapted and validated to achieve acceptable pregnancy rates (50%) following post-biopsy genetic testing and freezing. Several embryos have been collected, biopsied to provide genetic materials for testing, and frozen. Embryo transfers with frozen-biospied-thawed embryos are being performed. We hope to be able to produce our first multiplex kits for gender, coat color and the most important genetic diseases (Arthrogryposis Multiplex/Curley Calf Syndrome) by December of 2011. We will then begin to focus on adding virus detection components to the assay menu.

INTERIM REPORT
Title: Efficacy of a new Delivery System for B-Hydroxy-B-Methylbutyrate
PI: Rick Sharp
Company Partners (company names only): Metabolic Technologies, Inc
Project Goal: There is evidence that intramuscular and intravenous injection of ATP is effective in restoring muscle function after injury and as result of chronic muscle fatigue such as low-back pain. Although oral supplements of ATP are available as non-prescription dietary supplements, there is presently no evidence of their efficacy. Our purpose is to determine if providing an oral dose of ATP (adenosine triphosphate) will influence human muscle strength or endurance.

Publications/presentations based on project: Fuller J.C., R.L. Sharp, H.F. Angus, S. Baier, J.A. Rathmacher. Free acid gel form of β-hydroxy-β-methylbutyrate (HMB) improves HMB clearance from plasma in human subjects compared with the calcium HMB salt. British Journal of Nutrition. 7:1-6, 2010.
Awards received: None to date
Invention disclosures: Patent disclosure filed by MTI in December, 2010
External funding applied for (indicate received/denied/pending): NIH SBIR grant proposal in preparation.

Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress):

All human subject testing trials have been completed and analysis of blood samples has been completed. We are currently conducting analyses of clinical chemistry markers to document safety of the product and preparing to conduct statistical analyses on the measures related to muscle performance (strength and endurance). We anticipate submitting additional papers for publication and SBIR grant proposal during spring of 2012.

INTERIM REPORT
Title: *AdvanCE*s in Food Safety: Fast Fragment Analysis for Differentiation and Tracking of Foodborne Pathogens
PI: Byron Brehm-Stecher
Company Partners (company names only): Advanced Analytical Technologies, Inc.
Project Goal: Develop improved DNA fragment-based analyses using an advanced capillary electrophoresis platform; to apply this approach to practical problems of pathogen ecology in layer hen and related agricultural environments of critical importance to Iowan agribusiness.

Publications/presentations based on project:

- Byron Brehm-Stecher spoke at the "Single Cell Analysis Summit", held 28-29 October, 2010, San Diego, CA
- Byron Brehm-Stecher gave an invited talk at SamplePrep 2011, held April 4-5, 2011, San Diego, CA
- Byron Brehm-Stecher gave an invited talk at the Institute for Food Technologists (IFT) Annual Meeting and Expo's symposium on "Emerging and Novel Trends in Rapid Diagnostics and Subtyping Methods for Foodborne Pathogens", June 13, 2011
- Byron Brehm-Stecher gave an invited talk at the NSF Workshop on Novel Sampling and Sensing for Improving Food Safety, Georgia Tech, Atlanta, GA, June 16-17, 2011
- Byron Brehm-Stecher gave an invited talk at Cornell University June 20th on "The Food Safety Curriculum at Iowa State University"; Robert Gravani, President of IFT and other Cornell faculty, as well as our Romanian and Slovenian partners in our Tu-Be-Safe Department of Education ATLANTIS grant and ISU colleagues L. Wilson and A. Mendonca were present.
- Byron Brehm-Stecher gave an invited talk at Select Biosciences' "Advances In Biodetection & Biosensors" conference in Hamburg, Germany, June 30- July 1, 2011. Met at conference with Steve Lasky, CEO, Advanced Analytical Technologies, Inc. and Lutz Büchner, Director of European Operations, Advanced Analytical Technologies, GmbH. Presentation was helpful in driving interest to Advanced Analytical booth, providing several sales leads.
- **Two abstracts** presented at the American Society for Microbiology 2011 General Meeting (New Orleans, LA):
    - High-Throughput Capillary Electrophoresis for DNA-Based Typing of *Salmonella* spp.
    - Combination of Multiplex PCR and Electrophoretic Detection for Identification of *Salmonella*, with Subspecies Differentiation

- **One abstract** accepted for presentation at the 2011 International Association for Food Protection (IAFP) Annual Meeting (Milwaukee, WI):
    - Application of Multiplex PCR for Rapid Differentiation of *Salmonella* Subspecies I, *S*. Typhimurium and *S*. Enteritidis from Biochemically-Similar Enterobacteriaceae Isolated from Layer Hen Production Facilities

Symposium proposal accepted for development as full 3.5 hour symposium at IAFP 2011: Symposium entitled "From Farm to Fork to Physician: Detection of Human Pathogens Across the Production to Consumption to Disease Continuum", submitted in collaboration with Dr. Mary Lou Tortorello, Chief, Food Technology Branch, U.S. Food and Drug Administration (FDA). Gary Procop, Chair, Clinical Pathology, Director, Molecular Microbiology, Mycology and Parisitology, Cleveland Clinic Foundation (also a partner from our 2009 GIVF award) will be speaking at this event.

Awards received: Dr. Brehm-Stecher awarded the Early Achievement in Teaching Award, College of Human Sciences, 2011
Invention disclosures: None to date
External funding applied for (indicate received/denied/pending):
Funding Received:

1. **Midwest Poultry Research Program (MPRP, H. Xin, PI). USDA-NIFA $438,345.** USDA grant for enhancing safety and animal welfare in Midwest Poultry production systems. **My Role:** Co-PI responsible for development of molecular detection and characterization techniques as rapid alternatives to current methods for screening of egg production facilities for the presence of *Salmonella*. Work will be carried out in close coordination with an Iowan partner company, a leading producer of layer hens to the world market.
2. **Assessment of Alternative Production Systems for Laying Hens to Safeguard Animal Welfare and Sustainable Egg Supply (H. Xin, PI).** USDA grant to investigate cage-free layer systems from a holistic perspective (hen behavior and health, environmental impact and food safety). **USDA-NIFA: $699,906**. **My**

Role: Co-PI responsible for classical microbiological testing and development of new molecular tests for *Salmonella* spp. in environmental and aerosol samples taken from traditional and alternative layer hen housing.

3. **Tuning and Upgrading the Food Safety Education Curricula for BSc (TU-BE-Safe; L. Wilson, PI).** ATLANTIS grant awarded for harmonizing of EU-US food safety regulations through exchange of ideas between regulators, educators, industry and students and through tuning of Bachelor of Science food safety curricula. EU-US Department of Education**: 70,000€ ($89,000). My Role:** Co-PI serving as member of the U.S. team travelling to Romania and Slovenia to provide scientific expertise on rapid detection of pathogens and on development of educational curricula related to this topic.
4. **Funded Research Visit, Spanish National Research Council.** Antonio Martinez Abad, a Spanish PhD student in the Group of New Materials and Nanotechnology at Instituto de Agroquimica y Technologia de Alimentos (IATA) in Valencia, Spain, was funded by the Spanish government **(~$10,000**) to visit my lab April 1 – July 31st, 2011 to study rapid detection and characterization of bacterial pathogens.

Funding Pending:

1. **Midwest Poultry Research Program (MPRP, H. Xin, PI). USDA-NIFA $438,345.** USDA grant for enhancing safety and animal welfare in Midwest Poultry production systems. **My Role:** Co-PI responsible for development of molecular detection and characterization techniques as rapid alternatives to current methods for screening of egg production facilities for the presence of *Salmonella*. Work will be carried out in close coordination with an Iowan partner company, a leading producer of layer hens to the world market.
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Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress): The project is focused on use of AATI's FS-96 instrument for DNA fragment-based detection and characterization of pathogenic bacteria occurring in layer hen production facilities and other environments of critical importance to Iowan agribusiness. The project is being carried out in close consultation with an Iowan company that is a lead supplier of layer hens to world markets. Additional collaboration in support of this project's technology transfer goals includes partnership with Dr. Hongwei Xin, Director of Iowa State University's Egg Industry Center. In addition to the above list, important milestones for the project include:

- Took delivery of FS-96 instrument, valued at $70,000.
- Accepted Zongyu Zhang, FSHN PhD student – began work in my lab in May, 2011

This project has served as an essential backdrop for high-visibility collaborative work between the Brehm-Stecher Rapid Microbial Detection and Control Laboratory and Advanced Analytical Technologies, Inc., Specifically:

- We have been invited by the editors of Journal of Visualized Experiments to co-author (with AATI) a video article on application of the FS-96 instrument for DNA-fragment-based analyses of *Salmonella* spp. Experiments for this paper are currently underway.
- AATI personnel presented data from this project during the LabAutomation2011 meeting in late January 2011 in a session on high-throughput methods for the analysis of foods, chaired by Dr. Brehm-Stecher.

- Dr. Brehm-Stecher was invited to speak at the "Advances In Biodetection & Biosensors" conference to be held in Hamburg, Germany (July, 2011). The conference was held within the greater European Lab Automation meeting. Visit was coordinated with Lutz Büchner, Director of European Operations for Advanced Analytical Technologies. Met with Lutz Büchner and Steve Lasky, CEO of Advanced Analytical Technologies, Inc. during this visit. My talk helped drive interest in AATI's technology, leading to increased traffic to their booth. This visit has enabled us to maximize exposure of our GIVF-funded work with the FS-96 system to potential AATI customers in Europe.

INTERIM REPORT
Title: ***Design Verification and Cost Evaluation of UHPC Towers for Enhancing Iowa's Wind Energy Production***
PI: Sri Sritharan
Company Partners (company names only):.Iowa Prestressed Concrete, Clipper Windpower, Inc, Lafarge North America
Project Goal: Complete a concrete system suitable for wind turbine power**.**

Publications/presentations based on project: None to date
Awards received: None to date
Invention disclosures: None to date
External funding applied for (indicate received/denied/pending): None to date
Funding Pending: None to date

Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress): Only limited progress has been made on the project due to the difficulty in bringing all three industry partners to the same table. A part of the problem has been due to Lafarge not have signed a NDA with ISU. The PI met with the Vice President of Lafarge last week discussed the issues. They are ready to sign the NDA and this will hopefully take place within the next two weeks. As soon as this is done, all three industry partners and PI will meet and organize the next step. In the mean time, Grant Schmitz has been recruited for the project as a concurrent/graduate student. Grant and a post-doc (Sriram Aaleti) have been working on the project. So far, we have developed basic details for the first experimental test and working on the existing literature that has dealt with lateral load behavior of concrete wall piers designed with end columns. We have also identified suitable connection details between Ultra-High Performance Concrete (UHPC) columns and precast concrete panels that may be suitable for the concrete wind turbine tower. As the next step, the details will be presented to the industry partners and their approval will be sought. Once the necessary changes and approval are completed the testing will begin.

INTERIM REPORT
Title: Data Mining Tools for Healthcare Informatics
PI: Vasant Honavar
Company Partners (company names only): Collaborative Health Solutions, LLC
Project Goal: To demonstrate the feasibility of applying statistically based artificial intelligence algorithms for improving the quality of healthcare.

Publications/presentations based on project:

1. Tu, K., and Honavar, V. (2011). Exemplar-based Robust Coherent Biclustering. In: Proceedings of the SIAM Conference on Data Mining (SDM 2011). SIAM Press, pp. 884-895.
2. Caragea, C., Silvescu, A., Caragea, D. and Honavar, V. (2010). Abstraction-Augmented Markov Models. In: Proceedings of the IEEE Conference on Data Mining (ICDM 2010). IEEE Press. pp. 68-77.
3. Koul, N., Bui, N., and Honavar, V. (2010). Scalable, Updatable Predictive Models for Sequence Data. In Proceedings of the IEEE International Conference on Bioinformatics and Biomedicine (BIBM 2010).
4. Koul, N. and Honavar, V. (2010). Learning in the Presence of Ontology Mapping Errors. In: Proceedings of the IEEE/WIC/ACM International Conference on Web Intelligence and Intelligent Agent Technology. pp. 291-296. ACM Press.
5. Pandit, S., and Honavar, V. (2010). Ontology-Guided Extraction of Complex Nested Relationships from Text. IEEE Conference on Tools With Artificial Intelligence (ICTAI 2010). pp. 173-178.
6. Sanghvi, B., Koul, N., and Honavar, V. (2010). Identifying and Eliminating Inconsistencies in Mappings across Hierarchical Ontologies. In: Springer-Verlag Lecture Notes in Computer Science Vol. 6427, pp. 999-1008. Berlin: Springer.

Awards received: None to date
Invention disclosures: None to date
External funding applied for (indicate received/denied/pending): None to date

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Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress):

No funds have yet been spent on this project because the start of the project was delayed in part because of delay on the part of Collaborative Health Solutions (CHS) in gathering some of the patient data and making it available to the ISU team working on the project and in part because of the delay in obtaining an account number for the project. The account for the project was set up on June 28, 2011.

The delay on the part of Collaborative Health Solutions, LLC has been mainly due to the challenges of coping with non-standard encodings and nomenclature used in the illness knowledge base as well as the patient health records. Hence, the efforts of CHS have been focused on standardizing the vocabulary used to represent the data in illness knowledge base and patient database. We had anticipated having the first set of data by March 2011. In the mean time, the ISU team focused on developing strategies for data analysis and mining tasks in patient-patient matching, patient-illness matching, and computer-assisted diagnosis and related tasks using illness knowledge base and patient health records. We are well-positioned to take advantage of the illness knowledge base and patient data as soon as they are made available by CHS. While we continue to develop the data analytics tools, we have also begun to explore partnerships with other companies that could provide us with access to other data sets in case CHS does not come through.

Additionally, because some of the data analysis and mining technologies being developed have applications beyond healthcare, we have begun to explore partnerships with companies that focus on other application domains. Based on preliminary discussions, Canrig Drilling Technology has expressed an interest in using our expertise in prediction of events of interest from complex multi-dimensional time series data. This problem shares similarities with some of the data mining problems that arise in a healthcare setting.

INTERIM REPORT
Title: Battery Life Enhancement in Portable and Remotely-Deployed Systems using Spread-Spectrum Switching Power Regulators
PI: Ayman Fayed
Company Partners (company names only): Rockwell Collins Inc.
Project Goal:
The development of energy-efficient buck switching power regulators using innovative random spread-spectrum control schemes to convert their switching output noise into an analog/RF friendly noise spectrum. This will enable using them to directly power sensitive analog/RF modules in battery-operated portable electronic devices, hence eliminating energy inefficient linear regulators and/or expensive noise filtering. This new technology can result in significant reduction in system power consumption, which translates in extended battery life or reduced number of batteries needed by the system in both military and commercial applications.

Publications/presentations based on project:

Three papers have been presented, or accepted and will be presented and published in 2011:
[3] Chengwu Tao, and Ayman Fayed, "Analysis and Modeling of Buck Converters Output Spectrum in CCM with PWM Control," *IEEE Midwest Symp. on Circuits and Systems (MWSCAS)*, to be presented Aug. 2011.
[2] Chengwu Tao, and Ayman Fayed, "Noise Spectrum Manipulation Techniques in Switching Power Converters for Analog and RF Loads," *Government Microcircuit Applications* & *Critical Technology Conference (GOMACTech 2011)*, Mar. 2011.
[1] Chengwu Tao, and Ayman Fayed, "Spurious-Noise-Free Buck Regulator for direct-powering of Analog/RF loads using PWM Control with Random Frequency Hopping and Random Phase Chopping," *IEEE International Solid-State Circuits Conference (ISSCC 2011)*, to be presented Feb. 2011.

Four presentations have been made to companies about the new technology and how it can be developed and possible adoption by the industry:
[4] National Semiconductors Inc. on April 4, 2011.
[3] Texas Instruments Inc. on Nov. 22, 2010.
[2] Rockwell Collins Inc. on Nov. 18, 2010.
[1] Skyworks Inc. on Nov. 17, 2010.

Awards received: None to date
Invention disclosures: One invention disclosure has been submitted to the US Patent office as follows:
Ayman Fayed and Chengwu Tao, "System and Method for Providing Power via a Spurious-Noise-Free Switching Device", *US Patent Pending*, Application # 61/444,459 Feb. 2011.

External funding applied for (indicate received/denied/pending):
$20K in cash and $20K in-kind support from Rockwell Collins. So far $9,062 in-kind has been provided through using lab facilities and test equipment provided by Rockwell Collins. The rest is still pending.

Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress):

In the past 6 months, we have been focusing to trying our design with actual RF loads to assess the performance with real-life products. We have visited both Rockwell Collins Inc. as well as Skyworks Inc. and used their labs to test our design with some of their RF Power Amplifiers (PA). The results showed superior low-noise performance when our design is incorporated to power the PAs, which further validated our theory. Our engagement with industry showed that in order to make our design more valuable and suitable for commercialization, we must be able to achieve this low-noise and high-efficiency performance in light-load conditions as well and not only in high-load conditions. To cover this condition, we have designed a new controller that is used only at low-load conditions. A new testchip has been designed and sent to fabrication. We are currently waiting for it to come back in order to evaluate the performance. Our next step would be to integrate this new controller with our original one in a single design. With that, we will be able to have a design that covers all load conditions with very high efficiency.

INTERIM REPORT

Title: Commercialization of an integrated, single molecule Atomic Force Microscope-Fluorescence Microscope for academic and industrial applications.
PI: Sanjeevi Sivasankar
Company Partners (company names only): Novascan Technologies
Project Goal: The objective of this proposal is to build a highly integrated and modular single molecule Atomic Force Microscope-Fluorescence Microscope (smAFM-FM) for academic and industrial applications.

Publications/presentations based on project:
Publications

1. Choi, C.L., Li, H., Olson, A.C.K., Jain, P.K., Sivasankar, S.+, Alivisatos, A.P.+, (2011) Spatially Indirect Emission in a Luminescent Nanocrystal Molecule, Nano Lett., 11, 2358–2362
   +Corresponding author, *[Impact Factor: 9.6]*

Presentations

1. Li, H., Yen, C.-F., and Sivasankar, S., "Simultaneous AFM force spectroscopy and FRET measurements on single biological molecules", American Physical Society, March Meeting, 2011
2. Li, H., Yen, C.-F., and Sivasankar, S., "Simultaneous AFM force spectroscopy and FRET measurements on single biological molecules", Biophysical Society, 55th Annual Meeting, 2011
3. Li, H., and Sivasankar, S., "Simultaneous single molecule AFM and FRET", Midwest Single Molecule Meeting, 2010

Awards received: None to date

Invention disclosures: ISURF #03855 - Microscope for Simultaneous Single Molecule AFM and Fluorescence Measurements

External funding applied for (indicate received/denied/pending):
NSF CAREER: Declined
American Heart Association: Declined
American cancer Society: Pending
2011 NSF CAREER: Planned
2011 American Heart Association: Planned

Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress):
Since award of the GIVF funding, we have made significant progress in four areas.

1. We have refined the smAFM-FM instrument by introducing a feedback system that improves measurement accuracy. We have also built and tested an instrument module that permits simultaneous AFM-spectral measurements . We have upgraded to a closed-loop AFM to minimize mechanical drifts.
2. We have performed "proof of concept" simultaneous single molecule AFM-spectral measurements. In these experiments, we used smAFM-FM to measure the force dependent of optical properties of CdS/CdSe tetrapod, a technologically important semiconductor nanocrystal. We were able to demonstrate, for the first time in the world, that a single tetrapod changes its optical properties when subjected to an external force.
3. We have invented a novel technology to localize fluorescent molecules in the z direction with nm accuracy: We will be filing an invention disclosure on this technology with ISURF and publishing this work shortly.
4. We have begun working with Novascan Technologies to integrate their VErtigo AFM platform on the single molecule fluorescence microscope. When this integration is complete, we will acquire data that will be used for generating sales and marketing material to commercialize the instrument

INTERIM REPORT

Title: A Programmable Software Pattern Analyzer (PSPA); Critical Safety Improvement for Transportation Control Systems

PI: Suraj Kothari

Company Partners (company names only): EnSoft

Project Goal: The project is aimed at developing the Programmable Software Pattern Analyzer (PSPA). The PSPA will be useful to discover underlying programming patterns and use those to validate mission-critical software. Specific applications are targeted at two areas of software: (a) the safety-critical control system software such as the flight control software, (b) operating systems at all levels from small systems for smart devices to large systems for cloud computing. The PSPA will offer the programming capability to perform thousands of program analysis instances in few seconds as opposed to several hours it currently takes to do a single instance.

Publications/presentations based on project:

1. Kang Gui, Suraj Kothari, "A 2-Phase Method for Validation of Matching Pair Property with Case Studies of Operating Systems," pp.151-160, 2010 IEEE 21st International Symposium on Software Reliability Engineering, 2010.
2. Kang Gui, Suraj Kothari, "An empirical study to discover patterns for checking the matching pair property," IEEE International Conference on Computational Intelligence and Software Engineering, Wuhan, China, December, 2010
3. Kothari Suraj, and Jeremias Sauceda, "How tracking Byzantine bugs in the Linux kernel led to a new way of thinking about complex software," Embedded World Conference, Germany, March, 2011.

Invited Talks:

1. "Efficient and unified approach to validating large C programs," at Cisco, Cisco Campus, California, September 10, 2010
2. "Efficient and unified approach to validating large C programs," at VMware, California, November 5, 2010.
3. "Intelligence amplifying tools for software," at Principal Financial, Des Moines, March 8, 2011.
4. "Intelligence amplifying tools for software," at Tata Automotive Software Development Center, Pune, India, June 6, 2011.
5. "A 2-Phase Validation Method Based on a New Approach to Program Comprehension," at Tata Research Development and Design Centre (TRDDC), Pune, India, June 15, 2011

Awards received: None to date

Invention disclosures: None to date

External funding applied for (indicate received/denied/pending): None to date

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Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress): A query-based programming environment for analyzing software patterns has been developed. Two graduate students are currently testing the prototype.

INTERIM REPORT
Title: Innovative methods for the manufacturing of patient specific bone implants
PI: Matt Frank
Company Partners (company names only):
Project Goal: To develop methods for bone implant manufacturing, provide pilot testing results, and move toward commercialization of a software product for surgery planning and rapid implant production.

Publications/presentations based on project: None to date
Awards received: None to date
Invention disclosures: None to date
External funding applied for (indicate received/denied/pending): White Paper submitted: "Automated Shape-Manufactured Allograft Bone Implants to Fit Anatomic Irregularities", Funding source: The Musculoskeletal Research Foundation, Amount: $224,000, Status: Pending

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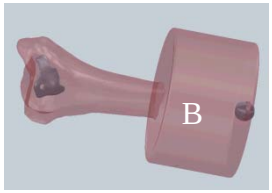
Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress):

We have completed numerous successful tests of "harvesting" bone implants from a representative donor leg bone. Personnel at the Musculoskeletal Transplant Foundation (MTF), upon visiting the team (ISU and U of Iowa partners in the Orthopaedic Biomechanics Laboratory) in Summer 2010, indicated that an open question was to the efficacy of using our proposed methods with donor bones, rather than from stock material (rods or squares of artificial/natural bone samples). Since December, the ISU lab has been running trials testing an artificial bone sample, a commercially available bone surrogate for the distal (far) end of the human Tibia (shin bone). This bone represents what an organization like MTF would start with for creating an implant. The process was summarized in our January report and shown in Figures A-D. These figures show how a donor bone (FigA) can be used to "harvest" a custom shaped bone implant (FigD). The overarching goal of this method is to improve the fixation strength and accuracy of surgical techniques used to treat traumatic fracture and/or missing bone due to tumor removal, etc.



Late in Spring, we (ISU and the U. of Iowa) submitted a white paper proposal to MTF and are waiting for feedback. The ISU team is in the process of generating the first version of CNC-RP$_{bio}$, a process planning software package that will make the planning of the process in Figs A-D completely automatic. This software can be used in conjunction with software developed at the University of Iowa, and offered commercially as a solution for fracture reconstruction. The process would be able to start with a CT scan of the fractured bone/joint, aid in developing a plan for reconstructive surgery, and, if desired, a creating custom implant for the surgical procedure.

As a first step toward commercialization, a company is in the process of forming. As of June, FxRedux Solutions, LLC was filed with the State of Iowa and the IRS. Dr. Matt Frank will serve as a co-owner, along with 5 collaborators at the University of Iowa.

Iowa State University - as of December 31, 2010
Grow Iowa Values Fund Appropriations

FY 2010 GIVF Appropriation **$1,732,500** Board of Regents approved August 2009

1 Commercialization Infrastructure and Campus-Wide Entrepreneurial Culture $600,000
2 Commercialization Program $1,132,500

Iowa State University	Project	List of all FY 2010 Revenue Sources	Revenue Dollars for FY 2010	Amount of FY 2010 State Appropriations Expended as of 6/30/2011
1	**Commercialization Infrastructure and Campus-Wide Entrepreneurial Culture**	FY 2010 State Appropriations (GIVF)	$600,000	$600,000
		FY 2010 Matching Funds (General Fund)	$577,596	
		FY 2010 Matching Funds (In-Kind)	$200,000	
		FY 2010 Matching Funds (Other)	$31,659	
Description of Project				
Anticipated End Results				
Results achieved to Date				
Plans				

Iowa State University	Project	List of all FY 2010 Revenue Sources	Revenue Dollars for FY 2010	Amount of FY 2010 State Appropriations Expended as of 6/30/2011
2	**Commercialization Program**	FY 2010 State Appropriations (GIVF)	$1,132,500	$1,132,500
		FY 2010 Matching Funds (General Fund)	$1,004,442	
		FY 2010 Matching Funds (Federal Support)	$0	
		FY 2010 Matching Funds (Cash)	$96,286	
		FY 2010 Matching Funds (In-Kind)	$433,546	$1,534,274
Description of Project				
Anticipated End Results				
Results achieved to Date				

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2010	Amount of FY 2010 Allocation Expended as of 6/30/2011
Principal Investigator	Anumantha Kanthasamy (Jim Bloedel)	$128,100	$128,100	$128,100
Description of Project	Testing of lead PK compounds in preclinical animal models of Parkinson's disease			
Anticipated End Results	Our main goal is to develop oral neuroprotective drugs for the treatment of Parkinson's disease (PD) in humans. Currently we are in the preclinical stage of drug development. The ultimate success of the proposed neuroprotective techno			

Results achieved to Date	Results In the previous funding period (Jan-Dec 2010), we had synthesized 4th generation analogs derived from PK302 structure, in which meta-phenols containing Michael acceptors were protected by methoxy groups and other chemically reactive groups were modified. In this funding period generated a new set of 12 analogs designated RM analogs against Fyn kinase a new therapeutic target that regulates PKC kinase activity. We identified a lead RM analog, RM101, which was neuroprotective in cell culture Parkinson's disease (PD) models, with IC50s in the nM levels for its intended therapeutic target Fyn kinase at 725nm. We will these novel			
Plans				
Iowa State University	**Project**	**Total Project Budget**	**Allocated Dollars FY 2010**	**Amount of FY 2010 Allocation Expended as of 6/30/2011**
Principal Investigator	Jesse Goff (Jim Bloedel)	$89,657	$89,657	$89,657
Description of Project	Use of Beta-Glucuronides of Vitamin D to treat inflammatory bowel disease			
Anticipated End Results	Develop products based on vitamin D to treat and prevent a number of human and animal diseases. The basis for these products is a plant of the Solanaceae family that contains a number of vitamin D-related compounds that have been shown to have unique activities affecting both calcium metabolism and cell growth and immune function. The native hormone form of vitamin D has been shown to ameliorate the			
Results achieved to Date	In a mouse model utilizing dextran sodium sulfate to induce inflammatory bowel disease (IBD), we previously demonstrated our 1,25-vitamin D -glucuronide reduced severity of disease. Though 1,25-dihydroxyvitamin D had a similar effect, it caused severe hypercalcemia. We focused on our compound's ability to "target" deliver 1,25-dihydroxyvitamin D, the active hormone, to the colon. 1,25-dihydroxyvitamin D acts on tissues to cause up-regulation of an enzyme known as 24-hydroxylase. Measuring 24-hydroxylase mRNA levels allows a very sensitive indicator of the degree to which a tissue has responded to a vitamin D compound. Administering 24 pmoles of 1,25-dihydroxyvitamin D up-regulated colon 24-hydroxylase 5-8 fold. Giving 24 pmoles of our 1,25-dihydroxyvitamin D glucuronide up-regulated colon 24-hydroxylase almost			
Plans				
Iowa State University	**Project**	**Total Project Budget**	**Allocated Dollars FY 2010**	**Amount of FY 2010 Allocation Expended as of 6/30/2011**
Principal Investigator	Bryony Bonning	$107,680	$107,680	$107,680
Description of Project	Transgenic Plant Resistance to Invertebrate Pests			
Anticipated End Results	We have developed a new technology for plant resistance to aphids based on a plant virus coat protein (CP) fused to an insect specific toxin (omega-atracotoxin Hv1a) that acts within the aphid body cavity (Miller and			
Results achieved to Date	Objective 1. As the receptor for the plant virus CP in the aphid gut is unknown, we do not know whether CP-P-toxin fusions will be specific to aphids, or whether the fusion protein will also be delivered into the hemocoel of other insects. Feeding of larvae of the tobacco budworm caterpillar, Heliothis virescens, with 8 ng CP-P-Hv1a and the control fusion protein (CP-P-Hv1am with a mutated, inactive toxin) resulted in lethargy of larvae that ingested CP-P-Hv1a but not those in the control treatment. This result indicates that higher concentrations of the fusion protein may be toxic to lepidopteran larvae. Transgenic plants developed in objective			
Plans				
Iowa State University	**Project**	**Total Project Budget**	**Allocated Dollars FY 2010**	**Amount of FY 2010 Allocation Expended as of 6/30/2011**
Principal Investigator	Byron Brehm-Stecher	$106,690	$106,690	$106,690
Description of Project	Rapid Sequence- based Detection of Human Pathogens: From Farm to Fork to			
Anticipated End Results				
Results achieved to Date	This work is synergistic with our other Grow Iowa Values Fund project, AdvanCEs in Food Safety: Fast Fragment Analysis for Differentiation and Tracking of Foodborne Pathogens. Both projects are collaborative with Advanced Analytical Technologies, Inc. (AATI) and both focus on capillary electrophoresis-based methods for analysis of biological materials, yet each project retains distinct individual goals. Parallel work on both projects has facilitated excellent interactions with AATI and have resulted in unique opportunities to gain additional market exposure for the company. For example, AATI will present data from this project during			
Plans				

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2010	Amount of FY 2010 Allocation Expended as of 6/30/2011
Principal Investigator	Pat Halbur	$69,500	$69,500	$69,500
Description of Project	Development of a novel Genetic Test fo Inerited Bovine Diseases and its application to tissues and embryos			
Anticipated End Results	Develop and commercialize a panel of molecular diagnostic assays for detection of genetic diseases and production traits sensitive enough to use on biopsies from bovine embryos. This will benefit the Iowa beef and			
Results achieved to Date	See 2011 Update. The project received some funding in both years.			
Plans				

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2010	Amount of FY 2010 Allocation Expended as of 6/30/2011
Principal Investigator	Brad Bosworth / Hank Harris	$146,610	$146,610	$146,610
Description of Project	Prevention of swine influenza: Commercialization of replicon particle and replicon subunit vaccines			
Anticipated End Results	The goal of this project is to develop replicons that express various influenza HA genes and to determine their immunogenicity and efficacy as SIV vaccine candidates			
Results achieved to Date	Since its introduction, novel H1N1 virus has been a concern for the swine industry. For a novel H1N1 vaccine efficacy study, we produced novel H1 replicon particle (RP) and replicon subunit (RS) vaccines within two months of the outbreak being reported. Following challenge, both H1 RS and RP vaccinated pigs demonstrated reduced viral shedding and lung pathology, and increased average daily gain, when compared to non-			
Plans				

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2010	Amount of FY 2010 Allocation Expended as of 6/30/2011
Principal Investigator	David Grewell	$34,504	$34,504	$34,504
Description of Project	Naturally Controlled Gelatinization of Corn Starch			
Anticipated End Results	The main thrust of the proposed work was to characterize, demonstrate, and scale-up the use of high powered ultrasonics to partially and controllably gelatinize corn starch application. The new processing method would			
Results achieved to Date	PREVIOUS REPORT: Two products are currently being tested by the industrial sponsors; soy protein plastic pellets by SoyWorks and soy based lubrication sticks by Creative Composites. In more detail, we have worked with SoyWorks to develop a soy plastic formulation and pellet geometry to match their product specifications. This involved indentifying proper mixing sequence, material ratio and design, and fabrication of an extrusion die. To date, nearly 2,000 pounds of soy protein based plastic were supplied to SoyWorks. SoyWorks has indicated that our ability to accommodate several difficult specification changes requested by their			
Plans				

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2010	Amount of FY 2010 Allocation Expended as of 6/30/2011
Principal Investigator	Rick Sharp	$29,890	$29,890	$29,890
Description of Project	Effect of oral ATP on human muscle performance			
Anticipated End Results	There is evidence that intramuscular and intravenous injection of ATP is effective in restoring muscle function after injury and as result of chronic muscle fatigue such as low-back pain. Although oral supplements of			
Results achieved to Date	All human subject testing trials have been completed and analysis of blood samples has been completed. We are currently conducting analyses of clinical chemistry markers to document safety of the product and are conducting statistical analyses on the measures related to muscle performance (strength and endurance). In our analysis of results, we found a marginally promising effect of ATP supplementation in reducing the amount			
Plans				

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2010	Amount of FY 2010 Allocation Expended as of 6/30/2011
Principal Investigator	Tanja Opriessnig	$80,000	$80,000	$80,000
Description of Project	Cross Protective Immunity			
Anticipated End Results	The objective of the current project is to further explore a novel PRRSV vaccine candidate, and to validate the results from the previous pilot study while concurrently evaluating details of the immune response and cross			
Results achieved to Date	In two previous proof-of-concept studies, we have injected antibody-virus complexes using IgG purified from sera taken at various times after infection. Upon challenge with heterologous virus, the animals were examined for a variety of correlates of lessened virus replication and pathogenesis and the reductions in lung lesions observed grossly, in histopathological scores of stained lung tissues, and reduced viral RNA concentrations suggested that the AIM-treated animals had developed broadened protective responses compared to the other groups. In the last study performed in 2010-2011 utilizing AIM vaccination and heterologous			
Plans				

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2010	Amount of FY 2010 Allocation Expended as of 6/30/2011
Principal Investigator	George Kraus / Eliot Winer	$100,000	$100,000	$100,000
Description of Project	Volumetric Model Analysis for Bariatric Medicine			
Anticipated End Results	Research visualization strategies that can aid in bariatric medicine for diagnosis and treatment of patients.			
Results achieved to Date	We have developed multiple tools to assess the physical characteristics of patient's in diagnosis and treatment from a bariatric specialist. These advances include: • Basic segmentation of organs and structures to allow visual examination			

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2010	Amount of FY 2010 Allocation Expended as of 6/30/2011
Principal Investigator	Mike Kessler	$40,000	$28,275	$28,275
Description of Project	Pultruded Window Frames from Agricultural Oils			
Anticipated End Results	To develop resins and composites for pultrusion manufacturing to produce fiberglass reinforced biorenewable composite window frames.			
Results achieved to Date	PREVIOUS REPORT: We are making good progress in developing and characterizing polymer composites processed by the pultrusion processing of fiberglass/bio-resin for composite window frame applications. These bio-based resins are made from soybean and linseed oils by two different processes: cationic polymerization and ring-opening metathesis polymerization (ROMP). Our initial efforts had been directed at decreasing the cure times and characterizing the cure kinetics of the resins made by the cationic polymerization of soybean oil (with different loadings of the styrene and divinylbenzene co-monomers). In that work, we found that			

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2010	Amount of FY 2010 Allocation Expended as of 6/30/2011
Principal Investigator	Mike Olsen	$104,690	$4,804	$4,804
Description of Project	Development of the Next Generation of Vortex Flow Meters for Engine Applications			
Anticipated End Results	To assist J-TEC in developing their next generation of vortex flowmeters, the proposed research seeks to: 1) experimentally study the basic physics of vortex flows generated by struts in automotive applications, 2)			
Results achieved to Date	The project was complete June 30, 2010 and the final report submitted then.			

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2010	Amount of FY 2010 Allocation Expended as of 6/30/2011
Principal Investigator	Ted Heindel / Atul Kelkar	$143,814	$9,337	$9,337
Description of Project	Waste Plastics, Crude Oil Sludge, and Tar Sand to Diesel – Capturing Energy from			
Anticipated End Results	To conduct research related to thermo-catalytic conversion of Waste Hydrocarbons to useful fuels. Specific goal of this GIVF project is to enhance and fine-tune the proof-of-concept technology developed by IES for			
Results achieved to Date	The accomplishments to date on the project are: 1. Based on the data given by IES from their proof-of-concept trials a new set of catalyst compositions and trial matrix was developed for various feedstocks in first half of 2009. Using this matrix different trials were			

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2010	Amount of FY 2010 Allocation Expended as of 6/30/2011
Principal Investigator	Iver Anderson	$221,499	$91,264	$91,264
Description of Project	Iowa Powder Atomization Technologies (IPAT): Titanium Atomizer Prototype			
Anticipated End Results	The primary goal of this project is to design and fabricate a novel prototype atomizer for the production of fine spherical titanium metal powder. Upon completion, this prototype will be used to demonstrate the			
Results achieved to Date	Task 1: A prototype close-coupled high pressure gas atomization (CC-HPGA) system with a cold wall copper melting crucible and composite refractory superheat pour tube was completed. An extended period of detailed system design was conducted and a complete set of engineering drawings was completed. In addition to the titanium atomizer, a monitoring and recording "module" and large heat-exchanger system were added to the system components.			

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Iowa State University - as of December 31, 2010
Grow Iowa Values Fund Appropriations

FY 2011 GIVF Appropriation **$1,459,200** Board of Regents approved August 2010

1 Commercialization Infrastructure and Campus-Wide Entrepreneurial Culture $500,000
2 Commercialization Program $959,200

Iowa State University	Project	List of all FY 2011 Revenue Sources	Revenue Dollars for FY 2011	Amount of FY 2011 State Appropriations Expended as of 6/30/2011
1	**Commercialization Infrastructure and Campus-Wide Entrepreneurial Culture**	FY 2011 State Appropriations (GIVF)	$500,000	$399,850
		FY 2011 Matching Funds (General Fund)	$143,928	
		FY 2011 Matching Funds (In-Kind)	$200,000	
		FY 2011 Matching Funds (Other)	$0	
Description of Project	See individual projects			
Anticipated End Results				
Results achieved to Date				
Plans				

Iowa State University	Project	List of all FY 2011 Revenue Sources	Revenue Dollars for FY 2011	Amount of FY 2011 State Appropriations Expended as of 6/30/2011
2	**Commercialization Program**	FY 2011 State Appropriations (GIVF)	$959,200	$160,174
		FY 2011 Matching Funds (General Fund)	$265,659	
		FY 2011 Matching Funds (Federal Support)		
		FY 2011 Matching Funds (Cash)		
		FY 2011 Matching Funds (In-Kind)	$134,011	
Description of Project	See individual projects			
Anticipated End Results				
Results achieved to Date				

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2011	Amount of FY 2011 Allocation Expended as of 6/30/2011
Principal Investigator			$200,000	-
Description of Project	Pappajohn Center for Entrepreneurship			
Anticipated End Results				

Results achieved to Date	Grow Iowa Values Funds provide student and staff support to assist individuals starting and growing businesses. The funds also support on campus entrepreneurship activities to provide students educational and experiential opportunities in entrepreneurship, including participation in a national student entrepreneurship conference, and supporting coordinating experienced entrepreneurs as student mentors.			
Plans				
Iowa State University	**Project**	**Total Project Budget**	**Allocated Dollars FY 2011**	**Amount of FY 2011 Allocation Expended as of 6/30/2011**
Principal Investigator			$200,000	$125,481
Description of Project	ISU Research Park			
Anticipated End Results				
Results achieved to Date	Grow Iowa Values Funds support efforts to provide support and assistance to companies at the Research Park or prospective Research Park companies. The companies assisted include; 1. Working with technology startup companies and faculty and students considering forming new companies. 2. Assisting technology companies secure the resources they need to be successful and grow. 3. Working with state and local economic development officials to recruit existing technology companies to Iowa			
Plans				
Iowa State University	**Project**	**Total Project Budget**	**Allocated Dollars FY 2011**	**Amount of FY 2011 Allocation Expended as of 6/30/2011**
Principal Investigator			$100,000	$100,000
Description of Project	Vice President for Research			
Anticipated End Results				
Results achieved to Date	Grow Iowa Values Funds support the technology transfer and economic development mission of the Office of the Vice President for Research and Economic Development (VPRED). Specifically, these funds are used to support the Industry Relations effort including salary support and operating budget. The Grow Iowa Values Fund commercilization program is administered in the VPRED office as well as efforts to coordinate industry relations and other tech transfer activities across campus.			
Plans				
Iowa State University	**Project**	**Total Project Budget**	**Allocated Dollars FY 2011**	**Amount of FY 2011 Allocation Expended as of 6/30/2011**
Principal Investigator	Diane Janvrin	$40,590	$36,521	$19,307
Description of Project	Market Research for Prioritizing Market Segments for Product Development			
Anticipated End Results	Provide WebFilings management with a broad understanding of potential markets for their product and an in-depth analysis of a single market segment.			
Results achieved to Date	WebFilings is an Iowa based startup company that has developed a cloud-based software application to assist publicly traded companies with developing reports for the Securities and Exchange Commission (SEC). We were asked to identify up to twelve industry segments where significant and perpetual reporting requirements exist for regulators, customers or stakeholders. Based on discussions with WebFilings management, we were then directed to conduct an in-depth market analysis of one market segment.			
Plans				

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2011	Amount of FY 2011 Allocation Expended as of 6/30/2011
Principal Investigator	Hui Hu	$78,305	$78,305	$5,393
Description of Project	Development of Advanced Flow Diagnostic Techniques to Characterize Next Generation Fuel Nozzles			
Anticipated End Results	The goal of this research project is to develop advanced diagnostics to quantify spray characteristics and to elucidate important processes in spray flows, such as the breakup of liquid jets and sheets, atomization and			
Results achieved to Date	Following progresses have been made on this GIVF project since the proposed project was awarded: 1). The system design of the experimental rig needed to carry out the proposed research work has been finished. Some of the hardware parts and test models are being manufactured.			
Plans				

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2011	Amount of FY 2011 Allocation Expended as of 6/30/2011
Principal Investigator	Patrick Halbur	$83,000	$83,000	$23,580
Description of Project	Developemnt of a Novel Geneti Test for Inherited Bovine Disease and Its Application to Embryos			
Anticipated End Results	Develop and commercialize a panel of molecular diagnostic assays for detection of genetic diseases and production traits sensitive enough to use on biopsies from bovine embryos. This will benefit the Iowa beef and			
Results achieved to Date	Our partner on this grant, Ames Center for Genetic Technologies (ACGT) went out of business in May, 2011. After searching for another partner we elected to work with Radix BioSolutions Ltd. We have bought this new partner to our laboratory for a work session and in the process feel we have made substantial progress. Primer pairs and probes have been designed and tested for gender determination and genetic disorders			
Plans				

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2011	Amount of FY 2011 Allocation Expended as of 6/30/2011
Principal Investigator	Rick Sharp	$99,883	$75,314	$19,307
Description of Project	Efficacy of a new delivery system for B-Hydroxy-B-Methylbutyrate			
Anticipated End Results				
Results achieved to Date	All human subject testing trials have been completed and analysis of blood samples has been completed. We are currently conducting analyses of clinical chemistry markers to document safety of the product and preparing to conduct statistical analyses on the measures related to muscle performance (strength and endurance). We anticipate submitting additional papers for publication and SBIR grant proposal during spring of 2012.			
Plans				

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2011	Amount of FY 2011 Allocation Expended as of 6/30/2011
Principal Investigator	Byron Brehm-Stecher	$106,961	$91,046	$16,254
Description of Project	Advances in food safety: fast fragment analysis for differentiation and tracking of foodborne pathogens			
Anticipated End Results	Develop improved DNA fragment-based analyses using an advanced capillary electrophoresis platform; to apply this approach to practical problems of pathogen ecology in layer hen and related agricultural environments			
Results achieved to Date	The project is focused on use of AATI's FS-96 instrument for DNA fragment-based detection and characterization of pathogenic bacteria occurring in layer hen production facilities and other environments of critical importance to Iowan agribusiness. The project is being carried out in close consultation with an Iowan company that is a lead supplier of layer hens to world markets. Additional collaboration in support of this project's			
Plans				

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2011	Amount of FY 2011 Allocation Expended as of 6/30/2011
Principal Investigator	Sri Sritharan	$109,000	$106,784	$4,183
Description of Project	Design Verification and cost evaluation of UHPC towers for enhancing Iowa's wind			
Anticipated End Results				
Results achieved to Date	Only limited progress has been made on the project due to the difficulty in bringing all three industry partners to the same table. A part of the problem has been due to Lafarge not have signed a NDA with ISU. The PI met with the Vice President of Lafarge last week discussed the issues. They are ready to sign the NDA and this will hopefully take place within the next two weeks. As soon as this is done, all three industry partners and PI will meet and organize the next step. In the mean time, Grant Schmitz has been recruited for the project as a concurrent/graduate student. Grant and a post doc (Sriram Aaloti) have been working on the project. So			
Plans				

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2011	Amount of FY 2011 Allocation Expended as of 6/30/2011
Principal Investigator	Vasant Honavar	$109,243	$109,243	-
Description of Project	Data mining toolsfor healthcare informatics			
Anticipated End Results	To demonstrate the feasibility of applying statistically based artificial intelligence algorithms for improving the quality of healthcare.			
Results achieved to Date	No funds have yet been spent on this project because the start of the project was delayed in part because of delay on the part of Collaborative Health Solutions (CHS) in gathering some of the patient data and making it available to the ISU team working on the project and in part because of the delay in obtaining an account number for the project. The account for the project was set up on June 28, 2011.			
Plans				

Iowa State University	Project	Total Project Budget	Allocated Dollars FY 2011	Amount of FY 2011 Allocation Expended as of 6/30/2011
Principal Investigator	Ayman Fayed	$117,944	$99,665	$34,655
Description of Project	Battery life enhancement in portable and remotely deployed systems using spread-spectrum switching power regulators			
Anticipated End Results	The development of energy-efficient buck switching power regulators using innovative random spread-spectrum control schemes to convert their switching output noise into an analog/RF friendly noise spectrum. This			
Results achieved to Date	In the past 6 months, we have been focusing to trying our design with actual RF loads to assess the performance with real-life products. We have visited both Rockwell Collins Inc. as well as Skyworks Inc. and used their labs to test our design with some of their RF Power Amplifiers (PA). The results showed superior low-noise performance when our design is incorporated to power the PAs, which further validated our theory. Our engagement with industry showed that in order to make our design more valuable and suitable for commercialization, we must be able to achieve this low-noise and high-efficiency performance in light-load conditions as			

Plans				
Iowa State University	**Project**	**Total Project Budget**	**Allocated Dollars FY 2011**	**Amount of FY 2011 Allocation Expended as of 6/30/2011**
Principal Investigator	Sanjeevi Sivansankar	$120,075	$107,433	$16,197
Description of Project	Commercialization of an integrated single molecule atomic force microscope-			
Anticipated End Results	The objective of this proposal is to build a highly integrated and modular single molecule Atomic Force Microscope-Fluorescence Microscope (smAFM-FM) for academic and industrial applications.			
Results achieved to Date	Since award of the GIVF funding, we have made significant progress in four areas. 1. We have refined the smAFM-FM instrument by introducing a feedback system that improves measurement accuracy. We have also built and tested an instrument module that permits simultaneous AFM-spectral measurements . We have upgraded to a closed-loop AFM to minimize mechanical drifts.			
Plans				
Iowa State University	**Project**	**Total Project Budget**	**Allocated Dollars FY 2011**	**Amount of FY 2011 Allocation Expended as of 6/30/2011**
Principal Investigator	Arun Somani / Suraj Kothari	$77,388	$76,268	$8,323
Description of Project	A programmable software pattern analyzer (PSPA); Critical safety improvement for transportation control systems			
Anticipated End Results	The project is aimed at developing the Programmable Software Pattern Analyzer (PSPA). The PSPA will be useful to discover underlying programming patterns and use those to validate mission-critical software.			
Results achieved to Date	A query-based programming environment for analyzing software patterns has been developed. Two graduate students are currently testing the prototype.			

Allocated and Expended FY2010 dollars
$4,069

Allocated and Expended FY2010 dollars
$24,568

Allocated and Expended FY2010 dollars
$15,915

Allocated and Expended FY2010 dollars
$2,216

Allocated and Expended FY2010 dollars
$18,279

Allocated and Expended FY2010 dollars
$12,642

Allocated and Expended FY2010 dollars
$1,125

University of Northern Iowa
Annual Economic Development and Technology Transfer Report
FY 2011

Section 1. UNI's Economic Development Activities to Enhance Economic Growth in Iowa

The past year proved to be a challenging one for the national economy, as well as here in Iowa. Our state was not insulated from the job loss and slow economic growth impacting the entire country. However, with all challenges come opportunities. The economic conditions helped to demonstrate the true character of our state and of all Iowans: a willingness to buckle down and get done what needs to be done. This same character is reflected in the consistent services provided by UNI's economic development programs. UNI has remained a reliable resource for businesses, communities and entrepreneurs throughout the state; not only continuing services, but in many areas, expanding our impact, despite reduced funding. Outcomes realized by key economic development/tech transfer programs during FY 2011 include:

Overall

- Provided service in all 99 counties to nearly 1,300 unique business, community and local government clients; another 10,000 individuals were engaged in the MyEntre.Net entrepreneurial support system.
- Involved 212 faculty members and more than 2,000 students in the delivery of these services.
- Leveraged each $1 invested by the state with $6 in private grants, fees or federal funding.

Entrepreneurship, Business Incubation and Technology Transfer

- UNI's 3 incubator/accelerator programs and MyEntre.Net helped start or expand 247 ventures creating 175 FTE jobs.
- Nearly 10,000 individuals are now actively engaged in the MyEntre.Net online community.
- MyEntre.Net provided on-demand business and market information to 311 businesses through its new Business Concierge service; another 243 clients were served by the UNI SBDC.
- 21 student businesses were tenants in the John Pappajohn Entrepreneurial Center's Student Business Incubator and 43 additional student entrepreneurs were assisted by the affiliate program.
- One of the UNI John Pappajohn Center's student incubator tenants has been selected as a winner of the John Pappajohn Collegiate Business Plan Competition and another tenant was one of five national finalists in *Entrepreneur* magazine's Collegiate Entrepreneur of the Year competition.
- UNI faculty and staff submitted 8 new intellectual property disclosures.
- 3 patents were received and 5 new patents were filed.
- 2 new license agreements were approved and a total of 11 license agreements are currently generating income.

Waste Reduction, Environmental Assistance and the Bioeconomy

- Environmental technical assistance and on-site reviews were provided to 191 small businesses.
- The GeoTREE program worked in conjunction with multiple state and local agencies, using geospatial mapping to identify solutions to specific problems including energy efficiency and watershed management.
- Recycling and reuse project funding was provided to 48 companies and organizations; another 160 individuals were provided testing assistance for products using recycled materials.
- The RRTTC provided education and training on recycling, environmental and health sustainability to students, faculty and Cedar Valley residents.
- Energy and environmental education programming reached 48,110 K-12 students.
- The Tallgrass Prairie Center distributed native prairie seeds to 50 Iowa counties as part of its roadside vegetation project.
- NABL contracted with US Department of Navy to develop biobased lubricant specifications for military use.
- NABL-developed technologies were featured on an episode of The History Channel's *Modern Marvels* television program

Local Economic Development

- IDM worked with Iowa Workforce Development to complete a community guide for dealing with mass layoffs and plant closures.
- Community clients report creating approximately 1,500 jobs as a result of local economic development technical assistance from the Institute for Decision Making (IDM).
- Comprehensive technical assistance was provided to 68 community partners and 4 regional groups.
- Strategic marketing Services completed a new regionally-based existing industry report that illustrated the unique economic impact of major employers in the North Central Iowa region.

Advanced Manufacturing & Market Research

- Continued sponsored research was conducted into biobased foundry binder systems resulting in two new patent submissions and license agreements.
- MCC provided custom technical assistance and outreach services to 6 Iowa foundries.
- Market research and analysis services were provided to 9 Iowa companies and 15 national companies.
- Market research clients report an average employment increase of 14%, due in part to the information provided by UNI.

Section 2. Technology Transfer and Intellectual Property

FY 2011

	UNI
a. Number of disclosures of intellectual property	8
b. Number of patent applications filed	5
c. Number of patents awarded	3
d. Number of license and option agreements executed on institutional intellectual property	2
e. Number of license and option agreements yielding income	11
f. Revenue to Iowa companies as a result of licensed technologies	$2,400,000
g. Number of start-up companies formed, in total and in Iowa	61/61
h. Number of companies in research parks and incubators	23
i. Number of new companies in research parks and incubators	15
j. Number of employees in companies in research parks and incubators	45
k. Royalties/license fee income	$99,074
l. Total sponsored funding	$43,000,000
m. Corporate-sponsored funding for research and economic development and revenue generation (excludes corporate philanthropy - all in Iowa)	$2,070,500
n. i. Annual appropriations for economic development ii. Grow Iowa values appropriation	$549,606 $729,600

Section 3. Overview of UNI's Economic Development Programs

UNI outreach services for community and economic development activities are outlined in a table format on the following seven pages. The format provides a brief overview of each program, its purpose, those served and outcomes. Together, the programs served approximately 1,300 unique businesses and organizations in the past year and another 10,000 individuals through the MyEntre.Net entrepreneurial development system.

Section 3. Overview of UNI's Economic Development Programs (continued)

Programs	Services	Those Typically Served	FY 2011 Results	Cumulative Results
Institute for Decision Making (IDM)	Hands-on community and economic development guidance and research	Economic development organizations, chambers of commerce, city councils, communities and others	✓ Completed a new type of existing industry report outlining economic impact of regional employers. ✓ Assistance and research provided to 68 community partners and 4 regional development groups. ✓ Provided assistance to two communities impacted by tornado disasters. ✓ Developed a state-wide guide to dealing with mass layoffs and plant closures.	✓ Served 641 communities, counties and groups in nearly all of Iowa's counties. ✓ Community clients report 1,500 – 2,000 new jobs annually as a result of IDM assistance. ✓ Trained over 760 economic development professionals.
Iowa Waste Reduction Center (IWRC)	Free, confidential, environmental assistance for small businesses	Small businesses throughout Iowa	✓ Environmental technical assistance and on-site reviews were provided to 191 small businesses. ✓ 387 military painters, supervisors and Department of Defense personnel trained by the STAR4Defense paint training program.	✓ Provided 5,244 on-site reviews to Iowa small businesses. ✓ 1,740 individuals trained in efficient spray painting techniques through the STAR4Defense program.
National Ag-Based Lubricants (NABL) Center	Biobased lubricants research, testing services, development of performance standards and biobased lubricant product certification	Companies and individuals developing biobased lubricants, traditional lubricant companies, and lubricant consumers	✓ Provided fee-based testing and biolubricant product development services to clients in multiple countries and states. ✓ Contracted with US Department of Navy to develop military-compatible, biobased lubricant specifications ✓ Published text on biolubricant technology: *Biobased Lubricants and Greases*.	✓ Over 40 soy lubricants, greases, metalworking fluids and specialty lubricants developed to date. ✓ A national testing and certification center, leading the nation's biobased lubricants industry.

Section 3. Overview of UNI's Economic Development Programs (continued)

Programs	Services	Those Typically Served	FY 2011 Results	Cumulative Results
Strategic Marketing Services (SMS)	Market research and analysis	Businesses, entrepreneurs and non-profit organizations	✓ Market research and analysis services were provided to 9 Iowa companies and 15 national companies.	✓ Since 1990, market research and analysis services have been provided to 281 Iowa companies.
Executive Development Center (EDC)	Management and professional training workshops and certificate programs	Iowa businesses and organizations	✓ Specialized business management training provided in 66 workshops to 538 business professionals representing 53 businesses.	✓ Since 1998, has provided training in 1,142 workshops to 19,034 business professionals.
John Pappajohn Entrepreneurial Center (JPEC)	Research, entrepreneurship education, technology transfer, and capital investment programs	Students interested in entrepreneurship, UNI faculty and staff entrepreneurs, new ventures and rapidly growing small companies	✓ One UNI student entrepreneur was selected as one of five finalists for *Entrepreneur* magazine's student entrepreneur of the year. ✓ UNI Entrepreneurs (student organization) took second place nationally in the environmental sustainability challenge sponsored by Sam's Club. ✓ 21 student business owners were tenants in the student business incubator. ✓ 43 student business owners were provided services as part of the student business affiliate incubator program.	✓ The JPEC Student Business Incubator has provided space to more than 52 business owners since FY05. ✓ The JPEC has consulted with 192 faculty and staff from colleges and universities from around the U.S. and the world on student business incubation since FY08. ✓ The Cedar Valley Venture Fund, managed by JPEC, has invested in 6 new ventures.

Section 3. Overview of UNI's Economic Development Programs (continued)

Programs	Services	Those Typically Served	FY 2011 Results	Cumulative Results
Iowa Center for Immigrant Leadership and Integration (ICILI)	Helping Iowa communities and businesses accommodate the needs of newcomers	Communities, faith-based organizations and businesses	✓ Created a new handbook entitled *New Americans, New Iowans.* ✓ Created a manual for effectively using interpreters in health care settings. ✓ Worked with 20 companies, health care providers, social service providers and communities to better meet the needs of newcomers.	✓ Assistance in accommodating the needs of newcomers has been provided to more than 200 Iowa companies and organizations. ✓ More than 25,000 print copies of 4 different manuals (and countless electronic copies) have been distributed throughout Iowa.
UNI Regional Business Center/ Small Business Development Center (RBC/SBDC)	Rural/ Urban Entrepreneurship development, online entrepreneurship support system, business consulting, business training, business incubation	Small and medium sized businesses, entrepreneurs, entrepreneurial service providers, community leaders	✓ 3,339 new members of MyEntre.Net. ✓ Business Concierge services were provided to 311 businesses. ✓ 2011 MyEntre.Net statewide small business survey results show 183 new or expanded businesses, 174.5 new FTE jobs and $10,861,381 in new commercial/ equity investment. ✓ Incubation Services engaged 9 new tenants, graduated 1 business and added 20 new employees. ✓ 243 clients served by UNI SBDC with technical assistance, 164 served with classroom training. ✓ 100,000+ visits to MyEntre.Net.	✓ 9,776 entrepreneurs are engaged online at MyEntre.Net as of June 2011. ✓ EntreFest! traveling conference has hosted 993 attendees from 78 Iowa counties. ✓ MyEntre.Net webinars have been hosted twice monthly since 2003; 153 webinars are archived online.

Section 3. Overview of UNI's Economic Development Programs (continued)

Programs	Services	Those Typically Served	FY 2011 Results	Cumulative Results
Tallgrass Prairie Center (TPC)	Research, techniques, education and source-identified seed for restoration and preservation of native vegetation	Iowa counties, state and federal agencies, commercial native seed producers, the community, educators, students and prairie enthusiasts	✓ Roadside vegetation research for restoring right-of-ways was provided to the Iowa DOT and native seeds were distributed to 50 counties in Iowa. ✓ Continued applied research to determine prairie species mix for optimal biomass electrical generation. ✓ Published by U of I Press *Tallgrass Prairie Center's Guide to Prairie Restoration in the Upper Midwest, Tallgrass Prairie Centers Guide to Seed and Seedling Identification.* ✓ Hosted 23rd North American Prairie Conference.	✓ More than 17,000 acres of roadway right-of-way have been restored to native vegetation. ✓ Provided information for Iowa DOT to change seeding regulations. ✓ Demonstration projects on effectiveness of hydroseeding. ✓ Prairie Power Project completes 2nd year. ✓ Three major publications by staff.
Center for Energy and Environmental Education (CEEE)	Technical assistance, educational programs and leadership in energy conservation and renewable energy, environmental conservation and community-based agriculture	Iowa cities, counties, Iowa schools, teachers, farmers, businesses, elected officials, state agencies, community leaders, citizen organizations	✓ Green Iowa AmeriCorps sites weatherized 114 homes in the state. ✓ The CEEE FREE loan program reached 10,072 students, 9,445 adults, and 447 teachers, increasing energy understanding. ✓ Iowa School Energy Challenge engaged 20 secondary schools in energy efficiency. ✓ Buy Fresh, Buy Local participating restaurants and institutional buyers in the Black Hawk County area spent $2.65 million on locally grown foods. ✓ Iowa Farm Energy Working Group helped reduce fossil fuel use on small to mid-sized farms this year through meetings for 60 farmers/advocates.	✓ Green Iowa AmeriCorps has weatherized 365 homes, conducted 250 education programs that reached over 17,000 people. 23,000 homes have been provided with energy efficiency advice/improvements and over 7,400 volunteers have been recruited since the program began in 2009. ✓ Since 1998, CEEE's Northern Iowa Food & Farm Partnership has facilitated purchase of $12.5 million

Section 3. Overview of UNI's Economic Development Programs (continued)

Programs	Services	Those Typically Served	FY 2011 Results	Cumulative Results
			✓ In 2011, CEEE's waste reduction initiative reached 391 teachers, impacting roughly 7,500 students.	worth of meat and produce from hundreds of area farmers by food vending institutions.
Recycling and Reuse Technology Transfer Center (RRTTC)	Recycling and by-products research, environmental education and outreach.	Serving Iowa businesses, the recycling industry, University, K-12 schools and Iowa citizens.	✓ Research project funding and outreach services related to recycling and reuse were provided to 48 companies and organizations. ✓ Outreach services provided to more than 10,455 individuals this year, including business/industry, K-12 students and teachers, and Iowa citizens.	✓ Over 43 RRTTC funded research projects. ✓ Over 170 reports and publications available.
Metal Castings Center (MCC) and Center for Advanced Biobased Foundry Binders (CABB)	Metal casting technologies, applied research, testing and training	Iowa casting users, foundries and foundry suppliers	✓ Maintained active contracts with 24 companies, provided outreach projects to 6 Iowa foundries and technical assistance to 30 additional foundries. ✓ Sponsored research into bio-based foundry binders – 2 patents submitted. ✓ Sponsored commercialization of bio-based foundry binders. ✓ Assisted University of Iowa and Rock Island Arsenal in technology development	✓ Over 50 industry funded research projects have been completed to date.
Materials Innovation Service (MIS)	Mechanical, physical and chemical tests of metals, polymers and cementitious materials	Serving Iowa manufacturers and suppliers	✓ Technical assistance and testing services provided to more than 160 individuals, primarily for products using recycled materials. ✓ Continued active testing contracts with five companies.	✓ More than 2,000 hours of testing provided since the beginning of the program.

Section 3. Overview of UNI's Economic Development Programs (continued)

Programs	Services	Those Typically Served	FY 2011 Results	Cumulative Results
Geoinformatics Training, Research, Education and Extension Center (GeoTREE)	Geospatial technologies, education, research, and outreach activities for federal, state, local and tribal agencies	Federal, state, local and tribal (FSLT) government agencies (NASA)	✓ Worked with Iowa DNR and Iowa Department of Public Health to apply geospatial data for solving problems. ✓ Worked with Cedar Falls Utilities on identifying areas most in need of energy conservation and efficiency assistance. ✓ Worked with the City of Cedar Falls on watershed management.	✓ GeoTREE has provided training to over 100 people and collaborated with multiple state and local agencies.

Section 4: Grow Iowa Values Funding Project

See attached spreadsheet highlighting outcomes from UNI's Grow Iowa Values Fund projects in 2011.

Section 5: Collaborative Projects

Entrepreneurship, Business Incubation and Technology Transfer

- **Regional Business Center (RBC), The Iowa Bankers Association, The Technology Association of Iowa, Renew Rural Iowa, Iowa Department of Economic Development, Iowa Area Development Group, the Community Vitality Center and multiple regional economic development groups**
  In early FY11, the RBC and collaborative partners launched a statewide contest entitled Dream Big Grow Here, featuring $1,000 monthly grants awarded online to emerging and existing Iowa small business owners who uploaded their 'dreams,' then encouraged friends, family and other business owners to vote for them. In response to the initial contest's popularity, a regional competition was initiated with additional service provider partners. This statewide team identifies regional economic development groups willing to host a $5,000 regional Dream Big Grow Here Contest. All regional contest winners will be invited to participate in a statewide pitch-off party hosted via live video streaming this fall for a $10,000 grand prize judged and awarded by the sponsorship team.

Waste Reduction, Environmental Assistance and the Bioeconomy

- **NABL Center and the U.S. Department of the Navy**
  In FY11, the NABL Center began a long-term collaborative project with the US Department of the Navy, to evaluate current standardized testing metrics for biobased lubricants, and to develop appropriate biobased product specifications and testing methodologies which would assure biobased lubricant performance levels. The goal of this collaboration is to provide the US Navy with useful standards and guidelines for adopting biobased products in naval equipment and operations.

- **Metal Casting Center (MCC)- Center for Advanced Biobased Binders (CABB) and multiple Iowa firms**
  The CABB program is continuing to refine and develop biobased foundry binders in an effort to replace current petrochemical urethane systems. The CABB program is currently working with several Iowa manufacturers including Deere & Company, ATEK Precision Castings, Clow Valves, Viking Pump Corp and Sivyer Steel castings in efforts to replace current adhesive systems with an environmentally friendly renewable source material. To date the center has developed several new technologies that will positively affect the foundry industry in Iowa.

- **Tallgrass Prairie Center, Cedar Falls Utilities and the Iowa Crop Improvement Association**
  The Tallgrass Prairie Center (TPC) continues a relationship with Cedar Falls Utilities (CFU) to determine the maximum energy production potential from prairie biomass. CFU will burn the biomass in their stoker furnace to evaluate the materials. Unfortunately, the June 2008 flood has set the project back one year. Plots were replanted in 2009 and second year biomass data will be collected this fall. Test burn of biomass will be conducted in spring 2012. TPC continues working with the Iowa Crop Improvement Association to develop a consortium of native seed producers, native plant growers, nurseries, Iowa DNR, Iowa DOT, Iowa NRCS and private individuals to market native plants.

Local Economic Development

- **Institute for Decision Making (IDM) and Iowa Workforce Development (IWD)**
  In the spring of 2011, IDM and IWD released the guide *Community Response Manual: A Guide to Reacting to Business Downturn*, providing actions and strategies for communities to prepare for, and respond to, mass layoffs and business-closing crises. These partners launched the concept and began pursuing funding for this manual several years ago, and through a recent investment from the U.S. Department of Labor, were able to complete this practical guide. The manual is designed to be a resource for local leaders to respond proactively. Though each local economy is unique, many of the actions and strategies needed in a layoff or crisis situation are similar and this manual attempts to highlight many of those actions and strategies in a practical and useable manner.

Advanced Manufacturing & Market Research

- **Strategic Marketing Services (SMS) and the North Central Iowa Alliance (NCIA)**
  SMS partnered with NCIA to determine the amount of excess production capacity existing among a select group of businesses in the geographic region represented by the NCIA. The results of the study will be used to select four companies from those participating in the study for in-depth market research projects to be conducted by Strategic Marketing Services. Based on the responses received by 43 potential participants, SMS recommended eight companies for consideration as potential participants for a marketing research project. Of the eight companies recommended, four accepted the opportunity.

- **Metal Casting Center (MCC), Northern Illinois University, Quad Cities Manufacturing Laboratory and Rock Island Arsenal**
  The MCC is currently collaborating with these partners to develop a center for excellence in titanium casting technologies. Projects include the development of advanced technology to replace heavy conventional castings with high-performance titanium castings. The resulting technology will be available to Rock Island Arsenal and also licensable by commercial companies throughout the Midwest.