The University of Iowa
FY 2015 Annual Economic Development Report

Executive Summary

Key Outcomes

Via both continuing and new initiatives (see below), the University of Iowa continued to advance economic development in FY 2015. Industry investment in applied research and clinical trials resulted in a 22% increase in industry-sponsored research funding. More research was translated and moved into the marketplace as well, as invention disclosures increased by 7%, licenses and options were up 25%, startups increased by 20% and licensing revenue rose 26%.

In entrepreneurship, the University of Iowa was awarded a National Science Foundation (NSF) I-CORPS Sites grant to accelerate the commercialization of discoveries by UI faculty, students and community-based entrepreneurs through Venture School. Attendees of Venture School launched 27 new companies as the program expanded from Iowa City to Des Moines, Cedar Falls, Council Bluffs, Cedar Rapids and the Quad Cities. This fall, the program will again expand to include Sioux City and Dubuque. We also so expanded our engagement with the small businesses community across the state. After a successful pilot in Iowa City, UI Partners opened two additional offices in Council Bluffs and Sioux City, providing 8,942 hours of IT assistance to 137 small businesses in 45 Iowa communities and 31 counties.

At the University of Iowa Research Park (UIRP), the Kirkwood Regional Center at the University of Iowa was completed in the summer of FY 2015. This fall, over 300 high school students will take college credit classes exposing them to various Science, Technology, Engineering and Math (STEM) career opportunities, including internships with startups at the UIRP. MediRevv, a thriving healthcare revenue cycle management company at the UIRP, added 60 new employees in FY 2015 and moved into their second facility, a 26,200 square foot building. The company has plans to add a third facility in FY16 as they grow their workforce to more than 300 people. Plans are currently underway for Integrated DNA Technologies (IDT) to increase their footprint at the UIRP as well. On December 1, 2015, they will lease an additional 13,800 square feet of wet laboratory space to accommodate their expanding R&D operations.

Future Initiatives

In FY 2016, we will create new incentives and critical infrastructure to encourage and support faculty entrepreneurship across campus. We will establish two early-stage incubators as a part of a comprehensive lab-to-market incubation strategy for faculty startups. An east-side software (dry-lab) incubator will be located close to campus on the Iowa City Pedestrian Mall and a west-side biomedical (wet-lab) incubator will be located on campus in the Bowen Science Building. Each Facility will house 6-8 startups and will open during FY 2016.

Background

In FY 2014, the University of Iowa launched five new initiatives aimed at fulfilling its mission: To chart a path to economic prosperity for all Iowans by accelerating business and cultivating the state's workforce

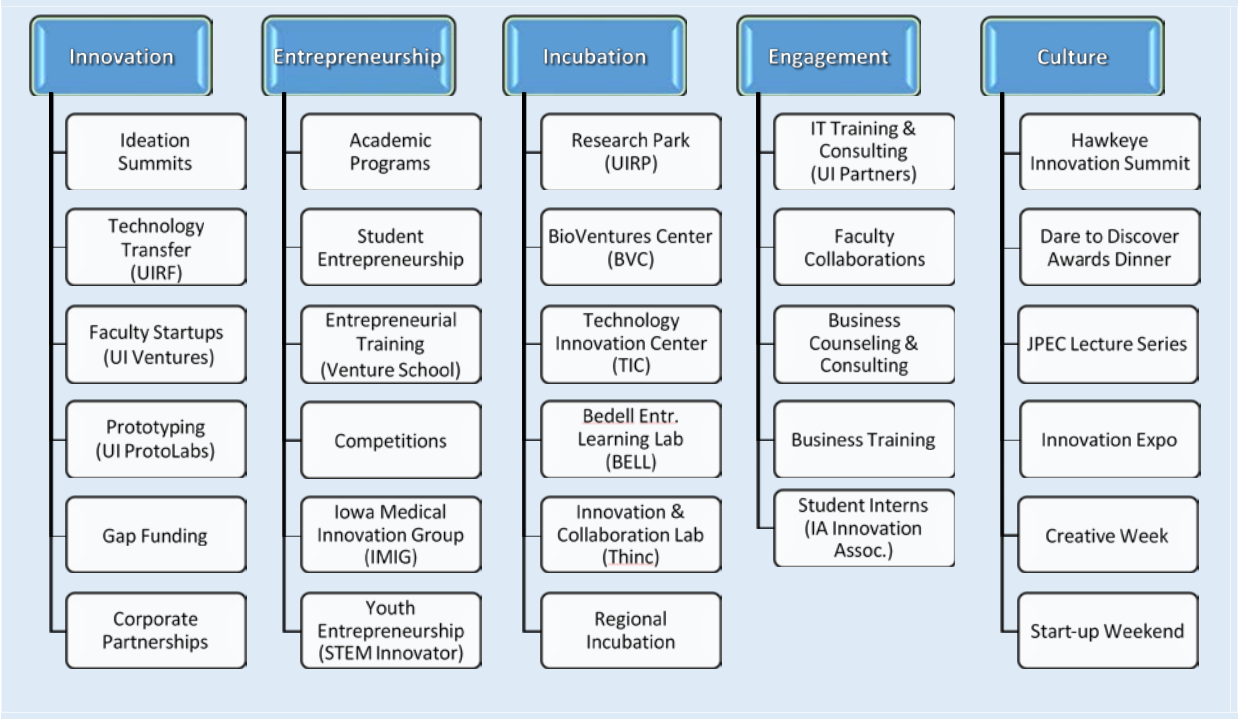
- *Venture School*, an entrepreneurship training program that teaches faculty, staff, student and community entrepreneurs to assess and then improve the commercial viability of their startups
- *UI ProtoLabs*, a public-private prototyping resource providing 3-D printing, fabrication, machining and electronics services to inventors and startups
- *UI Ventures*, an organization helping faculty, postdocs and graduate students create startups, find mentors, recruit executives and management, and raise capital
- *UI Partners*, an external-facing organization that provides hands-on IT assistance and training to Iowa small businesses and their workforces, making them more innovative and competitive
- *STEM Innovator*, a professional development program for teachers to infuse innovation and entrepreneurship into K-12 classrooms. The program pairs students from across Iowa with industry experts, entrepreneurs,

teachers, and university and community college faculty to find and solve STEM-related problems fostering future interest in STEM careers in Iowa.

In addition, the University of Iowa's economic development organizations include: the University of Iowa Research Foundation, the technology transfer arm of the university; and the University of Iowa Research Park, a blended campus consisting of commercial ventures and startup incubation facilities.

Organizational Structure and Programs

The University of Iowa's economic development strategy is organized around five major themes: *Innovation, Entrepreneurship, Incubation, Engagement, and Culture*. Programs within each of these themes are already yielding important economic development impact, as highlighted below.



Examples of UI Economic Development Impact

- Technology Transfer (Innovation) – Because of increased faculty outreach efforts, the University of Iowa Research Foundation (UIRF) received 149 invention disclosures in FY 2015 (up 7% over FY 2014). **It also executed 40 license or option agreements, an increase of 25% over FY 2014. University of Iowa startups accounted for 11 of these agreements.**
- Faculty Startups (Entrepreneurship) – UI Ventures' focus on startup creation, executive recruiting and raising capital is paying dividends. There are **43 startups in the pipeline, 18 of which were added this year**. Moreover, startups are aggressively using university and state economic development resources to build value and advance through the commercialization pipeline. The following two examples are illustrative of this process.
    - **IDx** uses smart retinal imaging solutions to take photos of the back of the eye and automatically identify markers for diabetic retinopathy, glaucoma, and cardiovascular diseases all in real time. In the past year, IDx has continued to grow, hiring three new full time employees, and seven interns from a diverse range of University of Iowa programs including Law, MBA, Engineering and Computer Science, and Health Informatics. In the past year IDx also raised an additional $1,000,000, adding to the over $10M in capital financing previously raised.

- **Immortagen** seeks to personalize cancer treatment through private tumor banking, full spectrum genetic profiling, revolutionary clinical decision support algorithms, and advanced mouse models for drug research and development. Over the past year, Immortagen received Proof of Commercial Relevance funds from the state, which led to an external market analysis to corroborate their current business model. They also brought on two experienced business people as advisors and used University of Iowa gap funds to increase the accuracy of their algorithm.

- Student Startups (Entrepreneurship) – Sixty student-businesses are under development through the John Pappajohn Entrepreneurial Center's (JPEC) student incubator program housed at the Bedell Entrepreneurship Learning Laboratory. Western Wise and Spectator are two examples.
  - **Western Wise**, a student startup, uses native English speakers to provide online English tutoring to Chinese K-12 students. The company emphasizes passion, patience, and dedication to create a unique one-on-one experience between tutors and their students. Co-founders Emily Roberts, an Entrepreneurial Management and Spanish Major, and Chen Cui, a Ph.D. student in Computer and Electrical Engineering, were awarded $1,000 at the Discovery and Innovation Awards Ceremony hosted by the Office of the Vice President for Research and Economic Development.
  - **Spectator** was co-founded by Jon Myers, a Mechanical Engineering major and Mitch Larson, an Enterprise Management major and received a $7,500 Hubert E. Storer Engineering Student Entrepreneurial Startup Award. Spectator is a sports information company that was created to connect fans with their favorite high school teams, strengthening athletic communities by bringing team statistics to a fan-accessible, centralized hub. Spectator was accepted into the Nebraska Startup Accelerator where team members spent the summer refining their business model.

- Venture School (Entrepreneurship) – The University of Iowa was awarded a National Science Foundation (NSF) I-CORPS Sites grant in FY 2015 to accelerate commercialization of discoveries by UI faculty, students and community-based entrepreneurs. As a result, 66 teams comprised of 182 entrepreneurs attended Venture School to assess and improve the commercial viability of their startup ideas and business models. Upon completion of the program, 27 new ventures were launched and 21 existing startups or businesses refined their business models. Eight Venture School cohorts were hosted in six cities: Iowa City, Des Moines, Cedar Falls, Council Bluffs, Cedar Rapids and the Quad Cities. The program will expand this fall to Sioux City and Dubuque.

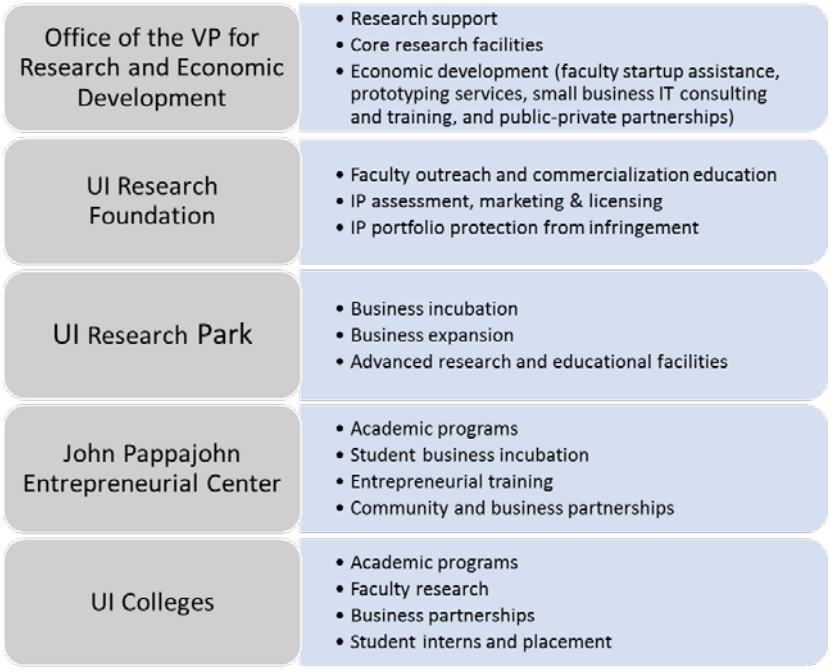
- STEM Innovator Program (Entrepreneurship) – This professional development program for teachers infuses innovation and entrepreneurship into K-12 classrooms. During FY 2015, 88 educators from 32 Iowa school districts impacted an estimated 10,895 Iowa high school students.

- Research Park (Incubation) – There are now **18 companies, including six new startups located in the BioVentures Center (BVC)** at the University of Iowa Research Park (UIRP). The number of companies housed in the BVC has tripled from when it opened in 2008 and the **BVC is now close to full occupancy**. **Currently 42 companies reside at the UIRP and employ over 1,966 people**. Key examples include:
  - **Higher Learning Technologies (HLT)**, an educational application development company, has grown its sales to over $3 million from more than 1,200,000 downloads of their apps. The company currently employs 50 people and plans to add more over the next twelve months. They have also received two equity investments totaling $6.5 million. HLT received an award for best company culture in the Creative Corridor as well as multiple Prometheus and Silicon Prairie awards.
  - **SantosHuman,** founded in 2008, is a University of Iowa spin-off company with an exclusive license to commercialize the Digital Human Modeling and Simulation (DHM&S) technology under development at the University of Iowa's Virtual Soldier Research (VSR) Program. SantosHuman's clients include the most recognizable brands in the world and they continue to build their portfolio of Fortune 500 industry clients and partners. New capabilities include predictive dynamic models and analysis specifically developed for dismounted warfighter activities, automated motion capture processing and analysis, predictive models for precision grasping, and a suite of capabilities which provide OEM's with truly human-centric design tools for occupant packaging. SantosHuman's products currently include a military-specific system for evaluating dismounted warfighter performance and interaction with warfighter equipment.

- Small Business Consulting (Engagement) – We continued our engagement with the Iowa small business community. Faculty/student teams completed **56 business consulting projects at 49 companies located in six Iowa counties** (Delaware, Des Moines, Johnson, Linn, Polk and Scott).

Economic Development Team

Research drives innovation at the University of Iowa. In FY 2015, total external funding at the University of Iowa rose 1.9% to $565.2 million ($443 million in sponsored research). This places the University of Iowa among the nation's elite public research universities and is especially significant in the face of continuing economic and research funding challenges in the U.S. This robust research enterprise, coupled with integrated economic development activities, plays an important role in supporting economic development in Iowa. Our economic development activities are directed by the Office of the Vice President for Research and Economic Development (OVPR&ED).



The following sections of this report will respond to specific areas, as requested by the Board of Regents. These include: the impact of 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 FY 2015, a summary of outreach and service activities, direct economic development assistance to Iowa communities, a summary of RIF expenditures, and emerging trends in the area of economic development.

Impact of UI Economic Development Activities on Economic Growth in Iowa

Job Creation and Wealth in Iowa

University of Iowa Research Park (UIRP) – The University of Iowa Research Park (UIRP) is a blended campus consisting of commercial ventures and a variety of university academic programs and infrastructure assets. As of June 30, 2015, 12 established companies, 30 startup companies and six university anchor laboratories were located in the park. These companies have access to university research infrastructure, including high-speed internet, access to university libraries and research facilities (i.e., core research facilities to support chemistry, biology, computation and

instrumentation), faculty for joint collaboration, business support centers (i.e., the John Pappajohn Entrepreneurial Center, the Small Business Development Center and the University of Iowa Research Foundation) and students as interns or employees. In FY 2015, the companies affiliated with University of Iowa Research Park and the Technology Innovation Center reported over 1,966 employees.

BioVentures Center (BVC) – The BioVentures Center (BVC) located at the University of Iowa Research Park opened in November of 2008. This 35,000 sq. ft. state-of-the-art biosciences incubator and office facility offers entrepreneurs and early-stage technology companies high-quality wet laboratories, a shared laboratory, a large multi-purpose room, multiple executive conference rooms and general shared space to meet their various business needs. At the end of FY 2015, 18 companies were located in the BVC employing over 90 people. By the end of calendar year 2015, the BVC will be 100% occupied. Incubation at the BVC has helped companies such as Higher Learning Technologies (HLT) move beyond the startup phase.

Technology Innovation Center (TIC) – The Technology Innovation Center (TIC) provides office space and a nurturing business environment to early-stage technology-based ventures that do not require wet laboratories. In FY 2015, the TIC reported a total of 12 companies and 21 employees.

- **Foundations in Learning**, a new tenant to the TIC, is the recipient of U.S. Department of Education Phase I and Phase II SBIR grants in 2014 and 2015, totaling more than $1 million.
- **Covida Medical**, a medical device company located in the TIC, received FDA clearance in June 2015 for their product HALO, which is closed system transfer device (CSTD) that protects medical professionals and patients from unintended exposure to toxic drugs when administering cancer therapies.

Bedell Entrepreneurship Learning Laboratory (BELL) – The Bedell Entrepreneurship Learning Laboratory is the University of Iowa's student business incubator. The 10,000 sq. ft. facility, which has 17 furnished offices and several conference rooms, offers a campus-wide program open to students from any major or college. The students receive intense mentoring and support as they launch or expand their businesses. The program, one of the first of its kind in the nation, has incubated over 200 businesses since opening in 2004. In FY 2015, 60 student businesses were being incubated at the BELL.

The Innovation and Collaboration Laboratory (THINC) – THINC provides student entrepreneurs with a space to meet to work collaboratively on their businesses or group projects. It was designed to mimic the offices of 1871 (an entrepreneurial hub for digital startups in Chicago) or Google to encourage collaboration and sharing. The space features whiteboard walls, a conference room available to students on a reservation basis, a kitchenette, a 3-D printer, a ping-pong table, Xbox, and coffee to foster community.

Institutional Activities and Services that Indirectly Promote Economic Development

Office of the Vice President for Research and Economic Development (OVPR&ED)

University of Iowa Research Park, BioVentures Center and the Technology Innovation Center – The University of Iowa offered variety of educational and training programs for UIRP/BVC/TIC tenants in FY 2015. These included lunch & learns, quarterly roundtables and mixers, a service industry speaker series providing guidance on legal issues, human resources and financial management, and Iowa Innovation Council programs.

The University of Iowa Research Park hosts quarterly roundtable meetings for company executives representing all park companies. The BVC multi-purpose room was utilized by over 50 outside groups, including but not limited to, legislative and state agency meetings, vendor shows, pitch and grow competitions, Chamber events, Iowa City Area Development forums, STEM education meetings, SBDC monthly lunch and learns, and the bi-monthly meetings of the Corridor Business Alliance. The state-of-the art meeting and executive conference rooms at the BVC have become a vital meeting hub for both regional and state organizations.

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 faculty/student field

study program (56 companies assisted in FY 2015)

- Hosting/sponsoring elevator pitch and business plan competitions to support innovation and new venture creation (Over 10 competitions held in FY 2015)
- Supporting the creation and launch of student-based businesses at the Bedell Entrepreneurship Learning Laboratory (BELL) located on the UI central campus; student entrepreneurs receive office equipment, computers, and access to high speed internet.
    - In FY 2015, total of 60 businesses participated in BELL. Since its opening in 2004, a total of 609 students from nearly every UI college have been impacted by the facility and associated programs.
- JPEC delivers campus-wide and online undergraduate entrepreneurial education and technology innovation coursework in the MBA program.
    - In FY 2015, there were 4,112 total student enrollments in 115 sections of courses and 244 students graduated from one of the Certificate, BA, or BBA programs offered by JPEC.
- The Jacobson Institute for Youth Entrepreneurship is a comprehensive program that enriches K-12 students' lives through classroom and practical educational experiences.
    - During FY 2015, the Jacobson Institute licensed the BizInnovator curriculum to 128 Iowa high school teachers impacting 1,712 students.
    - Outside of Iowa, another 480 high school teachers are licensing BizInnovator and impacting an additional 3,328 students. Nationally, students have the ability to earn University of Iowa college credit. In FY 2015, which was the first year this was available, 71 students nationally received University of Iowa college credit.
    - 217 youth participated in 7 summer camps held across Iowa

Other Economic Development Activities – The economic development leadership team participated in a large number of economic development organizations in FY 2015.

Statewide:

- Iowa Business Council
- Iowa Innovation Council
- Iowa Innovation Corporation
- Iowa Economic Development Authority, Technology Commercialization Committee
- Iowa Biotechnology Association, Board of Directors
- Technology Association of Iowa, Board of Directors
- Technology Association of Iowa, Panelist Reviewer for TAI annual awards
- BEST of Iowa
- STEM Advisory Board

Local and Regional:

- Cedar Rapids Metro Economic Alliance Economic Development Committee
- Corridor Business Alliance
- East Central Iowa Council of Governments, Loan Review Committee
- Economic Development Center (EDC), Board Member
- Iowa City Area Chamber of Commerce, Member
- Iowa City Area Development Group, Board of Directors and Executive Committee

- Midwest Engineering Entrepreneurship Network (MEEN)

National:

- Council on Competitiveness
- Small Business Administration (SBA)
- Global Consortium of Entrepreneurship Center (GCEC), Leadership Circle
- University Economic Development Association (UEDA)
- United States Association for Small Business and Entrepreneurship (USASBE)
- Colligate Entrepreneurship Organization (CEO)
- Students in Free Enterprise (SIFE)
- National Collegiate Inventors and Innovators Alliance (NCIIA)
- NBIA National Business Incubator Association
- AURP Association of University Research Park and Association of University Midwest
- National Academy of Inventors

Metrics Describing University of Iowa Economic Development Activity in FY 2015 & FY 2014

	FY 2015	FY 2014
a. Number of disclosures of intellectual property	149	139
b. Number of patent applications filed		
• U.S. Applications	109	90
• National Applications	15	73
• Patent Cooperation	22	21
• Total Applications	148	184

c. Number of patents issued	50	80
d. Number of license and option agreements executed on institutional intellectual property	40	32
• In Iowa	13	12
e. Number of license and option agreement yielding income	135	140
f. Revenue to Iowa companies as a result of licensed technology	$1.62MM	$1.87MM

g. Number of startup companies executing licenses or options for UI technologies • In Iowa	15 11	12 12
h. Number of companies in research parks, incubators and graduates located in Iowa	55	49
i. Number of new companies in research parks and incubators	6	7
j. Number of employees in companies in research parks/affiliates and incubators	1,966	1,824
k. Royalties and license fee income	$1.87MM	$1.38MM
l. Total sponsored funding	$565MM (based on total external funding) $443MM (sponsored research)	$515.8MM (based on total external funding) $431.3MM (sponsored research)
m. Corporate sponsored funding for research and economic development • In total • In Iowa	$91.7MM $2.0MM	$71.4MM $2.7MM
n. Iowa special appropriations for economic development in the following categories • Annual state appropriations for ongoing programs (TIC, ORP and CADD) • RIF appropriations	$209,279 $1,050,000	$209,279 $1,050,000
o. Estimated jobs created by SBDC clients	211	129

Direct and Hands-on Technical Assistance to Businesses, Faculty Inventors & Entrepreneurs

Office of the Vice President for Research and Economic Development (OVPR&ED)

University of Iowa Research Foundation (UIRF) – As the university's technology transfer office, the UIRF's primary functions are:

- Protecting IP through patents and copyrights
- Advising on intellectual property terms in sponsored research agreements and clinical trials
- Executing outgoing material transfer agreements

- Marketing to identify suitable licensees and private-sector partners for commercializing technologies
- Protecting the university's IP portfolio against infringement

The University of Iowa Research Foundation (UIRF) received 149 invention disclosures (up 6% over last year). It also executed 40 license or option agreements, a 25% increase over FY 2014. Iowa startups accounted for 11 of these deals.

UI Ventures – UI Ventures focuses on faculty startup creation, financing, mentoring, and C-level executive recruiting. The organization's activities include:

- Scouting for entrepreneurial faculty, postdocs and graduate students with new inventions
- Developing new ventures
- Educating inventors and startup founders
- Evaluating technology market potential and developing go-to-market plans, business plans and investor presentations
- Providing gap funding to advance promising IP
- Connecting new ventures to sources of capital
- Performing due diligence on the viability of startups
- Generating business models for startups

There are now 43 startups in the pipeline, 18 of which were added this year. Moreover, startups are beginning to efficiently leverage and navigate university and state economic development resources to build value and advance through the commercialization pipeline.

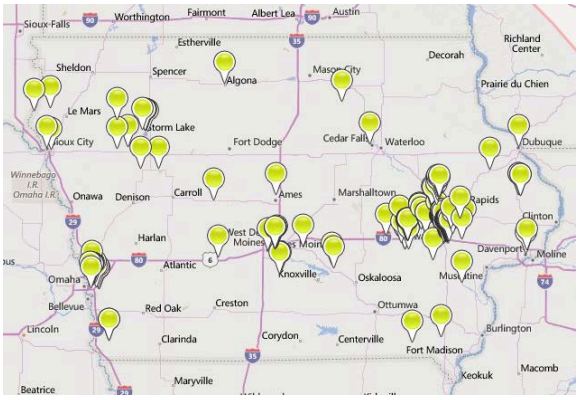
UI ProtoLabs – UI ProtoLabs is a public-private prototyping resource open to faculty, students and staff, startups, businesses, and the public. The partners that make up UI ProtoLabs are the university's Engineering Machine Shop, Physics & Astronomy Machine Shop, and a private-sector partner. These shops work together to provide a full menu of prototyping services including 3-D printing, CAD, and development of associated electronics/software. Labor costs are waived for projects shown to have high commercial and economic development potential. Users pay only for the cost of the required materials. Prototyping services allow users to:

- Find and fix flaws in their initial designs
- Demonstrate technologies to potential investors using hands-on presentations and pitches
- Raise the odds of obtaining a patent or increase the value of existing IP
- Investigate the manufacturability and cost parameters of initial designs

In FY 2015, UI ProtoLabs received 42 project submissions from various colleges within the university, as well as private-sector firms and public inventors. We expect the pipeline of potential prototyping projects to continue to expand throughout FY 2016.

UI Partners – IT Assistance – UI Partners was created to help Iowa small businesses innovate by solving their information technology (IT) challenges using practical insights and ideas drawn from university faculty, staff, and students. UI Partners was piloted in Iowa City with two full-time IT professionals who direct a team of four student interns. Students get to work with multiple businesses needing IT assistance. This experience is meant to prepare them for an IT career and in some cases may lead to permanent employment with UI Partners' clients. Services offered include: free technology assessments, custom application development, advanced networking, computer optimization, security and performance, hardware and software installation, data backup, remote monitoring of mission critical PCs and website design. UI Partners expanded by opening two outreach centers in western Iowa. UI Partners Council Bluffs and UI Partners Sioux City opened in January 2015 in cooperation with Iowa Western Community College and Western Iowa Tech Community College. Each outreach location has one full-time IT professional and 2 student interns. In FY 2015, the organization provided 8,942 hours of IT assistance to 137 clients in 45 Iowa communities and 31 counties. The communities served include: Akron, Algona, Amana, Ames, Cascade, Cedar Falls, Cedar Rapids, Cherokee, Columbus Junction, Coralville, Council Bluffs, Crescent, Davenport, Des

Moines, Donnellson, Dubuque, Galva, Holstein, Homestead, Humboldt, Ida Grove, Indianola, Iowa City, Jefferson, Kalona, Keosauqua, Lakeview, Lawton, Lisbon, Maquoketa, Marengo, North Liberty, Oxford, Parnell, Pella, Prairie City, Sidney, Sioux City, Solon, Spencer, Storm Lake, Stuart, Victor, West Branch, West Des Moines and Williamsburg.



Map of UI Partners locations in FY 2015

Talented programmers are a limiting reagent in the Iowa innovation ecosystem. To address the shortage, UI Partners, in partnership with Kirkwood Community College, offers guest speakers, weekend IT workshops, one-week programming programs and the intensive Dev/Iowa Bootcamp. Topics include: HTML/CSS, JavaScript, NodeJS, Databases, Version Control and Open Source. Designed and led by industry experts, the courses offer a hands-on, immersive learning environment. Emphasizing fundamental web development skills and industry practices, the courses are skill-set heavy and sought after by employers across the state and across the world.

2015 Commercialization & Business Development Funding Awards

UI Ventures, in collaboration with the UIRF and outside experts, worked to vet new projects and provide proof-of-concept funds for projects that could lead to new company formation. A summary of projects evaluated in FY 2015 is shown below. An historical view of GIVF commercialization funding that stimulated startup activity is also provided in Appendix A.

Gap Funding Awards for FY 2015

Title	PI(s)	Venture/License	Gap Funding	Additional Funding	Technology
SLEAK sheath, injects clot-busting drugs directly at the site of thrombosis	Laroia & Sharma	Invared	$16,725		Medical device
Articulated oral airway	Abrons	License	$25,783		Medical device
Iowa Adaptive Technologies- clinical trials	Hurtig	Iowa Adaptive	$50,000	$600,000	Medical device
Rapid easy-to-use buccal drug delivery device for the urgent treatment of seizures	Baker	Clipse	$56,873	$100,000	Medical device
Inactivation of HIV-1 and enhancement of its neutralization	Haim	License	$62,408		Drug
Predictive algorithms to enhance personalized cancer treatment	Kim, Dai & Theil	Immortagen	$64,952		Medical software

Organic magnetoelectro-luminescence for transduction between magnetic and optical information	Wohlgenannt & Flatte	License	$74,848		Non-medical device
An automated real-time treatment error detection system for radiation therapy	Xia & Siochi	Infondrian	$74,994		Medical software
The development and commercialization of a new class of microRNA inhibitors	Amendt	NatureMIRI	$75,000	$25,000	Therapeutic
Fabrication and clinical utility of devices used to measure fluid shear stress resistance in cancer cells.	Henry	License	$75,000		Medical device
Development of effective novel anti-cancer agent	Jin	InnoBioPharma	$75,000	$100,000	Therapeutic
		Totals	**$651,583**	**$825,000**	

John Pappajohn Entrepreneurial Center (JPEC)

Venture School – JPEC offers an immersive "Lean LaunchPad", or business model canvas, bootcamp-style training program named Venture School to accelerate startups. Venture School is available to students, alumni, faculty, staff, and community members who are committed to investigating their business hypotheses and applying the scientific method to improve their concept and to better gauge the viability of their ideas. Venture School emphasizes real-world entrepreneurship through experiential learning, a flipped classroom, and immediate feedback.

- In FY 2015, 66 teams comprising 182 entrepreneurs attended Venture School to assess and improve the commercial viability of their startup ideas and business models. Upon completion of the program, 27 new ventures were launched and 21 existing startups or businesses refined their business model through Venture School. There were eight Venture School cohorts across the state in 6 cities: Iowa City, Des Moines, Cedar Falls, Council Bluffs, Cedar Rapids, and the Quad Cities. This fall year the program will expand to Sioux City and Dubuque.
    - Four Venture School teams have been accepted into regional accelerators (NMotion and ISA)
    - Four Venture School teams were nominated for a Prometheus Award
    - Venture School Alumni have won the Invest In She, Dream Big Grow Here, The Pappajohn Business Model Contest and one team qualified for the One in a Million pitch competition (Kaufman Foundation)
    - One Venture School team accepted into the National NSF ICorps program at University of Michigan

Assistance to Businesses – JPEC faculty and staff provide one-on-one and faculty/student team-based consulting services to technology-based entrepreneurial companies located at the UIRP, the BELL and throughout Iowa's Creative Corridor.

- JPEC staff provided consulting services to over 242 regional entrepreneurs and business startups, totaling over 8,773 hours of assistance.
- An estimated 6,720 hours of research, analysis and strategic planning services were performed for 49 Iowa companies assisted through the JPEC faculty/student team consulting courses.
- MBA students completed five technology commercialization feasibility studies for nascent technologies being developed by University of Iowa faculty.

Six-Week Start-Up – JPEC delivers this intense entrepreneurial training program for start-up and growing businesses. The initiative prepares aspiring entrepreneurs to launch new ventures and existing companies to grow their businesses. Two classes were held in Iowa City in FY 2015.

Seminars/Workshops/Lecture Series – JPEC hosted over 15 different opportunities last year for students, faculty and persons from the community. In FY 2015, over 8,000 attendees came to learn from experienced entrepreneurs on a variety of topics including: the Technology Export Roundtable, various tax workshops, Entrepreneurial Boot Camps and lecture series.

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 Economic Development Authority, and the Small Business Administration to help business owners secure additional venture funding.

Elevator Pitch Competitions – Five various Elevator Pitch Competitions were held with $49,000 in cash prizes awarded. A total of $32,500 was awarded to 28 teams and 198 total teams participated.

UI Business Plan and Model Competition – A total of 4 business plan and business model competitions were held. A total of $80,000 was awarded to 24 teams, with 128 teams participating. The top student team received an additional $5,000 and the opportunity to participate in the International Business Model Competition held at Brigham Young University.

Iowa Medical Innovation Group (IMIG) – This unique, student-led program focuses on identification of solutions to clinical problems through collaborations between the Colleges of Medicine, Engineering, Business and Law. Students work on creating medical devices and/or Health IT solutions with the assistance of staff from JPEC and UIRF; to date, over 45 interesting technologies have been identified and reviewed and two are currently moving forward in advanced phases of development in anticipation of forming startup companies.

UI Small Business Development Center (SBDC) – In FY 2015, the UI SBDC, which provides small business counseling services and training in Cedar, Johnson, Iowa, Poweshiek and Washington counties, served 268 entrepreneurs and small businesses, resulting in 23 new business starts. SBDC clients raised over $9 million in external financing and created an estimated 211 jobs. The SBDC also provided 796 hours of one-on-one counseling.

Direct Economic Development Assistance to Iowa Communities

Office of the Vice President for Research and Economic Development

UI Partners – UI Partners was created to help Iowa small businesses innovate by solving their information technology (IT) challenges using practical insights and ideas drawn from university faculty, staff, and students. The organization also offers IT training to support workforce development. After a successful pilot in Iowa City, we opened two outreach centers in western Iowa. UI Partners Council Bluffs and UI Partners Sioux City opened in January 2015 in cooperation with Iowa Western Community College and Western Iowa Tech Community College.

John Pappajohn Entrepreneurial Center (JPEC)

Online Education – Students who cannot come to Iowa City may still earn a BBA or Certificate in Entrepreneurial Management online through the University of Iowa's Division of Continuing Education. The certificate is also accessible through JPEC's partnership with several Iowa community colleges.

Business Consulting Services – Through the Entrepreneurial Management Institute, JPEC offers business consulting services to entrepreneurial and startup companies around the state. In FY 2014, 56 projects were completed for Iowa-based companies and organizations.

Corridor Business Alliance

The Corridor Business Alliance was created in December 2009 and is composed of leaders from the Cedar Rapids Metro Economic Alliance, the Entrepreneurial Development Center, the Iowa City Area Chamber of Commerce, the Iowa City Area Development Group, Kirkwood Community College, MidAmerican Energy, Kirkwood's Small Business Development Center, the ***University of Iowa's Small Business Development Center, the Research Foundation and the John 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 University of Iowa Park benefit from sustained relationships with University of Iowa in the form of access to specialized research facilities, library access, faculty consultation, research collaboration and access to students as interns and employees. University of Iowa resources also provide smaller companies with assistance in business planning, identification of professional service providers, introductions to local and state government agencies and the regional business community, help in identification of 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 B.

University of Iowa Core Facilities

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

University of Iowa Pharmaceuticals (UIP) – The University of Iowa Pharmaceuticals, a division of the University of Iowa College of Pharmacy, offers contract analytical, development, and GMP manufacturing services to the pharmaceutical and biotechnology industry. The Center for Advanced Drug Development (CADD) within UIP is a U.S. Food and Drug Administration (FDA) registered and cGMP-compliant laboratory that works closely with the manufacturing groups at University of Iowa Pharmaceuticals. The focus of CADD is the development of analytical methods and testing to support the manufacture and control of clinical supplies of new drugs entering initial clinical trials.

CADD has a client base of mainly smaller biotechnology and pharmaceutical companies and a growing pool of U.S. and foreign pharmaceutical firms. CADD is 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 the University of Iowa unique among U.S. universities in facilitating 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 CBB is a microbial pilot plant facility and education center reporting to the Vice President for Research and Economic Development. The center links university scientists from six different colleges who focus on biocatalysis and bioprocessing. The center also performs scale-up of products ranging from ethanol to proteins. CBB serves industries from Iowa, the U.S. and around the world for fermentation and bioprocessing of food products, biofuels, bio-pharmaceuticals and other biotechnology products. The center collaborates with startup biotechnology companies from Iowa for production of small molecules to complex proteins, such as alcohols, vaccines, antibiotics, anticancer drugs, polymers, biochemicals, enzymes, pharmaceutical intermediates and derivatives of bioactive compounds. In the Research Development and Process Laboratory, they conduct extensive process research including first level production from the bench-scale to 1000 liter fermentation. For example, CBB is now developing Simulated Moving Bed Chromatography for protein and small molecule separations. The center also has a current cGMP production facility for biotherapeutics at a scale of up to 300 liters.

CBB is the leading bioprocessing facility located in a U.S. university setting and the only biopharmaceutical production facility in the State of Iowa with a state-of-the-art fermentation and bioprocessing laboratory to produce biotherapeutics for Phase I human trials.

National Advanced Driving Simulator (NADS) – The National Advanced Driving Simulator (NADS) is a center for driving simulation excellence located at the University of Iowa Research Park. This center's mission is to improve driving safety through the research of human-motor vehicle connection. Development and research conducted at NADS is sponsored by government, military, and industry partners, saving lives and improving quality of life for motorists, as well as advancing the cutting edge in driving simulation. This facility is home to the one of the world's most advanced research driving simulators, the NADS-1. In addition, NADS has developed an in-house portable driving simulator, the MiniSim™, which is currently being marketed to research institutions around the country. Recent research at NADS has focused on detection of impaired drivers, distracted driving, drowsy driving, advanced vehicle crash warning systems, and future vehicle communication systems. NADS has added an autonomous vehicle to its fleet and is currently working to advance understanding and standardization at the interface between drivers and automation.

State Hygienic Laboratory – The State Hygienic Laboratory (SHL) was established in 1904 to provide laboratory services to both governmental and private-sector individuals as well as organizations concerned with the health and environment of the state. Today, SHL conducts more than 500,000 tests for clients in all of Iowa's 99 counties through disease detection, environmental monitoring, and newborn and maternal screening. Clinical laboratory tests provided include virology, serology, microbiology, molecular biology, blood lead screening and biological and chemical terrorism response. State-of-the-art chemical, biologic and enzymatic analytical methods are used in this testing, which is performed at three SHL facilities, the UI Research Park in Coralville, on the DMACC campus in Ankeny and at the Board of Regents Lakeside Lab in Milford, Iowa. The SHL makes these services available to both for profit and not for profit organizations as well as individuals on a fee for service basis. 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 and four-year college students studying laboratory chemistry. In FY 2014, the Center for the Advancement of Laboratory Science opened at the SHL. With a conference center that accommodates 150 people, BSL2 and BSL3 learning laboratories and modern classrooms, the Center provides unique spaces and resources for community, state, regional and national partners to advance laboratory science.

Collaboration for Economic Development with Iowa Entities

Kirkwood Regional Center at the University of Iowa

Construction of the STEM center, a partnership between the University of Iowa and Kirkwood Community College, was complete in summer of 2015. The facility houses the professional development staff of the Grant Wood Area Education Agency (AEA) and provides STEM-related coursework and Career Academy experiences to high school students from seven regional school districts. College of Education faculty are partnering with the schools and Grant Wood AEA to provide K-12 professional development for teachers. The advanced TILE-like classroom design within the University of Iowa space of the Center serves to assess new models of teaching and learning, as well as to train high school and community college teachers in active learning delivery strategies. A variety of UIRP technology companies and University centers and laboratories, including the State Hygienic Laboratory, the National Advanced Driving Simulator, UIHC, the Center for Computer-Aided Design and the Flood Center are serving as experiential sites to augment career academy experiences. Additionally, University of Iowa health science colleges are adding value to Kirkwood's highly successful Health Science Career Academies across all health disciplines. In addition, the Jacobson Institute for Youth Entrepreneurship at the College of Education has developed a new course, STEM Innovator's Business Innovation, which will be piloted in the fall of FY 2016. This unique center will also serve as a programmatic home for the Southeast Regional STEM hub created under the Governor's STEM taskforce.

IC CoLab

The University of Iowa is a sponsor of the IC CoLab, a co-working space developed by the Iowa City Area Development Group (ICAD Group) to serve the needs of young entrepreneurs and their businesses. Co-working is not just about the space, it's about a social gathering of people who share values and who are interested in the synergy that can happen from working with like-minded talented people in the same space. Co-working offers a solution to the problem of isolation many entrepreneurs experience while working at home.

FY 2015 Regents Innovation Funds (RIF)

RIF Impact for the University of Iowa

The Regent's Innovation Funds allow the University to produce high-value intellectual property that derives from faculty research and enhances technology transfer and commercialization through the concerted efforts of our integrated economic development model. The ultimate goal is to facilitate industry-academia partnerships in technology commercialization, cultivate student and faculty entrepreneurship, and continue to support and grow existing companies and create new companies in Iowa based upon UI technology. Additional funds were used to support:

- Proof-of-concept funding to further the development of highly promising UI intellectual property/technologies. Additional funds are critical to move discoveries into the marketplace, to increase opportunities for raising additional capital from the private sector, and to support licensing of technologies to existing companies or to launch new ventures.
- Campus-wide student, staff and faculty innovation, entrepreneurship and business support programs to stimulate innovation and new venture creation and to provide essential services during the initial business formation stages.
- Economic development centers targeted at providing on-site technical and business services to Iowa businesses and startups, IT and entrepreneurial workforce training and student internships with Iowa companies.
- Vice President for Research and Economic Development infrastructure funds to invest in and support University startup and technology-based companies as they mature by assisting with space, equipment, business and technical assistance.

The University of Iowa has efficiently used its state economic development funds to stimulate technology commercialization, create startups and help expand existing businesses. Below are recent examples of such successes:

- **Iowa Approach, LLC** is a medical device company founded in 2012 by Dr. Steven Mickelsen, cardiac Fellow at the University of Iowa Hospital and Clinics. The company, located in the University of Iowa Research Park, is developing a treatment for one of the most common heart disorders in the world – atrial fibrillation (irregular heart beat). Using ablation catheters, Iowa Approach can reduce procedure times, complications, and side effects. The company has raised approximately $500,000 in seed funding, including $250,000 in grants, $100,000 from the Iowa Innovation Acceleration Fund, and a $100,000 Wellmark Blue Cross Blue Shield investment. In July, Plains Angels invested an additional $325,000. Iowa Approach has validated its prototypes and completed initial animal studies and will soon seek a $5,000,000 Series A round to fund first-in-man efforts for 2016.
- **Virtual Systems Engineering** (VSE) was founded by Drs. Ibrahim Ozbolat and Timothy Marler in 2013. VSE's software system, PREVIEW, can significantly reduce PCB design-test cycles and production errors for devices from cell phones to military electronics. PREVIEW includes interactive 3D visualization of single and multi-board systems. Dr. Ozbolat and Dr. Marler received RIF funding from UIRF under the GAP Commercialization RFP. VSE is in negotiations with four major firms to beta test and partner on initial installations of PREVIEW.
- **Higher Learning Technologies** (HLT) was founded by several University of Iowa students. HLT creates customized mobile test prep applications to assist students in preparing for technical, entrance and proficiency exams. The company has grown sales to over $3 million from more than 1,200,000 downloads of their apps. They currently employ 50 people and plan to add more over the next year. They have also received two equity investments totaling $6.5 million. HLT has been awarded best company culture in the Creative Corridor in addition to multiple Prometheus and Silicon Prairie Awards.

Successful Technology Transfer, Commercialization and Startups Enabled by RIF Proof-of-Concept Support

RAMDO Solutions has developed an advanced software system to enhance the reliability of military and commercial ground and air vehicles, wind turbines, and many other areas that are design focused. RAMDO (Reliability Analysis & Multidisciplinary Design Optimization) gives organizations the ability to obtain an optimum design prior to prototype development, reducing product development costs. Design optimization software is used in conjunction with other CAE (Computer-aided Engineering) applications to find the optimal design.

RAMDO has received a $75,000 GAP award from the UIRF, plus both phase I and II SBIR awards totaling over $1.25 million from TARDEC, the army's Tank Automotive Research Development and Engineering Center.

Immortagen, founded by the nation's leading researchers in women's cancer (Dr. Kim Leslie's, Professor and Head of Obstetrics and Gynecology), seeks to personalize cancer treatment through private tumor banking, full spectrum genetic profiling, revolutionary Clinical Decision Support algorithms, and advanced mouse models for drug research and development. While great strides have been made in the treatment of cancer, it is still a one-size-fits-all approach. From the latest research, it is well-known that every individual tumor has a unique genetic profile that makes it more responsive to one treatment over the other. Yet chemotherapeutic agents, which are standard treatment, do not distinguish which mutations are driving the tumor's growth.

Immortagen has developed the first predictive algorithm to account for the entire genome. The company used University of Iowa gap funding to increase the accuracy of the algorithm, which can now predict the probability of cancer recurrence with 93% accuracy.

InnoBioPharma has developed several novel drug candidates (two in pre-clinical trials) that are particularly effective against aggressive cancers that lack effective drug therapy. Cancers such as triple-negative breast cancer (TNBC), melanoma, and brain cancers are often resilient to many of the current treatments used to battle cancer. InnoBioPharma has solved this problem by observing naturally found anti-cancer compounds, synthesizing them or their structural analogs, and building a patent portfolio to pursue commercialization. These compounds will first be used to target triple-negative breast cancer.

Dr. Jin, founder of InnoBioPharma, has received a $75,000 GAP award from UIRF, a $100,000 Demonstration fund award for IEDA. Dr. Jin has also complete UI's commercialization Venture School and has been accepted to NSF's national I-Corps commercialization training program which awards $50,000 to its graduates.

Regents Innovation Fund projects for FY 2014-FY 2015

RIF Program Summary	Description of Program	FY15 – RIF Expenditures From FY14and FY15 Match Funds Source	Progress through June 30, 2015 ROI DATA
VP for Research	These funds have been instrumental in enabling the University of Iowa to expand the economic development infrastructure. These funds supported critical economic development functions associated with University Research Park, the BioVentures Center and the Technology Innovation Center.	**EXPENDITURES: $146,528** **MATCH: UI BioVentures Center in-kind contribution: $204,563**	Staff support for UIRP, BVC and TIC. Helped with the joint publishing project of Entrepreneur 101 magazine, with OVPR&ED, JPEC and OSC. University of Iowa Entrepreneur 101 Magazine is intended to promote University of Iowa-affiliated entrepreneurs and some of the UI programs and services that help spur entrepreneurship. Installed new conference room projector, copier and other technology upgrades. Replaced air conditioning compressor at the BioVentures Center to improve HVAC performance. Installed chemical fume hood and casework for various BioVentures Center tenants. Purchase of office furniture to complete fit-out of BioVentures Center offices allowing for tenants to move in. Cosponsor of the Midwest Creative College Town Conference in September. The Midwest Creative College Town conference featured business and cultural startup leaders from Iowa City and other Midwest college towns. Ideas to advance transformation for both cities and universities will be discussed, along with the benefits of economic growth resulting from new businesses, technology startups, art galleries, musical venues and design centers. The rise of college towns as engines of economic and cultural transformation also has positive implications for state economic development. Support for the College of Engineering prototyping projects. Assisted students in building prototypes of designs developed in the classroom that have potential commercial applications.

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 University of Iowa-based new and emerging ventures.	**EXPENDITURES: $10,000** **MATCH: JPEC in-kind contribution $10,000**	$5,000 for STEM Innovator Innovation Institute provided seed capital for high school student-led computer applications developed to meet an identified and validated entrepreneurial need. 20 Iowa students participated in Innovation Institute. Each team pitched their concept during the spring competition. $5,000 sponsorship of EntreFest, partnering with Iowa State University and the University of Northern Iowa to support statewide entrepreneurship.
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 in identifying viable technologies that have potential to create intellectual property which can 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, RIF and GIVF have 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.	**EXPENDITURES: $280,403** **MATCH: UIRF Seed Grants $102,517**	Funds were utilized to support existing projects that continue to demonstrate commercial merit. This support included specialized technology experts, external grant identification and application, intellectual property evaluation and strategy, external partnership development and assistance in securing investment and management for startups. RIF (previously GIVF) funding has been critical in creating a culture of commercialization and enabling the creation of highly innovative startups based on faculty research. These investments can be directly linked to 30 startups through the end of FY15. See Appendix A for Historical perspective of RIF/GIVF funding that Stimulated Start Up Activity.

UI Partners	An external-facing organization that provides hands-on IT assistance and training to Iowa small businesses and their workforces, making them more innovative and competitive by leveraging student interns.	**EXPENDITURES: $738,473** **MATCH: UI Research Foundation Seed Grants and Reserves; VPR Reserves; UI BioVentures Center in-kind contribution $622,727**	Funding is also being used for program development and staffing for engagement centers to impact statewide economic development efforts. The Iowa City location was launched in spring 2014 and has provided assistance to 70 companies. Services have ranged from desktop virus removal to custom database development. In December 2014, two Western Iowa engagement centers were launched. These centers are in partnership with Western Iowa Technology College in Sioux City and Western Community College in Council Bluffs. Funding is also being used for program development and staffing for engagement centers to impact statewide economic development efforts.
UI Ventures	An organization spun out of the University of Iowa Research Foundation specifically to focus on helping faculty, postdocs and graduate students create startups, find mentors, recruit CEOs and raise capital.	**EXPENDITURES: $38,450** **MATCH: UI Research Foundation Reserves $38,450**	These funds are used to bring resources and expertise to faculty, postdocs and graduate students who want turn their ideas into viable companies capable of raising private equity. Although UI Ventures is only in its infancy, we expect the pipeline of investable startups to continue to grow as the program matures. A total of 54 teams (163 individuals) have participated in venture school to date: 2013 - 7 teams 2014 - 35 teams 2015 - 12 teams (will start January 2015) Venture School has resulted in the launch of 12 new startups. Based on the program's success, we will be offering it across the state in FY 2015.

Appendix A

PI Name	GIVF Funded Projects	Number of Unique Startups Created	Potential Startup Identified	Startup Formed	Year Company Started	Company Name	Startup Is On-Going	Remains Under Consideration for Startup	GIVF stimulated What Result	UIRF Option or License
FY2014										
Bowden	47		√	√	2013	Pure Oleochemicals	Yes		Startup Formation	Optioned
Choi	46	27	√	√	2013	Ramdo	Yes		Startup Formation	Optioned
Henry/Vigmostad	45									
Hurtig/Hahn	44	26	√	√	2013	Iowa Adaptive Technology	Yes		Startup Formation	Optioned
Jin	43	25	√	√	2014	InnoBioPharma	Yes		Startup Formation	Under negotiation
Norian	42		√	√	2010	Memcine	Yes			Under negotiation
Ozbolat	41	24	√	√	2014	BioPrint	Yes		Startup Formation	Under negotiation
Vandenbush	40				2010	Memcine			Startup Formation	Under negotiation
VanVoorhis	39		√					√		
Xia	38	23	√	√		Applied Ray Tech	Yes		Startup Formation	Under negotiation
FY2013										
Anderson	37		√	√	2011	FxRedux Solutions	Yes	√	Product Beta	Licensed
Assouline	36	22	√	√	2012	NanoMedTrix	Yes	√	Startup Formation	Optioned
Bowden	35	21	√	√	2013	Pure Oleochemicals	Yes	√	Startup Formation	Optioned
Flynn	34		√	√	2013	pxAlpha	Yes	√	Startup Formation	Optioned
Marler/ Ozobolat	33	20	√	√	2013	Virtual Systems Engr.	Yes	√	Startup Formation	Under negotiation
Martins/Mickelsen	32		√	√	2011	Iowa Approach	Yes	√	Startup Formation	Licensed
McNamara	31								Startup Formation	Under negotiation
Morcuende/Grosland	30	19	√	√	2012	Clubfoot Solutions	Yes	√	Startup Formation	Under negotiation
Peters	29					Zefon International			Licensed to Existing Company	Licensed
Raghavan	28								Project Terminated	

Vanden Bush/Bishop	27		√	√	2010	Memcine	Yes	√	Startup Formation	Optioned
Wahls	26		√	√	2011	Xcellerator	Yes	√	Startup Formation	

FY2012

Adams/Welsh	25		√	√	2011	Emmyon	Yes	√	Startup Formation	Licensed
Davidson	24	18	√	√	2013	Spark Therapeutics	Yes	√	Startup Formation	Licensed
Das	23				2012			√	Project Terminated	
Flynn	22	17	√	√	2010	pxAlpha		√	Startup Formation	Optioned
Howard	21		√	√	2012	Direct Spinal Therapeutics	Yes	√	Startup Formation	Licensed
Martins/Mickelsen	20	16	√	√	2011	Iowa Approach	Yes	√	Startup Formation	Licensed
Salem	19	15	√	√	2009	PolyImmunex	No	√	Startup Formation	
Wahls	18	14	√	√	2011	Xcellerator	Yes	√	Startup Formation	
Vanden Bush/Bishop	17		√	√	2010	Memcine	Yes	√	Startup Formation	Optioned

FY2011

Anderson	16	13	√	√	2011	FxRedux Solutions	Yes	√	Startup Formation	Licensed
Baker	15	12	√	√	2010	Tansna	Yes	√	Startup Formation	Option Terminated
Doddapaneni*	14								Project Terminated	
Comeron, Manak	13								Project Terminated	
Vanden Bush/Bishop	12	11	√	√	2010	Memcine	Yes	√	Startup Formation	Optioned
Howard	11	10	√	√	2012	Direct Spinal Therapeutics	Yes	√	Startup Formation	Under Negotiation

FY2010

Schlutz	10	9	√	√	2009	ViewPoint Mole. Diag.	Yes	√	Startup Formation	Optioned
Adams	9	8	√	√	2012	Emmyon	Yes	√	Startup Formation	Under negotiation
McCray	8								Ongoing Research	
Lim	7	7	√	√	2007	JL Meditech	No	Not viable	Lack of viability	Lack of viability
Leddy	6	6	√	√	2009	Voltesla	No	Not viable	Startup Formation	Optioned then terminated

FY2007										
Abramoff	5	5	√	√	2009	IDX	Yes	√	Startup Formation	Licensed
Arnold	4	4	√	√	2005	ASL Analytical	Yes	√	Startup Formation	Company formed, no license
Hohl	3	3	√	√	2005	Terpenoid Therapeutic	Yes	√	Startup Formation	Licensed
Welsh	2	2	√	√	2007	Exemplar Genetics	Yes	√	Startup Formation	Licensed
Wohlgenannt	1	1	√	√	2006	OMR Sensors	No	**Not viable**	Lack of viability	Lack of viability
TOTAL	47									

Appendix B

Name of Business or Other Entity Served	City	County	University Unit that Interacted with Business or Other Entity
AMBI Group	Coralville	Johnson	Technology Innovation Center
ASL Analytical	Coralville	Johnson	BioVentures Center
Bio::Neos, Inc.	Coralville	Johnson	BioVentures Center
Brain Image Analysis	Coralville	Johnson	Technology Innovation Center
BRL HR	Coralville	Johnson	Technology Innovation Center
Cardiostrong	Coralville	Johnson	BioVentures Center
Cardiovate	Coralville	Johnson	BioVentures Center
Cellular Engineering Tech	Coralville	Johnson	BioVentures Center
Componica, LLC	Coralville	Johnson	Technology Innovation Center
Corvida Medical	Coralville	Johnson	Technology Innovation Center
Digital Artefacts, LLC	Coralville	Johnson	Technology Innovation Center
EGR International Inc.	Coralville	Johnson	Technology Innovation Center
Emmyon	Coralville	Johnson	BioVentures Center
Exemplar	Coralville	Johnson	BioVentures Center
Foundations in Learning	Coralville	Johnson	Technology Innovation Center
Higher Learning Technologies	Coralville	Johnson	BioVentures Center
Hennepin Life Sciences	Coralville	Johnson	BioVentures Center
Integrated DNA	Coralville	Johnson	BioVentures Center
Innomatix, LLC	Coralville	Johnson	Technology Innovation Center
Innovas Technologies	Coralville	Johnson	Technology Innovation Center
JP II Medical Research	Coralville	Johnson	BioVentures Center
Memcine	Coralville	Johnson	BioVentures Center
NanoMedTrix	Coralville	Johnson	BioVentures Center
Ramaanchar Technologies, Inc.	Coralville	Johnson	Technology Innovation Center
Santos Human	Coralville	Johnson	BioVentures Center
Terpenoid Therapeutics, Inc.	Coralville	Johnson	BioVentures Center
The Thomas Group	Coralville	Johnson	Technology Innovation Center
VIDA Diagnostics	Coralville	Johnson	BioVentures Center
Viewpoint Molecular Targeting	Coralville	Johnson	BioVentures Center
Voxello	Coralville	Johnson	BioVentures Center
RESEARCH PARK TENANTS	Coralville	Johnson	UI Research Park/TIC Graduate
Siemens	Coralville	Johnson	UI Research Park
Stanley Environmental, Inc.	Coralville	Johnson	UI Research Park
General Dynamics Information	Coralville	Johnson	UI Research Park

Noel-Levitz	Coralville	Johnson	UI Research Park
Integrated DNA Technologies	Coralville	Johnson	UI Research Park
Leepfrog Technologies	Coralville	Johnson	UI Research Park
Cargill International	Coralville/Cedar Rapids	Johnson/Linn	UI Research Park
Brighton Group	Coralville/Des Moines	Johnson/Polk	UI Research Park
KemPharm, Inc.	Coralville	Johnson	UI Research Park
ConnectFive	Coralville	Johnson	UI Research Park
MediRevv	Coralville	Johnson	UI Research Park
Kirkwood Regional Center at the University of Iowa	Coralville	Johnson	UI Research Park
OTHER BUSINESS INCUBATOR GRADUATES ACTIVE IN IOWA			
Ecolotree, Inc.	North Liberty	Johnson	Technology Innovation
Corcoran Communications, Inc.	Iowa City	Johnson	Technology Innovation
Innovative Software Engineering	Coralville	Johnson	UI Research Park/TIC
Bio-Research Products, Inc.	North Liberty	Johnson	Technology Innovation
aJile Systems, Inc.	Cedar Rapids	Linn	Technology Innovation
CompuTerra, Inc.	Cedar Rapids	Linn	Technology Innovation
HomeSafe	Coralville	Johnson	Technology Innovation
The Patient Education Institute	Coralville/Iowa City	Johnson	UI Research Park/TIC
Police Law Institute	North Liberty	Johnson	UI Research Park/TIC
Corridor Business Journal	Coralville	Johnson	Technology Innovation
Epley Marketing	North Liberty	Johnson	Technology Innovation
Sebesta Blomberg, Inc.	Cedar Rapids	Linn	Technology Innovation
Vive Media	Coralville	Johnson	Technology Innovation
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
Oakdale 8, LLC	Iowa City	Johnson	UI Research Park

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FY15 Board of Regents, State of Iowa, Annual Economic Development and Technology Transfer Report

PRESENTED BY
MICHAEL CRUM, VICE PRESIDENT FOR ECONOMIC DEVELOPMENT AND BUSINESS ENGAGEMENT,
OFFICE OF THE PRESIDENT

October 21–22, 2015

Economic development is a top priority for Iowa State University, and the university is very proud of the tremendous impact it has on the state economy. The university recently reorganized its economic development enterprise with the establishment of the Office of Economic Development and Industry Relations (EDIR) on July 1, 2014. Michael Crum, Vice President for Economic Development and Business Engagement, leads EDIR and he reports directly to President Leath. EDIR consists of the following key university economic development units:

- ***Center for Industrial Research and Service*** (including CIRAS Technology Assistance Program, formerly IPRT Company Assistance) : works with primarily, but not exclusively, manufacturing companies to enhance their performance in numerous ways, including process improvement, strategic planning, new product development, supply chain management, and market expansion
- ***Small Business Development Center***: ISU administers the state SBDC system which consists of 15 regional centers serving all 99 counties in Iowa. SBDC assists individuals interested in starting new companies and provides business services and counsel to existing companies across Iowa to solve management problems, to improve operations, to seek financing, and to pursue new opportunities
- ***Pappajohn Center for Entrepreneurship***: serves entrepreneurs, provides entrepreneurial opportunities for students, and administers the university-wide academic program in entrepreneurship
- ***ISU Research Foundation*** and ***Office of Intellectual Property and Technology Transfer***: manage, market, and license the intellectual property of ISU researchers and work with them to patent inventions and market the innovations to commercial partners.

The primary objectives of creating EDIR are (1) to increase the integration and collaboration among the university's economic development units to provide more comprehensive service to our clients and partners (i.e., a one-stop shop) and (2) to serve as the gateway or portal to the university's expertise, capabilities, resources, and facilities that support and enhance economic development throughout the state.

Economic development is not only central to the university's mission, it is a natural outcome of nearly all that we do. Thus, EDIR works very closely with the ISU Research Park and other university units that contribute to the university's economic development efforts and impact, including the Office of the Vice President for Extension and Outreach, the Office of the Vice President for Research, and the academic colleges.

ISU promotes economic growth in Iowa in a number of ways. We provide business and technical assistance to existing companies, we support the creation of new companies, we help attract new companies and entrepreneurs to Iowa, we create intellectual property and help move research ideas to the market, and we contribute to workforce and entrepreneurial development.

Business and Technical Assistance

During federal FY14, which is the most recent full year for the program, the **Iowa Small Business Development Center Program** provided business assistance to individuals and companies **in all 99 counties totaling 2,677 clients** and 11,412 counseling hours. As a result of this counseling, **251 new businesses** were started, **1,196 jobs were created, and 447 jobs were retained**. Additionally, SBDC assistance was credited by clients with increasing their capital infusion by more than $52 million and increasing their sales by more than $49 million. **This translates into a new job every 7 hours, a new business every 35 hours and an increase of $4 million in sales each month.**

The ISU SBDC regional center, in partnership with the ISU Pappajohn Center for Entrepreneurship, provided 533 hours of counseling assistance to startup and existing companies; **served 215 clients with one-on-one counseling**; **educated 361 attendees through workshops**; provided advice to several hundred clients via telephone and e-mail; and advised a number of technology companies in the areas of licensing, equity-based financing, market entry, and numerous operational areas. The centers **documented 24 new business starts with 76 new jobs created** that have generated **$2,115,621 in capital infusion**.

CIRAS has been working with companies in communities across Iowa for more than 50 years and has a vision for Iowa of healthy communities through business prosperity. **Cumulatively, over the past five years, CIRAS and partners have reported impact from companies totaling over $2 billion dollars ($1.7 billion in sales gained or retained, $220 million in new investments, $80 million in costs saved or avoided) with 29,290 jobs added or retained as a result of the assistance received.**

During FY15 **1,548 businesses from 97 counties** in the state received assistance on projects or attended educational workshops from CIRAS staff or partners. Companies responding to surveys reported **$386 million in total impact** — $329 million in sales gained or retained, $45 million in new investments, and $12 million in costs saved or avoided. Company executives stated that **5,154 jobs were added or retained** as a result of the assistance they received from CIRAS and its partners. The following summarizes the results of the four primary CIRAS programs for this past year:

- The CIRAS **Procurement Technical Assistance Program** (PTAP) works 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. CIRAS is the only organization in the state of Iowa that provides contracting assistance at all three levels of the government market segmentation—local, state, and federal. Last year, CIRAS staff **counseled nearly 900 companies**, resulting in **more than $186 million in government contract impact** as a result, in part, to this assistance. The Defense Logistics Agency, which funds CIRAS to provide assistance to Iowa companies, indicated this impact **helped create or retain 3,740 jobs**.

- In 2014, **426 small- to mid-sized manufacturers** received assistance under the **Manufacturing Extension Partnership** (MEP) program. Companies *responding to third party surveys reported **$198 million in financial impact*** from technical assistance and workshops on technology, growth, enterprise leadership, and productivity.

- CIRAS' **Economic Development Administration University Center Program** (EDAUCP) focuses on growing small businesses by coaching them on how to develop and commercialize innovative new products, processes, services or business models. This program has delivered **$2.37 million in monetary impact** over the past year and has **created or retained 24 additional jobs** in the plastics and machinery manufacturing industries

- The CIRAS Technology Assistance Program (TAP), formerly referred to as IPRT Company Assistance program, has a mission to promote assistance to Iowa companies with technical problems and advancing R&D activities. The program is composed of two segments that support Iowa businesses in unique ways: the technology assistance group (includes materials, non-destructive evaluation, and engineering) provides shorter-term technical assistance, while the research cost-sharing program helps Iowa companies access ISU's faculty and facilities for research by providing a 1:1 cash-match on research projects. In the past five years, **FY2011-2015, the CIRAS TAP has worked with more than 175 distinct businesses from 66 Iowa counties**. In FY15 alone, companies responding to surveys reported **$18.5 million of total economic impact** from the technology services they received. This was over double the impact reported in the previous year.

Appendix 1 provides some illustrative examples of CIRAS and SBDC projects with Iowa companies during the past year.

During the five year time frame FY2010-2014, 12,500 different companies in Iowa representing all 99 counties benefitted from CIRAS and SBDC business and technical assistance and/or education/training services.

This past year the **Community and Economic Development (CED) program within ISU Extension and Outreach** hired a third community development specialist with expertise in minority businesses and leadership. These three CED specialists **helped 28 Latino business owners start or improve their own businesses, trained 21 Latino business leaders and entrepreneurs, and assisted with the creation of 19 jobs and the retention of 90 jobs for minority employees.** The estimated value of the jobs created/retained is $3,388,000.

During 2014, the **ISU Extension and Outreach Value Added Agriculture Program** conducted several business **feasibility studies enabling Iowa business' to qualify for loan guarantees** through their local banks and USDA-Rural Development. The in-depth studies examined the economic, market, technical, management, and financial aspects of the proposed business start-up or expansion. **Rural economic development feasibility studies for nine local businesses in 2014 resulted in**

investments of $37.2 million into the Iowa economy and the potential for 126 newly created jobs when completed.

The ISU Research Park

The ISU Research Park has been hugely successful because companies find great value in having a closer physical presence to the university as it facilitates working with faculty and graduate students on research, tapping into and recruiting the graduate and undergraduate student talent pool, and accessing university facilities. Research Park tenants include companies of all sizes and industry focus, though engineering and technology firms and bioscience firms comprise the largest proportion, reflecting the STEM strengths of the university. Tenants include companies that were incubated at the Research Park as well as established global companies. **Four of the last five Iowa companies to go public started and reside in Ames, with three getting their start at the Research Park and two are still located at the Research Park.**

Today, the Research Park is a 230-acre development just south of campus with more than 500,000 square feet of building space. **Fourteen new companies and affiliates joined the Park in FY15**, bringing the **historical total to 246 companies and 4,594 employees for current and former tenants that are still in existence world-wide.** Currently, there are **66 companies and research centers and 16 affiliates located in the Park, employing 1,572 and 213 people, respectively**.

During the next two to three years, an additional 300,000 square feet of office and lab space will be added, and the City of Ames recently annexed nearly 200 more acres of land to allow for further expansion. In 10-15 years, it is expected that the Research Park will provide approximately 1.8 million square feet of office and lab space for more than 6,000 employees.

Workforce Development

Of course, a key component of the university's value proposition related to economic development, and its primary mission, is providing a world class education that provides students with the technical, analytical, problem-solving, communications, and social responsibility skills required in today's workplace. Iowa State is the largest university in Iowa with 36,000 students, and despite our Midwest location, our student body is quite diverse. Last year more than one in five students was either a U.S. multicultural or international student. Our students represented every Iowa county, all 50 states and 110 countries. This diversity leads to a wide array of perspectives, capabilities, and ideas that enrich the learning environment. Not surprisingly, our graduates are in high demand and we have a **campus wide placement rate of almost 95%** (i.e., 95% of undergraduate students are employed in their field or are pursuing graduate education within six months of finishing their undergraduate studies).

Iowa State is well known for providing students with professional development activities on campus that provide great opportunities for companies to utilize our students' talents. We have excellent entrepreneurship programs in every college as well as "experiential learning" centers that provide opportunities for cross

functional teams of students to work on business projects. Additionally, engineering students complete a senior capstone project, and several faculty across campus integrate company projects into their courses.

The CyBIZ Lab interdisciplinary student consulting program offers business solutions to companies of all sizes as well as supports faculty commercialization efforts. The improved performance resulting from these interactions allow businesses to retain and often expand their workforce. **CyBIZ Lab completed 30 consulting projects** and additionally facilitated live case classroom projects that resulted in **approximately 600 students engaging with companies** to solve real business issues.

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 with challenging opportunities to apply their engineering knowledge to real-world applications as a final step in preparation for joining the workforce. In addition to the senior capstone design projects, engineering students have worked with companies on projects related to lean manufacturing and facility planning.

By working with the students, companies gain a new perspective on difficult engineering problems as well as the value engineers bring to an organization. As a result of the projects, many companies achieve innovative solutions that lower costs and enhance quality and productivity. This collaborative program reinforces the benefits and challenges of working in team environments. The program also allows companies to gain insights regarding students as potential future employees.

In 2014, **engineering students worked on 93 projects, 77 of them with Iowa companies. This included 57 different Iowa companies across 22 Iowa counties**. Companies responding to surveys reported **impacts of more than $32 million** for these projects.

ISU's **College of Engineering Community Outreach** is celebrating over a decade of high quality STEM programming to create and deliver experiences that engage, educate and interest students of all backgrounds with a focus on creating an engineering pipeline to support workforce and economic development in Iowa and the nation. In the 2014-15 academic year, college programs impacted tens of thousands of individuals with **5,000 young people participating in FIRST LEGO League and Jr. FIRST LEGO League**, **352 schools actively teaching 23,407 students Project Lead The Way coursework**, and **over 600 youth engaging in engineering kids summer camps**. In addition, approximately 20,000 students and families were impacted through hands-on events such as the state fair, school field trips and activities, and over 500 teachers and administrators who attended ongoing training and professional development throughout the year. The college is keeping Iowa youth inspired through STEM initiatives today to build a better Iowa for tomorrow.

CED Extension and Outreach is part of the Iowa Retail Initiative (IRI), a collaboration to create thriving rural communities. Iowa State University is leading this initiative to support Iowa's independent retailers and revitalize rural downtowns. Financed by a Strategic Initiatives Grant from ISU Extension and Outreach, IRI unites existing campus services and provides a single point of contact for rural communities and retailers seeking help. In fall 2014, **30 ISU students in the senior-level Retail-**

Scapes studio class developed design concepts to enhance local retail experiences for 14 Storm Lake retailers, seven of whom are Latino entrepreneurs, creating a regional vision with connections and collaborations that can strengthen the area's economy. In spring 2015, **28 design students in the Retail-Scapes studio created retail and tourism concepts for Lyon County**.

In addition to professional development opportunities on campus, ISU's career services offices work closely with companies to assist them in establishing internships for our students. Internships provide students the opportunity to apply what they are learning on campus as well as the opportunity to experience firsthand the type of work environment they will be entering after completing their studies. Companies benefit from the interns' work output (many companies calculate a return on investment for their internship programs, and the returns are impressive), and they use the internship as a testing ground for prospective new employees. This past year our career services offices were able to document **over 2,400 ISU interns who were employed by more than 700 different Iowa employers located in over 140 communities in 78 counties**. These numbers do not include students who found internship opportunities on their own nor do they include students who had non-internship jobs related to their field of study.

Iowa State also contributes to workforce development in the state by supporting students' learning and skill development even before they get to the university. For example, ISU Extension and Outreach's North Central STEM Hub, one of six regional hubs of the Iowa Governor's STEM Initiative, has been connecting education and business to increase student interest and ability in STEM. The North Central STEM Hub has hosted STEM festivals at the Iowa State Fair and in Mason City, where families engaged in hands-on STEM activities hosted by formal and informal K-12 educators, community colleges, businesses, and economic development organizations. **The North Central STEM Hub supported more than 250 educators and 19,000 K-12 students** in the region with STEM Scale-Up programs in an effort to increase the students' interest and ability in STEM. ISU Extension and Outreach professionals play a significant role in each region through representation on each of the six Regional Advisory Boards. The Iowa STEM Monitoring Project's annual report highlights the following achievements from all six regions of Iowa.

- From 2011-2014, the average number of students meeting mathematics proficiency on the Iowa Assessments appears to be on the rise across demographic groups, including students who are female, African American, Hispanic, and/or with low income.
- Comparing 2011 to 2014 graduates in Iowa who took the ACT, the proportion meeting benchmarks for college readiness increased by seven percentage points for science.
- Since 2010, STEM degrees at Iowa's public universities have increased 12%, and at private colleges, 11%.
- Educators reported working with an estimated 1,162 existing business partnerships and established 376 new school-business partnerships during 2014-2015.

Finally, several ISU units provide training and related educational activities to a wide variety of individuals, occupations, and industries across the state. **Appendix 2** provides several such examples.

Research and Technology Transfer

ISU promotes economic growth in Iowa through its research and technology transfer – conducting basic research which is at the foundation of many innovations in the marketplace, and collaborating with companies on their specific research and development initiatives to help them introduce new products and services and improved methods for creating and delivering these new offerings. We excel at developing collaborative relationships with companies so that our groundbreaking research can be put to practical use to not only improve business practices but also improve lives.

ISU had a record setting year in FY15 with **total sponsored funding of about $425 million**, **including $225 million for research**. Businesses, corporations, and commodity organizations accounted for approximately $41million of sponsored funding.

In FY15 ISU researchers submitted **130 disclosures of intellectual property**, and our technology transfer office filed 36 patent applications. A report released by the National Academy of Inventors and Intellectual Property Owners Association, had **Iowa State ranked in the top 70 universities in the world (and top 50 in the U.S.) in 2014 in the number of U.S. utility patents granted with 31**, including patents for wind turbine tower systems, computer encryption logic, bio-asphalt, using mesoporous silicates for delivering agents into plant cells, and new methods to improve the treatment of Parkinson's Disease. **Iowa State was the only university in Iowa ranked in the top 100.**

Additionally, last year ISU technologies resulted in **108 license and option agreements worldwide with 61 in Iowa**. ISU currently has 157 license and option agreements yielding income. **Iowa companies earned $8 million revenue from ISU licensed technologies in calendar year 2014, and four startup companies based on ISU technologies were formed in Iowa.** Globally, total sales revenues from ISU licensed technologies were $237 million, not including germplasm.

The **Regents Innovation Fund** program at Iowa State has a competitive research component that pairs ISU faculty members with Iowa industries (primarily new to young startups) to create economic benefit for the companies. Surveys completed by companies on projects funded from **June 2006 through June 2014** (surveyed one year after project completion) **documented 152 jobs created or retained and an annual sales impact of nearly $19 million** due to the research projects conducted in partnership between ISU and the companies. Please see **Appendix 3** for a complete report on Regents Innovation Fund uses and results.

Assistance to Communities

Assistance to Iowa communities is the focus of many of the programs managed by ISU Extension and Outreach. Some examples of direct economic development assistance to Iowa communities are provided below.

CD-DIAL Builds Decision-making Capacity

CD-DIAL (Community Development—Data, Information, and Analysis Laboratory) works with communities and organizations to build decision-making capacity as they collect and use information about their local populations. In 2014–15, CD-DIAL conducted surveys for the city of Ames (three surveys), the Linn County Conservation Board, and a Mental Health Services Cross Region Needs Assessment for six counties.

Student Involvement in Community Development

This year the Partnering Landscape and Community Enhancements (PLACE) program involved more than 100 students in outreach projects in dozens of Iowa communities, including Manning, Storm Lake, Panora, Corning, and Lyon County. The ILR Community Visioning Program employed eight student interns to assist in assessments and analysis in 10 communities.

University Extension Community Development Collaborative

In 2012, Community and Economic Development Extension and Outreach (CED) established a partnership with the City of Dubuque and the University of Wisconsin and created a joint faculty position specializing in community planning and leadership. The agreement and joint appointment is one of the first of its kind in the country between two land-grant institutions. The person was hired with tenure at the rank of associate professor and is tenured at Iowa State University. Through the collaborative, ISU Extension and Outreach, University of Wisconsin–Extension, and University of Illinois Extension co-hosted the Community Development Society 2014 Annual Conference in July 2014 in Dubuque. The conference drew 232 community development specialists from several countries to the city, giving international exposure to ISU Extension and Outreach, the University Extension Collaborative, the city of Dubuque, and the surrounding area featured in mobile workshops. The collaborative has been working with the Community Foundation of Greater Dubuque to provide technical assistance to the Inclusive Dubuque Initiative, a collaborative effort on the part of city, industry, and nonprofit leaders to create a more welcoming community. To date, we have provided expertise in developing goals and plans of action. Inclusive Dubuque now has set goals and developed a logic model for moving forward to meet these goals of social and economic diversity and inclusion.

Regional, State, and Local Partnerships with ISU Extension and Outreach

CED maintains partnerships and shares joint community development specialist positions with the Chamber of Commerce of Keokuk, the City of Fairfield, the economic development organization of West Liberty (WE-LEAD), the development organization of Cedar County (CCEDCO), and the regional development organization of Southwest Iowa (SWICO). An additional shared position was established with the West Liberty Chamber of Commerce. Each local economic

development position is jointly funded by ISU Extension and Outreach and a local partner; the person serves as a local development official who provides economic development education on a part-time basis.

Extension and Outreach cosponsors joint position with Iowa League of Cities

This joint educational position focuses upon local government finance. Joint programming coordinated through this position includes the Iowa Municipal Professionals Institute and Academy, and webinar series on tax incremental financing attended by more than 500 across the state. In 2014–15, the Office of State and Local Government Programs trained 1,407 government officials. At the 2014 Municipal Professionals Institute and Academy, 266 city clerks, administrators, and finance officers received instruction on a variety of topics related to local government.

Iowa's Living Roadways Community Visioning Program

Since 1996, the Community Visioning Program has helped rural communities plan transportation enhancements using state funds from the Iowa DOT. To date, 218 Iowa towns have completed the process and collaborated with design teams to create conceptual transportation enhancement plans. The program continues to make a significant impact throughout the state. For example, in 2014–15, 11 communities that participated in the visioning program were awarded nearly $360,000 in grant funds to implement visioning projects.

Mapleton Rebuild and Recover

The fall 2014 landscape architecture community design studio worked with the Mapleton Rebuild and Recover Committee and Foundation to assist Mapleton's long-term recovery. In 2011, more than half of the community was damaged by a Category 3 tornado. Since fall 2012, Mapleton has been working with Iowa State through the community design studio and the Iowa's Living Roadways Community Visioning Program to rebuild the community and make long-term improvements. In 2014–15, the community received $75,000 for the Mapleton Active Living Design Project.

Community Design Lab

The Community Design Lab (CDL) is a partnership between the ISU College of Design and ISU Extension and Outreach that focuses on long-term, issue-driven design research with the goal of developing models that are applicable globally and pertain to sustainable initiatives on various scales (building, neighborhood, city, region, etc.). In 2015, CDL implemented the Agricultural Urbanism Toolkit for Healthy Harvest of North Iowa (Cerro Gordo, Franklin, Floyd, Hancock, Kossuth, Mitchell, Winnebago, Worth, and Wright counties), Dubuque, and Cass County. The toolkit was developed with a grant through the Leopold Center for Sustainable Agriculture and launched in spring 2014. This toolkit uses agricultural urbanism tactics (e.g., school gardens, farmers markets, and food hubs) as a strategy to promote local food system revitalization in communities.

Regional Food Systems Working Group Increases Access to Local Foods

The Regional Food Systems Working Group is a network of 15 organizations working with 91 of Iowa's 99 counties to advance local and regional food systems. The RFSWG is supported by Iowa State University's Leopold Center in partnership with ISU Extension and Outreach. The 2014 report shows the total local food sales by 57 farmers in 2013 was $13 million, up 23% from 2012. Total local food purchases by 37 institutions and intermediated markets totaled $13.1 million, up 47% from 2012. The total number of new jobs created by local food producers and local food buyers in 2012-13 was 171. More than one-third (37 percent) are full-time jobs. Positions were created in farming, sales and marketing, farm labor, processing, distribution, nutrition education, horticulture education, and culinary arts.

Grape-Growing and Winemaking Attract Midwestern Investment

The Midwest Grape and Wine Industry Institute (MGWII), supported by ISU Extension and Outreach, was formed in 2006 by the Iowa Board of Regents as a result of the state's evolving grape and wine industry. Its goals are to: 1) conduct research to evaluate cold-hardy grape varieties that can thrive in the Midwest; 2) conduct enology research; 3) develop a wine quality award program that will provide wine buyers a quality-assurance stamp of approval; 4) establish an outreach program to the industry by training a team of specialists; and 5) partner with community colleges to develop job training programs specific to growing grapes and making wine. Currently (July 2015) Iowa has 97 native wineries producing approximately 304,146 gallons of wine per year, and 300 commercial vineyards covering 1,250 acres of grapes. The grape and wine industry in Iowa continues to grow. According to a 2012 study by Frank, Rimerman + CO. LLP, the economic impact of the Iowa wine and grape industry on the state's economy is $420 million.

University Facilities and Services

ISU has laboratories, equipment, instruments and other facilities and services that it makes available to external partners on a fee for service basis. Often, companies would not find it prudent to invest in these facilities and capabilities as they do not have enough volume or frequency of usage to warrant the investment. However, these assets and services add great value when they are needed.

For example, our **Office of Biotechnology manages 31 facilities and service units** on campus. **Last year 47 different Iowa companies and individuals utilized these capabilities on 59 different occasions.** The most frequently used facilities were our DNA Facility and our Materials Analysis and Research Laboratory.

Another example is ISU's **Veterinary Diagnostic Laboratory**, the state's only public veterinary diagnostic laboratory (VDL) and only VDL accredited by the American Association of Veterinary Laboratory Diagnosticians. **Each year the lab processes 75,000 cases and conducts approximately 1.5 million tests.** It provides timely, comprehensive, high-quality diagnoses for diseases and toxicoses. The Iowa State VDL has detected and quickly responded to the introduction of various animal diseases in Iowa, including the 2013 PED virus in pigs and the 2015 HP-AVI virus in poultry. The lab provides unbiased, critical diagnostic services to meet the needs of

Iowa animal owners and consumers. In addition, the Iowa State VDL provides the research and outreach infrastructure to be the nation's leader in food animal diagnostic medicine.

Besides the Research Park's incubator space, the **Plant Sciences Institute** offers the **Innovations Development Facility** (IDF). Currently there are **four startup companies**, all university-related or affiliated, located at the IDF, including a new one that started this past year.

Major Economic Development Collaborations

Iowa State University takes great pride and pleasure in its collaborations with both private and public sector partners. These collaborations are essential to achieving the university's and the state's economic development goals. The first four sections below identify new collaborations begun or formalized this past year. The remaining sections describe on-going significant state and regional collaborations.

SBDC Partnership with IEDA Downtown Resource Center

America's SBDC Iowa is working closely with the Downtown Resource Center to help provide needed resources and services to Mainstreet Communities in Iowa. The goal is to help both the Main Street Communities expand their resources and services and to enhance the services received by existing businesses, along with providing a seamless service for the existing businesses to help them grow and thrive.

CIRAS New Partnerships

This past year CIRAS entered into new partnerships to effectively and efficiently deliver services to manufacturers across the state. CIRAS established regional partnerships with Northeast Iowa Community College (NICC) and the Quad Cities Manufacturing Innovation Hub, a program of the Quad Cities Chamber. CIRAS also established a statewide partnership with the Iowa Lean Consortium, giving the non-profit association the resources to continue growing and providing member-driven solutions.

Iowa State University and University of Northern Iowa Collaboration on Technology Transfer Services

Iowa State University and the University of Northern Iowa UNI) announced a partnership in technology transfer. The partnership allows UNI to access Iowa State resources for technology transfer. UNI has the option to manage the protection and commercialization of their innovations, or they can opt to have the ISU Research Foundation provide these services. Iowa State is not charging a fee for this service, but sharing in any income that is generated from the UNI innovations.

ISU Partnership with the City of Cedar Rapids

This past year the university formed a partnership with the City of Cedar Rapids and established a jointly funded Iowa State agricultural bio-based industries research and extension liaison position. The liaison has an office in Cedar Rapids, and works closely with the city's processing industries to identify opportunities for collaborating with Iowa State scientists, engineers, economic development, and extension specialists. The nature

and scope of future collaborations are still emerging, but will likely include: research and development on more environmentally friendly processing technologies; adding value to processing waste streams through coproducts and byproducts; development of innovative products — such as biorenewable fuels and biobased products — from agricultural raw materials; exploring new directions for food ingredients that boost health and wellness; and facilitating training opportunities to enhance the skills and capabilities of Cedar Rapids industry employees.

ISU Partnership with Cultivation Corridor

Iowa State University serves on the Board of Directors of the Cultivation Corridor, a regional economic development initiative to attract ag-bioscience firms to Iowa that was launched in April 2014. Other board members include Iowa Economic Development Authority, leading Iowa companies in the ag-bioscience industry, and Iowa commodity groups. ISU also serves on the Advisory Cabinet of the Executive Director of the Cultivation Corridor. ISU's Office of Economic Development and Industry Relations works closely with the Cultivation Corridor, providing university expertise and services to support the Corridor's efforts.

State-wide Committees, Councils, and Task Forces

Many people from ISU serve on committees that promote economic development programs, such as the Iowa Innovation Council, the Iowa Innovation Corporation, the Biosciences Alliance of Iowa, Iowa Meat Processors Association, Association of Business and Industry Advisory Council, Institute of Food Technologists-Iowa Section, the Iowa Lean Consortium, Professional Developers of Iowa, the Iowa Business Council, the Iowa Alliance for Wind Innovation and Novel Development (IAWIND), Innovate Iowa!, Technology Association of Iowa, Capital Crossroads, IA Sourcelink and the Cultivation Corridor.

Future Plans

Iowa State University greatly appreciates the resources and support that it receives from the Board of Regents and the legislature to carry out its economic development initiatives and activities. The primary purpose of this report is to show the huge economic and quality of life impacts we have been able to achieve for the state with the resources entrusted to us. The following sections identify how we plan to use additional resources to enhance the impact of university technology transfer and service on the creation of jobs and wealth in Iowa.

Small Business Development Centers. The SBDC helps its clients generate new taxes for the Iowa treasury in the form of income taxes on new jobs and sales taxes on increased sales. During the last full program year ending September 30, 2014, SBDC clients generated a total of $2,793,787 in new taxes, resulting in a return on investment of $2.04 for every Iowa tax dollar expended on the program. In addition, the SBDC helped clients avoid eliminating 447 jobs through layoffs or firm closings, resulting in a savings of unemployment compensation benefits of $1,932,056. Additional state support to SBDC would increase the state's return on investment and retain Iowa jobs.

With additional funds, the SBDC would increase its number of satellite locations and staff to better reach the rural areas that are currently being underserved. Small businesses are the ones that are directly affecting the economies of rural Iowa and positively impacting their communities. **Historic data reveal that the number of businesses started and jobs created is directly tied to the number of counseling hours we provide.** Thus, this would be our top priority if state funding for SBDC was increased.

The SBDC also wants to provide more training and do more to educate existing businesses in an effort to strengthen our small business foundation within Iowa. Under the current funding conditions, we are unable to offer the needed level of training.

It should be noted that SBDC is working diligently to collaborate and partner with other organizations, both public and private, throughout the state to ensure that we are not duplicating efforts and to leverage each other's resources and efforts.

Iowa State University Research Park. The Research Park is in the midst of a significant expansion, which will double the developable acreage, include commercial amenities such as a restaurant, fitness center, child care facility, parks, walking and biking paths and pave the way for the next generation of thought leaders/employees.

Within the next 12 months, a newly constructed research and development facility for Boehringer Ingelheim, the Vermeer Applied Technology hub, and the ISU Economic Development Core Facility will open. In addition several commercial projects are in development. **Any new funds to the ISU Research Park would be utilized to support costs associated with the expansion of the Park as well as to increase marketing efforts to attract new tenant companies.**

The Center for Industrial Research and Service. CIRAS has been supporting the growth of Iowa industry since 1963. CIRAS has successfully leveraged the state funding to bring in additional federal grants and fees to expand technical assistance, education programs, and economic development studies to assist Iowa businesses. **In FY15 CIRAS helped generate an additional $1 of external funds for each $1 of state funds provided**, yielding over $3 million of additional funding to support state economic development efforts. CIRAS leveraged the Technical Assistance funds to increase the federal funding and fees it receives through its existing Department of Defense and Department of Commerce grants.

For every $100,000 of additional funds that are made available, **CIRAS could leverage the funds** to bring in up to $100,000 from grants and fees and hire two new business professionals **to expand technical assistance and education services provided to Iowa businesses**. These two staff would help create nearly 170 jobs and $12 million in new sales, cost savings, and investment impact in Iowa companies.

ISU Extension and Outreach. Extension and Outreach works across ISU colleges and with external partners to provide technical assistance, research-based education, and access to the resources of ISU to improve the quality of life in the state. Iowans want an economy that can form new businesses, grow existing industry, enhance communities, and recruit companies to the state. With Iowa STEM jobs expected to grow by 16 percent this decade, Iowans see the need to stop the "brain drain" and take steps to develop the state's future workforce, connecting youth with opportunities here in Iowa.

With additional funding, ISU Extension and Outreach will expand economic development projects to broaden Iowans' entrepreneurial aspirations with education and technical assistance. Extension and Outreach also will address the distinct needs of minority populations, as well as a burgeoning local foods industry and many struggling rural downtowns. These are only a few of the basic needs and urgent trends facing this state.

ISU Extension and Outreach expects to leverage every $100,000 in new state funds with $150,000 in new federal matching funds, grants, fees, and gifts to generate a projected $2.5 million of impact and 25 new jobs throughout Iowa. **For every $100,000 of new funds, an estimated 2.5 additional staff will be hired to address growing demands and increase the depth and reach of work with families, businesses, and communities in all 99 counties across the state.**

Summary of ISU Economic Development and Innovation Data	
a. Number of disclosures of intellectual property	130
b. Number of patent applications filed	36
c. Number of patents awarded	31
d. Number of license and option agreements executed on institutional technologies: in total in Iowa	 108 61
e. Number of license and option agreements yielding income	157
f. Revenue to Iowa companies as a result of licensed technology (CY14)	$8 million
g. Number of startup companies formed (through licensing activities) in total in Iowa	 4 4
h. Number of companies in research parks and incubators private university related	 52 18
i. Number of new companies in research parks and incubators private university related	 9 2
j. Number of employees in companies in research parks and incubators Royalties and license fee income	 1,580 $3.0 million
k. Total sponsored funding received How much of this is for research	$424.9 million $225.7 million
l. Corporate sponsored funding received for research and economic development, in total in Iowa	 $39.6 million $16.5 million
m. Iowa special appropriations for economic development, in total SBDC CIRAS Technology Assistance Program (formerly IPRT-CA) ISU Research Park Regents Innovation Fund	$2.525 million $1.037M $1.366M $0.122M $1.050 million
n. Research expenditures (federal, state and local; business; nonprofit; institution funds; all other sources):	$256.0 million
o. Licenses and options executed per $10 million research expenditures (FY13 data from AUTM is most recent available)	3.3
p. Sales of licensed products by Iowa-based companies	$8.0 million
q. Number of employees for current Research Park tenants and incubators, as well as former tenants that are still in existence in basic form world-wide	4,594
Note: Unless noted, the data provided above are FY15 data.	

Appendix 1: CIRAS, SBDC and ISU Extension & Outreach company and community projects

Air Control in Clinton, Iowa, worked with CIRAS to improve the company's government sales. Air Control staff attended events sponsored by CIRAS that focused on matchmaking with government prime contractors. These events led to Air Control developing a relationship with John Deere and becoming one of Deere's vendors. CIRAS also provided one-on-one counseling and assisted Air Control with its Small Business Administration 8(a) certification, which provides the company with access to additional government opportunities. The assistance helped Air Control successfully compete for government contracts; more than $1.8 million in government contracts were reported in 2013-2015.

Grimes-based Ryko Solutions, a leading provider of car wash systems, turned to CIRAS for assistance with a new product development project. CIRAS provided expertise in plastic part design, plastic tooling design, and Additive Manufacturing technology. CIRAS also connected Ryko with two other Iowa companies to provide both plastic tooling and molding services. As a result of the project, the company expects to see $3.4 million in impacts and estimated they saved 3 – 6 months of development time. Ryko's Engineering Manager, David Simpson, said this "allowed us to. . . settle on a final design before making the investment in the injection mold tooling. Ryko has never done this before."

Misty Harbor, a pontoon boat manufacturer in Fort Dodge, reported a $2 million increase in sales after working with CIRAS on a long-term transformational project. In addition to the increased sales, the company made significant information technology investments and increased employee pay. CIRAS used a variety of productivity and leadership tools to help the company identify and eliminate root causes of several key issues throughout the business.

Blue-9, a manufacturer of dog training equipment, attended the EDA Innovation Summit to get assistance from CIRAS in trying to grow its business. Through work with CIRAS and a third party, Blue-9 commercialized a new product and has generated national annual sales of close to $200,000 within two years of commercialization. Additionally, Blue-9 is actively pursuing new customers overseas as well providing products for K-9 governmental applications.

Groschopp Inc. in Sioux Center turned to the CIRAS materials experts to assist in addressing a quality and reliability issue with one of the particular gearboxes they produce. The team conducted metallurgical analysis and worked with other ISU labs to provide recommendations for a better material to use in the application and to identify issues with the current heat treat process. Groschopp's Design Engineer, Scott Lundquist noted: "We're primarily using the results to find better material or better heat treat process or a combination of both." The company estimated savings of over

$850,000 annually due to the support. Groschopp's Commercial Engineering Manager, Paul Ross stated: "CIRAS was a big help."

Ankeny based Accumold Corp., a world leader of micro-molding, looked to the CIRAS non-destructive evaluation experts for techniques to verify the location of three very small components within a small plastic part. The team used x-ray technology to see inside the part to verify the component locations and communicate the abilities and limitations of the technology within the application. Accumold's VP of Communications stated the tests had: "a significant impact on our ability to get more business."

Seabee Corp. in Hampton, a leading producer of hydraulic cylinders needed assistance in analyzing functional characteristics of cylinders. The company used the CIRAS research cost-sharing program to determine the accuracy of various calculations and projections on the functional characteristics of cylinders and look for ways to optimize the operating parameters. ISU's Department of Agriculture and Biosystems Engineering (ABE) developed a complex computer model to complete the analysis. The project will benefit Seabee in future product development and evaluate enhancements to the current products.

CIRAS NEWS has published the first four segments of **"Special Report: Working on Workforce,"** providing Iowa businesses with data-driven information and real-world examples of creative ways Iowa companies are addressing the skills shortage. Articles have focused on reaching out to schools, attracting the best employees, attracting women to manufacturing, and developing talent internally.

CIRAS, Meat Science Extension (College of Ag and Life Sciences (CALS), Extension and Outreach), and the Center for Crops Utilization Research (CALS) have partnered to help **Iowa food manufacturers** improve their businesses, deliver safe foods, and deploy the latest technology. Over the past five years, this partnership has served more than 40 percent of food manufacturers in Iowa, resulting in over 1,800 jobs added or retained and creating an economic impact of more than $300 million.

Barilla America, Cummins Great Plains, The Principal Financial Group, and West Liberty Foods joined with CIRAS to create the Iowa **Sustainable Business Forum** (ISBF), a new nonprofit organization that is dedicated to providing Iowa businesses with a way to share solutions to their most complex sustainability issues. Four additional businesses have joined the forum and several more are expected to join.

Adel-based Iowa Spring, a producer of heavy-duty springs, came to CIRAS for support in evaluating whether an investment in a new process could provide products that meet the expectations of the market. Iowa Spring's VP of Operations, Brian Setchell, stated CIRAS: "…helped provide structure to the decision-making process…we heard perspectives that I doubt, in our normal process, would have come out." Iowa Spring made a $1.2 million

investment in equipment and reduced manufacturing cost by more than 30%.

CIRAS' long-term relationship with **Harvest Innovations**, an Indianola-based **manufacturer of natural food ingredients**, led to a project with CIRAS partner Center for Crops Utilization and Research (CCUR) to scale a proprietary extraction process. The variety of projects with CIRAS and CCUR resulted in new products, local sourcing, and increased sales.

Great Plains Survey, a professional engineering and consulting firm, leveraged CIRAS in a variety of ways in order to expand its business. CIRAS assisted with bid preparations, small business size standards, bid match services, developing a capability statement, SAM registration, and small business preference programs in Iowa and Illinois – including those specifically available to **women-owned businesses**. Great Plains Survey's owner credits CIRAS with helping to make her dream a reality and has been awarded more than $500,000 in government contracts from 2013 - 2014.

North Iowa Vocational Center (NIVC) based in Mason City, a nonprofit training center for the disabled, looked to CIRAS to explore options to expand their wood working capabilities into new markets. CIRAS used its Innovation Cycle to identify a market and a need. NIVC started production of **low cost hardwood urns for military veterans**. The project helped NIVC stay financially feasible, expand opportunities for the disabled, and offer families of veterans a dignified alternative for remains.

Sister's Home Style Entrées, winner of the Neal Smith Entrepreneur of the Year Award and Small Business of the Year Award, has worked with the SBDC since 2011. What started as a hobby business providing a few meals a month, has turned into a full-time business with manufacturing facility. The company has grown from two employees to over thirty employees and provides more than 30,000 meals per month to people all over the state of Iowa. The SBDC also brought in CIRAS to help Sister's Home Style Entrées make sure their manufacturing facility would be successful and cost effective.

SBDC Helps Veteran Grow Business to Help Other Veterans: Military Cost Cutters was started by military veteran Aaron Serrano. The SBDC helped him develop his idea and launch his company. Military Cost Cutters is dedicated to helping military members and veterans access the numerous discounts that are available to them nationwide. He has developed a mobile ID to help veterans provide the identification they need to take advantage of the offers available to them. He currently has nearly 300 veterans signed up in Eastern Iowa and is planning to expand the program to California, Texas and North Carolina in the next three to five years.

Alliant Energy awarded CED a $75,000 grant to conduct the **Latino Energy Efficiency Progra**m in Storm Lake. CED specialists conducted workshops for approximately 75 Latino participants in the following groups: landlords, contractors, residents, and small business owners. CED developed presentations and advertising materials in Spanish, and the workshops were conducted all in Spanish. As a result, eight Latino businesses and 50 residents signed up for energy audits.

CED and Human Sciences Extension and Outreach began a three-year project -- **Integrated Latino youth, family, community and business development** -- focused on Latino populations in Sioux City, Perry, and West Liberty. CED hired Latino community development specialists for Sioux City and West Liberty. The Sioux City position is shared with the University of Nebraska, and the West Liberty position is shared with the West Liberty Chamber of Commerce.

CED has managed the **ISU Road Scholar Program** since 2007, teaching local businesses to **capitalize on tourism in Iowa**. In 2014–15, CED conducted two Upper Mississippi River tours for 95 people from states throughout the country. It also conducted tourism training for businesses and communities throughout the state, training 6,176 citizens, 279 community leaders, and 194 business leaders/entrepreneurs. As a result, 80 businesses were expanded or improved, three businesses were started by minorities, and 35 jobs were retained.

A series of nine **customer service/hospitality trainings** were conducted between April 1 and June 30, 2015, as part of funding received from the Central Iowa Tourism Region through a grant from Travel Iowa. The two-hour sessions focused on the economic development value of tourism in Iowa, customer service skills needed by front-line workers, tips on creating Ambassador programs and Familiarization tours, what travelers are looking for when touring a community, and assessment tools employers can use to determine their employees' customer service skill set. Sessions and their attendance were: Iowa Falls (41), Ames (117), Centerville (52), Marshalltown (25), Pella (84), Newton (44), Ottumwa (80), Bloomfield/Davis County (22), and Clear Lake (50). Outcomes after the session include the community of Ames submitting a grant to create an Ambassadors program and to start Familiarization tours to help front-line hotel, restaurant, convenience store, and gas station workers familiarize themselves with Ames attractions.

The growing demand for **local and regional food** offers an unprecedented market opportunity for small and mid-sized farms and holds great promise for increasing access to healthy and affordable food for rural areas. Public schools can be a significant market for local food producers, however that market presents a number of challenges. New federal nutrition regulations for student meals spurred a project to help schools use more Iowa-grown products. Working with the Northeast Iowa Food and Fitness Initiative and four school districts, ISU Extension and Outreach used a grant to create a 5-week menu cycle that meets the new nutrition requirements. While a wide variety of foods can be produced in Iowa, the menu specifically focused on those that were affordable to schools and available in larger quantities. The goal for this project was to double purchases of local foods by schools – increasing use from $8,900 to $18,000 in two years. By the end of the project, purchases by four school districts increased 158% from the baseline year. The school market continues to grow, thanks to the development of a new local food hub to assist with distribution. In the 2014-15 school year, schools using the Northeast Iowa Farm to School cycle menu purchased $52,400 of food from local farms.

Appendix 2: Training and Related Educational Activities

Center for Industrial Research and Service (CIRAS)

CIRAS held the fourth annual **Corridor Procurement Conference** in Cedar Rapids, educating companies on the key elements of capturing business sales with government agencies or partnering with prime contractors. The event provided opportunities for more than 60 companies to network with government and prime contractor buyers, including contracting personnel from the City of Cedar Rapids, Iowa Department of Administrative Services, the Rock Island Arsenal, Rockwell Collins, and Alliant Energy.

CIRAS held its first annual **Iowa Vendor Conference** in West Des Moines with a goal of helping Iowa business leaders gain a better understanding of how to do business in the government sector. More than 90 companies were able to expand their government contracting potential through attending diverse workshops, participating in a best practices panel discussion and networking with a variety of resource partners and buyers, such as the National Parks Service, Offutt Air Force Base, Iowa National Guard, and Neumann Bros.

CIRAS hosted an **Innovation Summit** with more than 80 attendees to help spark progress in Iowa's machinery sector. Machinery, one of the largest manufacturing sectors in Iowa, is a key driver in Iowa's economy, but economic data shows we may be losing ground to the rest of the country in both efficiency and innovation. Experts provided updates on technologies, including additive manufacturing, automation, virtual reality, and "big data," followed by discussions and long-term coaching on finding opportunities to implement these innovative practices in each company's business.

CIRAS partnered with the U.S. Commercial Service, with support from the Iowa Economic Development Authority, Iowa Small Business Development Centers (SBDC), FedEx, and Iowa Farm Bureau, to launch **ExporTech in Iowa**. This program is a structured strategy development process designed to connect small manufacturers with experts to help them navigate the export sales process and develop plans to grow their businesses internationally. During this first year, AG Belt Inc. (Des Moines), M's Machine and Manufacturing Inc. (Monona), Puck Custom Enterprises (Manning), and Warren Distribution (Council Bluffs) developed and are currently executing new strategies to grow export sales.

CIRAS partnered with the Iowa Association of Business and Industry (ABI), the SBDC and several private service providers to launch a series of **Succession Planning Workshops** across Iowa. The first session, held in Cedar Rapids, attracted 31 people, including leaders from 12 manufacturing companies. These events are focused on providing actionable education to reduce the impact of unplanned ownership transition.

CIRAS held Introduction to **Industrial Automation** trainings to provide educational material on automation levels and key considerations for successful automation implementation. Events were held in Dubuque,

Allamakee, Hancock, Kossuth, and Scott counties and reached more than 80 attendees.

CED in ISU Extension and Outreach

The **Communities to Community program** offers a two-year schedule of bundled design, educational, business, and leadership development services available through CED and the College of Design. C2C involves a multi-faceted approach that includes faculty, staff, and students from the College of Design and CED. The C2C program has generated $106,488 for the CED unit through partnerships with Ottumwa, Maquoketa, and Waukon. Results from these partnerships include a housing needs assessment for Ottumwa and comprehensive plans for Maquoketa and Waukon.

CED conducted the **Flooding in Iowa Project** in collaboration with the Iowa DNR. This project involved creating a website and a series of web-based videos designed to educate local officials, business leaders, and the general public about floodplains, flood risks, and basic floodplain management principles. The website (http://www.extension.iastate.edu/floodinginiowa) hosts the videos and has links to several resources where the public can obtain more information about flooding. The videos are divided into five categories: Introduction to the NFIP, Understanding Flooding, Floodplain Mapping, Floodplain Regulation, and Flood Insurance.

Community development specialists are developing a curriculum designed to help community foundations and their partners—roughly 10 percent of the state's economy—work seamlessly to build their **leadership and local capacity for addressing disaster preparedness, response, and recovery** by addressing issues related not only to disaster management but also to inter-organizational and community leadership as well. The curriculum will be tailored to specific needs within particular areas and community foundations and will be developed on a creative platform based on community leadership development and engagement skills, disaster management skills, and techniques of adult education.

Agriculture and Natural Resources Extension and Outreach (ANR**)**

The latest Census of Ag states that there are 32,907 female farm operators in Iowa, accounting for 25 percent of all the farm operators in the state. Of these female operators, 7,108 were identified as the primary operator of the farm; another 23,235 were identified as the secondary operator. To support these operators, ISU Extension and Outreach offers training in five key areas of agricultural risk: financial, human resources, legal, marketing, and production farm management through **Annie's Project**. This program continues to be strong and **focuses on helping Iowa farm women** make good management decisions. In FY2015, 217 women participated in one of these farm management courses for women. A recent survey of Annie's participants summarizes the impacts Annie's Project has had. Participants reported that they developed a network of peers and made connections with professional service providers, increased confidence in decision-making across all aspects of farming, and had become better farm managers and

business partners. More than half of the participants reported contacting professionals regarding financial or legal issues and more than a third had contacted other Annie's Project participants or professionals to learn more.

Farmers, financial lenders, farm managers, and agriculture educators understand that having current, unbiased agricultural economics and business information is important to making sound farm management decisions. Knowing where to go in a rapidly changing agricultural environment to access up-to-date information that includes new and emerging issues is critical to their success. The **Ag Decision Maker** website, www.extension.iastate.edu/agdm, is such a resource. Many ISU Extension and Outreach farm management programs are supported by this web-based resource. In 2014, the website averaged 8,700 visitors per day, an increase of 2,000 from the previous year. An average of 10,300 visits per day were recorded in February and March 2015; this can be attributed to the high use of educational materials pertaining to the 2014 Farm Bill and the success of the related presentations by farm management field specialists across the state. Overall downloads of information sheets and decision tools reached 727,000. More than 100 information files, decision tools, voiced media, and teaching activity files were added to the site. More than 15,000 users receive monthly updates highlighting the materials on the Ag Decision Maker site. Farm leasing materials were provided to the 2,300 participants at farmland leasing meetings in July and August.

Swine producers face challenges of managing the ventilation system within production facilities. Ventilation impacts energy costs, pig health and productivity, animal welfare, and worker health and safety. Most producers, while knowing swine production well, have limited background in ventilation management. To help producers better understand and adopt proper management for their operations, a **ventilation demonstration unit was developed through the support of the Iowa Pork Industry Center and the Iowa Pork Producers Association**. The unit provides hands-on training on ventilation system management using modern equipment, but allows training to be conducted on a neutral site to avoid biosecurity issues. The workshops allowed participants to learn not only from the specialists, but also from putting the newly acquired information into practice. Two levels of instruction were offered, a "101" workshop with basic information and a "201" workshop with more advanced programming. In FY15, 168 people participated in 101-level instruction through 10 day-long workshops. Those completing the post-workshop survey had influence on more than 18.8 million market hogs annually. Thirty-three people participate in the 201-level workshops offered in four locations; the post-workshop survey indicated they influence the production of more than 4.7 million market pigs annually. Participants at the workshops influenced nearly two-thirds of Iowa's swine industry. All participants were asked what they felt the annual value of the workshops were to their operations. For the 101-level workshops, the average response was $3,000 or a total impact of $504,000 for all participants. For the 201-level workshops, the average response was $6,000 or a total impact of $210,000, for a combined total program impact of $714,000.

Death loss and downer pigs during transport are issues costing the swine industry millions of dollars annually. In addition, training for food safety could help reduce economically expensive meat recalls. Teaching proper

heating and cooling and other welfare topics, such as management of medication, could lead to increased swine herd health and improved economic performance. Annually, more than 200 producers have completed a workshop on **pork quality assurance** (PQA Plus) or **transport quality assurance** (TQA) taught by ISU Extension and Outreach. Changes in behavior were documented by third-party audit. Recorded changes in animal welfare, handling, and food quality were shown by follow-up farm assessment. For example, producers learned about timely euthanasia; follow-up shows implementation of that learning at 94.87%. Good heating/cooling and air quality were documented on more than 97% of farms. Many other practices such as emergency planning, euthanasia planning, residue avoidance, medical records, and facility upkeep were implemented to improve welfare and increase food safety. Additionally, as a result of the education, the percentage of farms making improvements is increasing. Third party audits of 90 farms showed year-over-year decreases in minor and major non-conformities, dropping from 80 to 63 and from 25 to 9, respectively. A yearly decrease in percentages of dead and downer pigs of 21,600 hogs valued at $4.3 million industry-wide at packer plants can be linked to the handling education provided at these workshops.

Iowa agriculture has maintained its unparalleled productivity over time by adapting. Challenges that have arisen in the past few years, especially those associated with increased weather variability, pose threats to long-term maintenance of agricultural productivity. In addition, there has been increasing attention on agriculture's impacts on water quality. The Iowa Farm and Rural Life Poll (IFRLP), an annual survey of Iowa farmers, generates information that helps the agricultural community to better understand farmers' knowledge, perspectives, and experiences so that specialists can do a better job of helping farmers adapt to changes and address issues. The 2014 IFRLP collected data on critical issues such as adaptation to increased weather variability, pesticide resistance management, and perspectives on Iowa's Nutrient Reduction Strategy. The three published reports from the 2014 Farm Poll have helped ISU research and extension faculty and field staff, state and federal agency staff, and private sector agricultural advisers to better help their clientele adapt to agricultural challenges. For example, the data on pesticide resistance contributed to the planning and implementation of the ISU-led pesticide management stakeholder meeting called **"Resistance Management: Whose Problem and Whose Job?"** (http://www.ipm.iastate.edu/content/pesticide-resistance-workshop-2015). The workshop was the first step toward developing a statewide, stakeholder-led plan to address the growing problem of pesticide resistance in Iowa. The 2014 Farm Poll data have been disseminated widely, with numerous articles citing the data published in the agricultural press (e.g., Farm Bureau Spokesman, Wallaces Farmer) and the mainstream press, including the Des Moines Register, and presentations given to stakeholder groups and academic audiences across the state and country.

Fluctuating energy prices have increased the need for up-to-date information about energy efficiency for farm enterprises. With funding support from the Iowa Energy Center beginning in 2010, ISU Extension and

Outreach launched **"ISU Farm Energy"** to conduct field research and provide outreach regarding agricultural energy efficiency. For example, case study data from 2014-15 field trials show 15-30% tractor fuel savings by selecting the proper gear and throttle settings for tillage operations. These and other research data are available publicly in a series of 28 case studies and fact sheets that address farm energy efficiency for electricity, propane, and diesel. During the past year, nearly 30,000 copies of these ISU Farm Energy publications were downloaded digitally by farmers, educators, and utility service providers. Statewide, the economic impact of a 1% reduction in fuel use for production agriculture is equivalent to $5 million in savings.

Even with the national beef cowherd starting to rebuild from its lowest mark since 1962 and indications of recent record high profits, cow-calf producers looking to expand their operation may feel financially strained due to the record prices. To help producers learn more, Iowa Beef Center and Iowa Cattlemen's Association hosted **"Heifer Development: Retaining Your Investment"** at 12 locations around the state in January and February 2014. Attended by 308 people, the sessions were a follow up to the Heifer Development Clinics held across Iowa in 2012. A follow-up survey showed that attendees managed an excess of 30,000 cows annually, and planned to develop almost 8,200 heifers in 2014. Approximately 6,400 of those replacement females are calved out on these operations. Ninety percent of the survey respondents implemented or plan to implement a new best management practice as a result of the 2014 program. On average, respondents improved pregnancy rates of their first-calf heifers by 3% and the program reduced culling rates of first and second calf heifers by 3.5%. These figures indicate that the 2014 program resulted in retention of an additional 223 first- and second-calf females per year. Based on the current Net Present Value decision tool developed for this program, producers realized an economic benefit of $303,726 from reductions in cull females. On average, respondents reported increased profitability by $1,640 per year, resulting in a total economic impact of $475,600 per year. When combined, the 2012 and 2014 heifer development programs have had an economic impact of $1.04 million per year for the 900 attendees of the live series. Furthermore, through a sustainable virtual format, this program has educated an additional 4,400 people through videos posted on YouTube, as well as helped drive economically sound decisions for an additional 3,450 producers through Ag Decision Maker downloads of heifer development decision tools and accompanying fact sheets.

Installing adequate **field drainage** is important to producers by reducing cropland nutrient losses and reducing impact on water quality. ISU Extension and Outreach field and campus specialists have developed a training program on drainage design to help producers address these issues. Annually, since 2007, this three-day drainage school trains 40 contractors and farmers on economic drainage design that can benefit the environment and crop production. This drainage school has attracted attendance from at least nine states throughout the Midwest, along with attendees from Canada. The drainage schools use a hands-on approach to allow participants to learn not only from the specialists, but also from each other. Nearly all participants have indicated the program will help them increase revenues for their operation. Multiple participants in 2014

indicated the drainage school would help them increase revenues by at least $10,000 each.

More than 35% of Iowa's dairy producers are milking in stall barns or antiquated milking parlors that are achieving only 25 cows milked per person per hour. From an initiative that started in 2013, the ISU Extension and Outreach **Dairy Team** continued to help producers implement practices to increase efficiency. As of 2014, there are 48 automatic milking farms using 109 automatic milking units, up from eight milking farms in 2012. This translates into significant labor savings, enhanced milk quality, better animal health and reproduction, as well as increased quality of life, which is valued at an average of $22,500 per farm. In addition to assuring continued success, producers who had made the change to automatic milking systems also benefitted from

- labor efficiency savings of $44,300 (two robots) with management labor increasing only by $218,
- reduced milking labor costs from $1.93/cwt milk to $0.27/cwt milk,
- an increased number of cows milked and increased milk production by 12% per farm, and
- increased pregnancy rate of 6%, resulting in an increased profit of $150 per cow.

Every year Iowa farmers deal with approximately 50 million tons of **manure fertilizer** valued at more than $650 million. Capturing this value requires getting the manure to the right fields, at the right time, and in the right manner to make sure those nutrients will be available for crops. Research at Iowa State University has shown that collecting manure samples and using this information to modify the fertility program to the manure's specific characteristics is worth about $12 per acre. Participant survey data showed that Iowa State specialists were able to convince 20% of these farmers that more frequent sampling would be beneficial to their operation. Increased sampling would impact approximately 750,000 acres in Iowa and the improved nutrient management would provide an additional $9 million of improved manure value.

Iowa State University Extension and Outreach annually trains representatives from about 600 businesses and 2,000 employees who come from more than 90 counties in Iowa and from the six surrounding states in the **commercial applicator program**. These businesses annually handle and apply about 1.5 million tons of solid manure and 3 billion gallons of liquid/slurry manure that has a fertilizer value of about $250 million, while doing about $70 million of business. More than 75% of the trained employees reported that the information provided was useful to their company. Many of those surveyed reported that it helped them make better equipment purchase decisions and provide better manure application recommendations to their clients.

Three multi-state beef conferences are held in partnership with Illinois, Minnesota, Missouri, Nebraska, and Wisconsin. More than 790 producers attended the three conferences. End of meeting surveys of participants showed that 70-80% said they planned to make changes to their operation based on information learned at the conference. Follow-up evaluations of

2013 participants showed that 46% modified heifer development to improve growth, conception, and longevity; 47% modified cow winter feeding to utilize alternative feedstuffs; and 50% changed cow feeding to reduce feed waste. Participants estimated these changes will increase by an average of $25 per head. Participants in these three conferences managed more than 107,000 cattle and more than 65,000 acres of pasture, resulting in a direct economic impact of these programs of $2,675,000.

Roughly 13 million acres of Iowa's land is cash rented each year for crop production, pasture, and other purposes. ISU Extension and Outreach offers a variety of **tools to assist landlords and tenants in determining fair land rental rates**. In 2014, ISU Extension and Outreach farm management specialists conducted 66 leasing meetings across the state, meeting with more than 2,400 land owners and operators. A post-meeting survey found that 24% of respondents indicated that they would decrease land rental rates for the following year based on the information provided at the leasing meetings. Iowa State's annual cash rent survey for 2015 found that typical cash rental rates declined by $14 per acre, confirming the leasing meeting survey result. Thus, the $14 per acre drop in typical land rental rates would result in a $182 million decline in farm expenses to tenants.

The Agricultural Act of 2014 (2014 Farm Bill) is a five-year reform of federal agricultural policy and contains programs that manage farm income support and risk management, nutrition and food assistance, conservation, trade assistance, and rural development. The legislation required producers to consider the new options and make long-term decisions for their operations. To help Iowa's farmers understand and make educated choices, ISU Extension and Outreach farm management team held more than **230 farm bill meetings** in a six-month period, educating more than 15,000 people. Based on current projections of program payments, Iowa farmers will receive more than $100 million based on their choice of farm bill programs for the 2014 crop year alone. The impact of the educational program will continue to be felt, as farmers make decisions for multiple years.

In 2014, nearly 10,000 applicators were recertified through the **Pesticide Education Safety Program**. When considering PSEP programs that were attended by more than 200 participants, PSEP directly contributed to 9,983 Iowa pesticide applicator jobs with a total salary base of $355 million, based on wage information from Iowa Workforce Development.

Meat Science Extension provides companies from the United States and around the world with cutting edge education on meat processing and food safety technologies. Meat Science Extension offers workshops for small processors, but also develops and delivers training programs for some of the nation's largest processors. In FY15, 1,150 people from the United States and 136 from other countries participated in **Meat Science Extension** short courses, regulation updates, HACCP and food safety workshops, and multi-level training sessions. This education resulted in an economic impact in Iowa of approximately $56.4 million in retained or increased sales, $1.8 million in cost savings, $4.5 million in increased investment, and 25 jobs created or retained.

The **Midwest Grape and Wine Industry Institute** in the last fiscal year provided six workshops to 87 participants representing 54 organizations. Participants included wine industry members, people considering starting a business, and a few enthusiasts. Of these participants, 99.9% responded that they are planning to do something different as a result of what they learned, and would recommend the workshop to someone else. Currently (July 2015) Iowa has 97 native wineries producing approximately 304,146 gallons of wine per year, and 300 commercial vineyards covering 1,250 acres of grapes. The grape and wine industry in Iowa continues to grow. According to a 2012 study by Frank, Rimerman + CO. LLP, the economic impact of the Iowa wine and grape industry on the state's economy is $420 million.

To help Iowa's farmers stay up-to-date on new research, treatments and technologies, Iowa State University Extension and Outreach hosted 13 **Crop Advantage Conferences** across the state. Some 2,237 farmers and agribusiness professionals attended the meetings. More than 80% of farmers who attended CAS modified their herbicide management program to reduce the risk of herbicide resistant weeds on their farm, making their operations more economically productive by reducing their loss of income. A post-harvest survey indicated that at least 97,822 acres have improved herbicide management practices in place. Attendees also received recent research about soil fertility and recommendations for lime, phosphorus, and potassium. Post-conference survey results indicated that farmers are more knowledgeable about soil fertility management, which increases their crop production profitability while reducing water quality risk from phosphorus run-off from their farming operations.

Working together, ISU Extension and Outreach Value Added Agriculture Program and the ISU Department of Natural Resource and Ecology Management, conducted workshops and provided direct technical assistance to potential **fish producers**. Information presented helped producers understand the risks, requirements, and resources needed to successfully approach such a venture. From the training provided to 185 attendees, 45 growers are actively negotiating contracts with companies.

4-H Youth Development

The Iowa Governor's STEM Advisory Council has identified STEM-abled workers (skilled in science, technology, engineering, and math) as a critical component of the growth of Iowa's economy. The Council has stated that STEM workers drive our nation's innovation and competitiveness and are central to our economic vitality. In the past 10 years, growth in STEM jobs was three times as fast as growth in non-STEM jobs. A critical talent gap exists in the current workforce and student education related to STEM literacy, decision-making, and practices. The STEM literacy gap also is connected to the shifting demographics in the state and includes children of color, children living in poverty, children with disabilities, and children who are English-language learners. For example, Iowa data indicate that 48.1% of black fourth graders and 66.1% of Latino children test at a proficient level as compared to white youth, who trend near 80% since 2002.

Working with the Iowa State University faculty, University of Iowa faculty and staff, and a cadre of K-12 teachers, Iowa State University Extension and Outreach conducted training that emphasized the incorporation of STEM practices into classrooms and K-12 outreach efforts. A pilot group of eight ISU faculty and staff participated in a workshop that provided experiences in argument-based inquiry and best pedagogical practices to support teachers and students in their outreach efforts. These same practices were used for training teachers and 4-H staff in STEM practices and content in a series of workshops. The pilot teachers and 4-H staff are targeting youth who are identified as being in the achievement gap.

Through the STEM outreach efforts, 33 educators were engaged in improving STEM pedagogy that is based in current learning theory and aligned with standards. These educators include 4-H staff, K-12 teachers, administrators, and ISU faculty and staff. The content component of the program included a carbon-based economy curriculum that uses agriculture production as the framework with which to approach STEM content and concepts in Iowa. The curriculum is being piloted and evaluated, and from the group of more than 500 students, 85% indicated an increase in knowledge about the carbon economy and 75% indicated an increased interest in STEM careers. In their evaluations, the educators indicated a shift in understanding about teaching and learning, and that alignment increased with standards and best practices. These efforts will be measured by data that are being shared by the Iowa Department of Education for tracking of impact on the achievement gap.

Educating Iowa's 4-H youth in the area of Animal Science STEM programming is a key priority for ISU Extension and Outreach. Of the more than 23,000 Iowa youth enrolled in the 4-H club delivery mode, more than 16,000 are enrolled in a livestock project area. With such a large portion of Iowa 4-H youth involved in animal agriculture, it is critical for them to have the necessary skills in science, technology, engineering, and math. By partnering with internal and external resources, several initiatives both statewide and nationally have been developed to increase knowledge and behavioral change in youth involved in animal science fields. Face-to-face and online resources allow youth to learn in the changing environments of today. A variety of project opportunities include the Iowa State Fair with more than 1,900 livestock show participants, an annual 4-H Animal Science conference targeted to 100 youth applicants, as well as the more than 10,000 youth required to be certified in food safety and quality assurance training. This training has resulted in more than 85% of the youth indicating their increase in both ag production knowledge and applying that knowledge to management and animal care changes in their own operations.

Human Sciences Extension and Outreach

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 that exceeds the size of the original refund. This money bolsters family financial well-being, strengthens neighborhoods, assists small

businesses, and spurs local economic development. During the 2015 tax season, ISU Extension and Outreach worked with community partners to recruit and train 34 volunteers to provide free tax preparation services to low- and moderate-income families through the Volunteer Income Tax Assistance (VITA) program. In 2015, VITA volunteers working at 16 VITA sites helped 1,352 low- and moderate-income Iowans complete their 2014 income tax returns. Special efforts are made to increase awareness of the EITC and VITA programs in rural Iowa. As a result, 546 filers qualified for the EITC and received $745,942 in the 16 counties that participated in the ISU Extension and Outreach/community partnerships to expand VITA programs in rural Iowa.

Iowa ranks second in the nation for the percentage of young children with employed parents (American Community Survey, 2012). In Iowa, 42% of children under age 5 and 27% of children between the ages of 4-15 are in some form of paid child care. Throughout Iowa, there are 13,260 child care programs with revenue of $447.6 million. The Iowa early care and education industry employs 22,716 individuals and supports an additional 5,100 jobs in related industry sectors (CED, 2015). Iowa families and employers depend on early care and education: for more stability for today's employees and to lay the foundation for tomorrow's workforce. Iowa business leaders recognize that investments in high quality care and education lead to improved outcomes for Iowa's children, resulting in less need for special education, higher graduation rates, and increased college attendance – all leading to higher earnings and greater productivity.

By 2020 the number of child care professionals is expected to increase nationally by 20% (Bureau of Labor Statistics, 2012). Human Sciences Extension and Outreach offers educational opportunities to strengthen the early childhood education workforce. Training programs include on-site and online learning experiences for new, emerging, and skilled professionals. The aim is to increase understanding and practice of research-based best practices to improve quality care and education for young children. Human Sciences Extension and Outreach programs taught 5,427 early care and education professionals new skills to promote early learning, literacy, science, math, and nutrition education. Of the more than 2,706 participants completing course assignments and responding to surveys, 93 percent demonstrated new knowledge, skills, or program improvements. Additionally, 787 new early childhood teachers and 117 program administrators participated in a 30-lesson program preparing new teachers for the early childhood classroom. Evaluations show that teachers significantly increased understanding in parent communication, child development, early learning, managing children's behavior, nutrition, and health and safety practices.

Youth who do not complete high school present a significant cost to the state of Iowa (Veale, 2007). They will cost the state $87 million in reduced state tax revenues over their lifetime, and more than $1.8 million per year in additional welfare costs, and will face higher unemployment and have increased health issues. They also are 10 times more likely to be

incarcerated. Research shows that Latino youth are at greatest risk for dropping out of school between the ninth and tenth grades. Parent involvement and academic support are important for youth to succeed in school.

Working with local school districts and community organizations, Human Sciences Extension and Outreach has brought together 49 community volunteers and 152 Latino youth and their families to assist the youth in graduating from high school, and pursuing higher education through the educational program “Juntos Para Una Mejor Educación (Together for a Better Education).” Juntos helps parents learn how they can help their children be successful in school, as well as helps parents and youth realize the long-term benefits of graduating from high school and participating in higher education.

Based on data from individuals who completed evaluation surveys, after participating in Juntos, 63 parents significantly increased their confidence in working with their child’s school and monitoring their child’s homework. They also increased their knowledge about courses their child needs to take to be prepared for college, and about college admission and application procedures. Additionally, some parents increased their knowledge about how to save for and finance their child’s college education. Sixty-three parents and 62 youth significantly increased communication about their youth’s aspirations after high school. Furthermore, some parents who participated in the program have completed their own high school education and have started to explore opportunities to pursue higher education for themselves at local community colleges.

Human Sciences Extension and Outreach nutrition and health specialists are registered instructors for the National Restaurant Association Educational Foundation’s internationally recognized food safety certification program. Human Sciences Extension and Outreach specialists have taught the ServSafe® food safety certification program for more than 20 years. ServSafe® is one of the approved programs. Participants are from commercial retail foodservices such as restaurants and institutional operations such as hospital and schools. Close to 3,000 Iowans participated in a ServSafe® food safety course taught by ISU Extension and Outreach, with about 80% successfully earning certification. In recent years, the class has been taught in Spanish in efforts to reach new Iowans; this outreach effort continues in partnership with the Iowa Restaurant Association.

Commercial operations recognize the value of training staff in safe food handling procedures, as an incidence of a foodborne illness can be devastating for business. In addition, promotion that staff members are certified in food safety can be a marketing advantage, as many operations post these certificates. Proper preparation, holding, and service of food are critical in any place where food is served. Many ServSafe® participants work in operations that serve those considered at greater risk of contracting a foodborne illness due to compromised immune systems; food safety training can avoid costly medical expenses. In addition, Iowa has adopted a

newer version of the Food and Drug Administration Food Code, which requires at least one supervisory employee in licensed foodservices be certified in food safety through an approved program.

Appendix 3: YEAR END FULL REPORT: JULY 2015, IOWA STATE UNIVERSITY RIF PROGRAM

EXECUTIVE SUMMARY

GIVF/RIF 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, the Iowa companies are surveyed for impact by the Center for Industrial Research and Service (CIRAS). These funds are a **critical source of gap funding**. They represent a unique resource that can be applied toward the success of Iowa companies. A summary of the projects funded to date is below, followed by the list of active projects. Since its inception, 119 projects have been funded through the Commercialization Program. One hundred three of these projects are complete and many show excellent progress in improving the competitiveness and profitability of the Iowa companies involved. Forty startup companies have been assisted; including **21 new companies that were started in the first nine years as a direct result of the GIVF/RIF funding; one of these companies was acquired in the past year, based in part of the success of the projects funded through RIF**. In total, more than 72 Iowa companies have participated in the program.

Surveys are conducted by CIRAS one year after project completion (true impact takes a minimum of 5-10 years).

Survey Results for FY06-07 through FY14-15 Projects

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
FY10-FY11	FY12	6**	6	$1,750,000	$1,730,000	$580,000
FY11-FY12	FY13	12**	13	$2,470,000	$2,571,000	$420,083
FY12-FY13	FY14	6**	21	$750,000	$1,315,000	$344,167
FY13-FY14	FY15	2	3	N/A	$1,167,000	$583,500
FY14-FY15	FY16	Ongoing				

* 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).

Project Outcomes for FY07-08through FY16

Year Project Completed	Number of Projects	Number of Publications & Presentations	Number of Invention Disclosures	Number of External Funding Applications	Number of Applications Awarded	External Funding Received*
FY16+	9	2	1	0	0	n/a
FY15	14	10	2	3†	2	$ 384,999
FY14	7	19	1	16	4	$ 370,000
FY13	4	6	2	12	5	$ 795,000
FY12	11	50	4	12	6	$ 6,364,000
FY11	11	46	3	20	6	$ 940,000
FY10	14	99	6	47	13	$ 2,720,000
FY09	15	53	4	48	20	$ 3,500,000
FY07-08**	n/a	n/a	n/a	n/a	n/a	n/a

*Some information on award amounts was not included. **Data was not collected.

+Partial results, projects are not complete. †A number of external funding applications are planned, but were not yet submitted at the time of reporting.

Proof of Concept Initiative

The GIVF/RIF funds have been incorporated into a Proof of Concept Initiative (POCI) http://www.industry.iastate.edu/POCI.html. The POCI is intended to build on the foundation started by the GIVF program, include additional funding sources such as i6, IPRT company assistance, Plant Sciences, etc., and position Iowa State to more rapidly propel technologies toward market opportunities. We will do this by emphasizing both the business opportunity and the technology in projects that are funded through the POCI. By doing this we will position young companies to be able to attract the next stage of funding from either the state, angel or VC sources and/or position technologies to be more attractive commercialization opportunities for existing companies.

There were an additional 16 projects funded under the POCI, using non-GIVF/RIF funding sources. A grand-total of 127 projects have been funded through the POCI model from FY07 – FY15; note that i6 funding terminated on March 31, 2014, so FY15 POCI projects will not include this funding source. Final reports for projects funded with i6 and Plant Sciences Institute funds were provided in the full year report for FY14. Summary statistics for all POCI projects (GIVF/RIF and all other funding sources) are as follows:

Project Outcomes for FY07-08through FY16 for All POCI Projects

Year Project Completed	Number of Projects†	Number of Publications & Presentations	Number of Invention Disclosures	Number of External Funding Applications	Number of Applications Awarded†	External Funding Received**
FY16+	9	2	1	0	0	n/a
FY15	14	10	2	3	2	$ 384,999
FY14	11	22	1	25	8*	$ 1,330,000
FY13	5	10	6	16	6	$ 1,020,000
FY12	11	50	4	12	6	$ 6,364,000
FY11	11	46	3	20	6	$ 940,000
FY10	14	99	6	47	13	$ 2,720,000
FY09	15	53	4	48	20	$ 3,500,000
FY07-08**	n/a	n/a	n/a	n/a	n/a	n/a

†Includes all projects funded through the POCI.
+Partial results, projects are not complete.
* A number of external funding applications were still pending at the time interim reports were submitted.
**Some information on award amounts was not included.

Principal Investigator	FY14 RIF Projects (Completed May 31, 2015)	Award Amount
George Kraus	Toxicological and Bioequivalence Analysis of Synthetic Procyanidin and Tannin Compounds	$50,000
Mike O'Donnell	Laboratory ISO 17025 Certification	$23,809
Basil Nikolau	Optimizing the productivity of novel biorenewable chemicals for lubricant and surfactant applications, using KASIII expressing strains developed in partnership with OmegaChea Biorenewables LLC	$50,000
Hui Hu	Development of an Advanced Spray Diagnostics Test Rig for the Measurements of Spray Flows Exhaust	$50,000

Alan Russell	A Castable Ceramic-Reinforced Aluminum Composite	$18,896
Pak Tavanapong	Gentle Colonoscopy with Computer-Guided Navigation	$50,000
Eric Cochran	Development of Biorenewable Thermopoastic Block Copolymers	$50,000
David White	Plunger Cast Equipment Design, Fabrication, and Product Engineering for Commercial Scale Polymer	$50,000
James Roth	National Implementation of the Secure Egg Supply (SES) Data Portal	$50,000
Rick Sharp	Nutritional and Exercise Intervention to Improve Muscle Function, Strength and Activities of Daily Living in Older Adults	$43,141
Balaji Narasimhan	Evaluation of a Synuclein immunotherapeutics in Animal Model of Parkinson's Disease	$50,000
Basil Nikolau	Optimizing Fermentation Process to Scale up a Technology for the Production of Monounsaturated Fatty Acids	$50,000
Byron Brehm-Stecher	Screening and Discovery of New High-Value Probiotic Strains: Phase II	$50,000
Steve Carlson	Development of Plant-Derived Feed Additives that Eliminate Salmonella from Poultry	$12,370
	FY15 RIF Projects (To finish May 31, 2016)	
Steve Carlson	Development of Plant-Derived Feed Additives that Eliminate Salmonella from Poultry	$37,630
Namrata Vaswani	Video Denoising	$50,000
Tim Day	Identification of a Non-antibiotic Drug that Prevents BRD at the Feedlot	$12,500
Zhiyou Wen	Establishment of a mobile Revolving Algal Biofilm (RAB) cultivation system for treating industrial and municipal wastewater on site	$50,000
James Reecy	Assay for Rapidly Identifying Bovine STEC Carriers in Feedlots	$49,734
Steve Carlson	Development of a Genetic Test for Salmonella Resistance in Cattle	$23,500

Jim Roth	National Implementation of the Secure Egg Supply (SES) Data Portal—Phase II	$50,000
Hui Hu	Development of an Advanced Spray Diagnostics Test Rig for the Measurements of Spray Flows Exhausted from Liquid Fuel Injectors-Phase II	$50,000
Eric Cochran	Development of Biorenewable Thermoplastic Block Copolymers—Phase II	$50,000

RIF FUNDING: PROGRESS REPORT

Report Type: Final

Title: Toxicological and Bioequivalence Analysis of Synthetic Procyanidin and Tannin Compounds

PI: George Kraus

Company Partners (if applicable, company names only): BioScience Research Captial

Project Goal: To overcome the hurdles associated with isolating and purifying therapeutic botanical compounds, the Kraus research group is producing synthetic procyanidins and tannins. These synthetic compounds will be tested for toxicity and biological effect compared to the equivalent natural compound.

Publications/presentations based on project: none yet, because of invention disclosure

Invention disclosures: "Proanthocyanin Synthesis via Hydride Abstraction" in preparation

External funding applied for (indicate received/denied/pending):
Identifying the most appropriate funding agency SBIR.

Procyanidins and tannins have been shown to possess various proven therapeutic benefits; however, the isolation of these compounds from natural sources is difficult. By chemically synthesizing these compounds, and showing biological and toxicological equivalence to the naturally derived product, these compounds could be marketed commercially at much more cost effective rates. Standardization with synthetic compounds is near perfect and avoids contaminants and precludes unknown entities in the compound. There is a significant public demand and commercial need for therapeutically valuable natural products and botanical compounds. However, isolating and purifying these compounds, which occur in low abundance, for commercial use can be prohibitively expensive.

The Kraus group has synthesized half-gram quantities of three tannins and five proanthocyanins. They have been transferred to the BSRC group for biological evaluation. The intellectual property from the project period has been collated and will be submitted as an IPDR in July 2015.

RIF FUNDING: PROGRESS REPORT

Report Type: Final

Title: Laboratory ISO 17025 Certification

PI: Mike O'Donnell

Company Partners (if applicable, company names only): Metabolic Technologies, Inc. (MTI)

Project Goal: assist company in becoming ISO 17025 Certified

Publications/presentations based on project: N/A

Invention disclosures: N/A

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

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

ExoLytic met with Metabolic in February and May of this year to start the process of assisting Metabolic attaining their ISO certification.

An ISO overview was presented to all FTE's. Current processes and procedures were reviewed. Documentation of all processes has been completed with the assistance of ExoLytic staff. Metabolic worked on further modifications of these documents (policies and forms) so that they fit the actual operating procedures of the company and laboratory. Metabolic returned these documents to Exolytic for a final review. Documents were compared to actual procedures over a period of time being performed and then either the procedures and/or documents were updated to reflect actual practices that fit within the ISO requirements.

A final visit occurred October 29-31, 2014. During this time Exolytic conducted an audit of the Metabolic ISO system and laboratory, trained Metabolic staff on auditing procedures, and prepared the Metabolic staff for the upcoming certification audit. The company has the systems in place for ISO certification, and an application to the certification agency has been submitted.

Technical assistance work under this scope is now complete.

RIF FUNDING: PROGRESS REPORT

Report Type: Final Report

Title: Optimizing the productivity of novel biorenewable chemicals for lubricant and surfactant applications, using KASIII expressing strains developed in partnership with OmegaChea Biorenewables LLC

PI: Shivani Garg; Basil Nikolau

Project Team: Ludmila Rizhsky, Marna Yandeau-Nelson, Peter Keeling, Steve DiBiase, Xiaochen Yu

Company Partners (if applicable, company names only): OmegaChea Biorenewables LLC

Project Goal: Identification of KASIII enzymes for maximized production of ω-branched fatty acids.

Publications/presentations based on project:

- Poster presentation at the 7th annual CBiRC NSF Site visit meeting, May 2015, Ames, IA
- Presentation to Technology Scout of the Dow Chemical Company, April 2015
- Virtual pitch, Global 1000 conference, Nov. 2014 (http://g1000mpd.com/index.php?option=com_cf&view=project&id=834&Itemid=619)
- Company presentation at the 6th annual CBiRC working meeting, Oct 2014, Ames, IA
- Poster presentation at the 2014 ASBMB Meeting, April 2014, San Diego, CA
- Poster presentation at the 6th Annual CBiRC NSF Site visit meeting, May 2014, Ames, IA
- Poster presentation at the 2013 ASBMB Meeting, April 2013, Boston, MA
- Poster presentation at the 5th Annual CBiRC NSF Site visit meeting, May 2013, Ames, IA
- Poster presentation at the 5th Annual CBiRC working meeting, Oct 2013, Ames, IA
- Yandeau-Nelson. "Using diverse KASIIIs for functionalizing the omega-end of fatty acids" presented at the 5th Annual CBiRC working meeting, Oct 2013, Ames IA
- Garg, Yandeau-Nelson, Nikolau. "*Dissecting the structural basis of diverse functionalities of E. coli and B. subtilis KASIII enzymes using STD NMR based ligand interactions*". Manuscript in preparation for the Journal of Biological Chemistry.
- Garg, Rizhsky, Jin, Yu, Yandeau-Nelson, Nikolau. "*Production of bi-functional molecules by diversification of the fatty acid synthesis pathway*". Manuscript submitted to *Metabolic Engineering*, Jun 2015

Invention disclosures:

- Invention disclosure to ISURF (#04362), titled "Production of bi-functional molecules by diversification of the fatty acid synthesis pathway", Garg, Rizhsky, Jin, Yu, Yandeau-Nelson, Nikolau (Jun 2015).
- ISURF 04083 and associated Provisional US Patent Application #61/755,946, entitled "*Materials and methods for using a 3-ketoacyl-acyl carrier protein (ACP) synthase III (KASIII) for production of bi-functional fatty acids*", S Garg, H Jin, MD Yandeau- Nelson, BJ Nikolau (2013)
- International Pat. App. No. PCT/US14/12616 "*Materials and methods for characterizing and using a 3-ketoacyl-acyl carrier protein (ACP) synthase III (KASIII) for production ofbi-functional fatty acids",* S Garg, H Jin, MD Yandeau-Nelson, BJ Nikolau; filed January 22, 2014.

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

- NSF STTR Phase II Funding (Denied, Dec 2014)
- NSF STTR Phase I Award (Received, July 2013)
- CBiRC Student Leadership Sponsored Grant Phase I awarded to Shivani Garg (Received Jul-Aug

2013), $10,000

- CBiRC Student Leadership Sponsored Grant Phase II awarded to Shivani Garg (Received Jan – Mar 2014), $10,000

Progress report:

Funds have been used to primarily support Dr. Xiaochen Yu, who joined the team as a post- doctoral researcher in August, 2014. Her area of expertise is optimization of fermentation methods, and the project has made considerable advances using this capability.

Quarter 1:

The goal for the RIF funded project is to maximize the production of ω-branched fatty acids using appropriate KASIII biocatalysts and also by optimizing fermentation conditions for increased product yields. Using in-vitro characterization techniques, we have identified at least three KASIII enzymes with high binding affinities for branched chain substrates. In summer 2014, we hired a new post-doctoral research associate (as an ISU employee) who is working at the ISU fermentation facility to optimize the fermentation conditions for production of ω- branched fatty acids, which is a Deliverable for Quarter 2 of this project.

For business development, OmegaChea engaged a senior consultant who has more than 40 years of experience in surfactants and lubricants market, and is working closely with the OmegaChea team to develop a viable commercialization strategy, and also to develop partnerships in the lubricants market. Based on his inputs, we identified high-performance synthetic lubricants market as the initial entry-point for OmegaChea's product offerings, followed by growth into surfactants for institutional cleaners. These market segments have been selected because market needs are well-defined, development partners are available, routes to application development are clear and there is a strategic interest in bio-based lubricants. As we worked on further developing the business plan, we also participated in regional business development opportunities. For example, OmegaChea was selected as a semi-finalist in the Cleantech Open Accelerator Program for 2014, and had access to mentors and other resources provided by this program for commercialization and business development.

Quarter 2:

For maximizing the production of ω-branched fatty acids, four engineered *E. coli* strains were evaluated in terms of their cell growth and ω-branched fatty acid production. Our experiments identified the strain that achieved the highest titers of ω-branched fatty acids after a series of optimizations. We evaluated several culture conditions, including inoculum size, growth temperature and induction parameters, first in shake flasks and currently we are evaluating titers in fermentors. To date, titers have reached 13mg/L and 25mg/L for total ω-branched fatty acid

and total fatty acid respectively, which represents 2-3 fold improvement over titers achieved prior to these optimization experiments. Although shake flasks are most suitable for practical applications in optimization studies, some disadvantages such as pH changes and oxygen limitation are associated with shake bioreactors. Therefore, the next experiments we are initiating at the ISU fermentation facility will address the effects of pH and dissolved oxygen on titer, using 5-L jar fermentors.

Toward commercialization and business development this quarter, the Global 1000 conference invited OmegaChea to provide a virtual pitch to interested investors (November, 2014), which was Stage 3 of 5 within Global 1000's Discovery and Innovation Platform (http://www.ncet2.org/index.php?option=com_content&view=article&id=505&Itemid=84). In addition, OmegaChea show-cased its technology at the annual CBiRC meeting (October 2014 in Ames, Iowa), at which Cargill and Elevance expressed interest in learning more about OmegaChea technology. Recently, OmegaChea has connected with the Commercialization Director of Iowa Innovation Corporation and will be discussing future funding and support opportunities in early 2015.

Quarter 3 and 4

In the previous experiments, as the colonies cultured on agar plates were observed with different sizes, the experiments were designed and conducted to investigate the fatty acid production from those colonies. The results showed that there were no significant differences on fatty acid titers and compositions from different colonies and demonstrated the homogeneity of those colonies as well. Furthermore, in order to scale up the

cultivation in 5 L fermentor, the cultivation experiments were firstly conducted in the shake flasks with different working volume (25 mL, 50 mL, 100 mL and 400 mL). In 2 L shake flask using optimized fermentation conditions (induction temperature, inducer concentration, pH, carbon-to-nitrogen ration), the final total fatty acid and hydroxyl-fatty acid titers were achieved at 23 mg/L and 14 mg/L, respectively. The result was comparable to that obtained in 125 mL shake flask with a working volume of 25 mL.

Moreover, we found that the medium composition had significant impact on cell growth and fatty acid production. Effect of nitrogen source was studied on the strain and ammonia chloride was the most favorable nitrogen source. Additionally, the results of experiments suggest good cell growth could support fatty acid production. LB medium resulted in a better cell growth while the fatty acid titers from M9 medium achieved much higher fatty acid, indicating optimization of medium composition was also required for both maximal cell growth and fatty acid production. In order to further increase the fatty acid titers, the future experiments will focus on studying effect of pH and dissolved oxygen, designing feeding strategy, and optimizing medium compositions in 5-L jar bioreactor.

OmegaChea was contacted for a presentation by technology scout of the Dow Chemical Company in April 2015, based on OmegaChea's profile in the Global 1000 system. OmegaChea was also contacted by a technology scout of Evonik, who showed interest in lubricant and surfactant properties of OmegaChea's products. We are currently in conversation with Evonik to establish a potential partnership in future.

RIF FUNDING: PROGRESS REPORT

Report Type: Final

Title: Development of an Advanced Spray Diagnostic Test Rig for the Measurements of Spray Flows Exhausted from Liquid Fuel Injectors

PIs: Dr. Hui Hu (Iowa State University; Tel: 515-294-0094/Email:huhui@iastate.edu)
Mr. Spencer Pack (UTC Aerospace Systems; Tel: 515-633-3460/Email: Spencer.Pack@utas.utc.com)

Company Partners (if applicable, company names only): UTC Aerospace Systems

Project Goal:
Build and certify a 250 psi spray rig at ISU for spray diagnostic measurements.

Publications/presentations based on project: None to date.

Invention disclosures: None to date.

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

UTAS 50K cost match with ISU agreement. No others pending.

Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress):
The joint program, entitled "Development of an Advanced Spray Diagnostics Test Rig for the Measurements of Spray Flows Exhausted from Liquid Injectors", has begun at United Technologies Aerospace Systems and Iowa State University. The research and design team held bi-weekly meetings throughout the program to ensure that the finalized spray rig design would meet all program goals. The main goal of this program is to develop a 250 psi pressure spray rig that will allow spray droplet diagnostic testing at points closer to engine conditions which will directly lead to improved injector designs. A critical design review (CDR) of the spray rig was held between the two entities, all drafting complete, and all components have been ordered. The rig has been partially assembled and the three high pressure rotating glass windows for optical access have been tested and are complete.

A critical item that has progressed significantly over the last month of this project is the spray chamber. This large complex item has required a twelve week lead time which is extremely long. Because of this, the spray chamber was not available for final rig assembly. The Spray Chamber has been started at the vendor and is on schedule for a July 8th deliver. At this point the high pressure spray rig is not fully assembled. The rig is currently 50% complete on the second floor of Howell Hall. The final build and certification pressure test will be complete by the end of July 2015. The project was only funded until the end of May but UTAS will continue work the project once the Spray Chamber has been received.

In summary, the project has completed the design, drafting, and purchasing of all components. Final assembly and pressure test pending receipt of the Spray Chamber.

Phase II of this project was scheduled to begin July 1, 2015.

RIF FUNDING: PROGRESS REPORT

Report Type: Final

Title: A Castable, Ceramic-Reinforced Aluminum Composite

PI: Alan Russell

Company Partners (if applicable, company names only): NewTech Ceramics

Project Goal: Develop a test casting of Al + BAM composite that contains regions with slow cooling rate, intermediate cooling rate, and fast cooling rate. Test the mechanical properties of metal taken from each of these regions to determine the relationship between cooling rate and strength/ductility.

Publications/presentations based on project: None yet.

Invention disclosures: This IP is protected by U.S. patent no. 7,172,641, "Ultra-hard boride-based matrix reinforcement"; issued 6 Feb, 2007, Cook B.A., Russell A.M., Harringa J.L., Biner S.B., and Anderson I. ISURF has licensed this patent to NewTech Ceramics.

External funding applied for (indicate received/denied/pending): At this time, no projects beyond this one have been proposed to any external funding agency**.**

Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress): The procedure for this project can be divided into nine tasks:

(1) Two castings were poured from melted aluminum, magnesium, and boron. One (Specimen A) was held briefly at 1100˚C, then poured; the other (Specimen B) was held for one hour at 1500˚C, cooled to 1100˚C, then poured. The mold was designed to cool the metal at varying rates.

(2) Specimen A had incomplete dissolution of the boron, rendering it unusable. The boron dissolved successfully in Specimen B, forming the desired $AlMgB_{14}$ phase.

(3) Twelve tensile test specimens were cut by electrodischarge machining from fast-, medium-, and slow-cooled regions of Specimen B.

(4) Strength and hardness tests performed on the 12 specimens to measure strength and ductility. These tests showed no variation in properties with cooling rate, demonstrating that cooling rate is not a key factor in determining the microstructure and properties of the composite. The $AlMgB_{14}$ particles form a stable size and shape while suspended in the surrounding liquid aluminum, and the cooling rate does not alter their size/shape as the metal freezes. This is a favorable finding because it means that slow-cooling thick sections in the mold will have properties that are just as good as fast-cooling thin sections. In general, the metal was found to be ductile (tough) with a microhardness of the Al sections similar to that of typical commercial solid solution aluminum alloys; the microhardness of the $AlMgB_{14}$ phase was 60 times harder. The specimens contained porosity, a defect that could be corrected by pouring at a lower temperature.

5) Project participants will wait to publish these results to protect potentially valuable intellectual property related to the cooling rate and porosity findings.

RIF FUNDING: PROGRESS REPORT

Report Type: Final

Title: Gentle Colonoscopy with Computer-Guided Navigation

PI: Wallapak Tavanapong

Company Partners (if applicable, company names only): EndoMetric

Project Goal:

The project aims to develop novel software technology to speed up the navigation of the Invendoscope inside the human colon. Currently, navigation is done manually by the endoscopist repeatedly pushing buttons on the handheld device to move the scope. The proposed software will compute and mark the location of the lumen where the scope should be moved. When the endoscopist agrees with the suggested lumen location, she presses a button once on the handheld control device. EndoMetric software will move the scope along the computed path to the desired destination. The endoscopist can stop the movement of the scope at any time by pressing a cancel button on the control device. The proposed technology is anticipated to increase the commercialization potential of InvendoScope and EndoMetric's technology.

Publications/presentations based on project: None at this time

Invention disclosures: None at this time

External funding applied for (indicate received/denied/pending): None at this time

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

Since our last presentation in August 2014, the InvendoScope unit together with EndoMetric's hardware and software were successfully installed at Mayo Clinic Rochester. Videos were collected successfully on a synthetic colon model. Our medical collaborator received the IRB approval to use the scope with real patients. Three procedures were performed on real patients. However, only one of them was completed entirely using the InvendoScope. After the third procedure, the Invendocope hardware was broken. Parts have been ordered from Germany. A technician from Invendo Medical was scheduled to replace the parts at Mayo Clinic on Dec. 31, 2014. After that, our medical collaborator would have started enrolling patients again. All planned activities were delayed until this hardware issue was resolved.

In March 2015, we were informed that Invendo Medical finally discontinued further development of the current InvendoScope and was working on a major revision of the scope hardware. The team informed the program manager of this funding about the situation and received an approval to focus the work on the development of the algorithms for automatically driving an endoscope camera to examine the colon thoroughly rather than waiting to work with the problematic InvendoScope hardware. The new algorithms have potential to be used also with the more recent wireless capsule endoscopy technologies that can be controlled.

Results: We designed one algorithm and simulated the endoscope path on two different colon models. The algorithm works well for the straight colon model, but is not sufficiently effective for the colon model where folds are not well aligned. Hence, the proposed path planning algorithm is not ready for practical use. We will continue to improve the algorithm to reduce the percentage of the unseen surface area to below 5%, a desirable percentage for excellent quality of the colon inspection in practice.

RIF FUNDING: PROGRESS REPORT

Report Type: Final

Title: Development of Biorenewable Thermoplastic Block Copolymers

PI: Eric Cochran

Company Partners (if applicable, company names only): ArgoGenesis Chemical, LLC, Archer-Daniels Midland Co, Senca Petroleum, Kraton Polymers, LLC

Project Goal:
The goal for this project is to create a cost effective way to chemically synthesize specialized hybrid materials (biorenewable thermoplastic block copolymers) that current technology does not allow for.

Publications/presentations based on project: None

Invention disclosures: None

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

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

The goal of this project is to create a method that will help merge industry's cost effective, but limited in the number of monomers that can be polymerized, way of synthesizing rubber with a novel technology that allows the polymerization of a wider spectrum of monomers, including biorenewables.

We have successfully synthesized two different molecules that could potentially serve as termination agents for the industry's rubber production process. These molecules where then individually tested: one failed to terminate the reaction (thus eliminating it as a possibility) and the other molecule successfully terminated the reaction.

With the use this molecule we have been able to produce different materials starting from the industry's terminated precursor. We will continue to test the efficacy to polymerize different monomers, as well as continue to perfect the synthesis and performance of these molecules in order to increase the effectiveness of producing these hybrid materials.

Kraton Polymers, LLC continues to be very interested in joining efforts in perfecting and further developing this method.

Phase II of this project was scheduled to begin July 1, 2015.

RIF FUNDING: PROGRESS REPORT

Report Type: Final

Title: Plunger Cast Equipment Design, Fabrication, and Product Engineering for Commercial Scale Polymer Mortar Composite (PMC) Pipe Manufacturing

PI: David White

Company Partners (if applicable, company names only): r-Pipe

Project Goal:

1) Fabrication of Plunger Cast Equipment and Molds for 24" product; 2) Manufacture 24" diameter specimens for commercial testing; 3) Commercial testing and validation

Publications/presentations based on project: N/A

Invention disclosures: N/A

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

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

Project goals have been slowed because of the extra time taken to fabricate the Plunger cast equipment and molds. The Ames Laboratory Machine Shop is expected to complete the equipment by 6.26.2015. Requirements for a hydraulic press have been completed and this will be purchased using Phase 2 funding. It is anticipated that manufacture of the test specimens will begin in late August.

RIF FUNDING: PROGRESS REPORT

Report Type: Final

Title: National Implementation of the Secure Egg Supply (SES) Data Portal

PI: James Roth, Center for Food Security and Public Health

Company Partners (if applicable, company names only): GlobalVetLINK (GVL)

Project Goal:
The project goal is to gather system requirements for a National Secure Egg Supply (SES) Data Portal. We plan to use the project funds to hire two contract programmers to work with the Center for Food Security and Public Health (CFSPH) and GVL to gather system requirements for the data portal. This work is an essential step for transitioning the current Iowa – only data portal to a sustainable national portal commercialized by GVL. The portal will be beta tested by an Iowa egg producer that has used the Iowa –only demonstration portal. The long term goal is that the SES plan and data portal will become operational nationwide and that it can be expanded to control additional poultry diseases nationwide.

Publications/presentations based on project:
September 12, 2014: Webinar (Jim Roth and Kevin Maher) with Pat Stonger (DayBreak Eggs) and University of Minnesota Partners

September 15, 2014: SES Group Conference Call (approximately 60 participants) – Presentation by Jim Roth on the future plans for the data portal and voluntary preparedness component of the SES.

Meeting with Pat Stonger, UMN partners at the US Animal Health Association meeting in Kansas City, on October 19.

GVL Workshop with Iowa Egg Producers, Thursday, December 18

Invention disclosures: None

External funding applied for (indicate received/denied/pending):
Currently exploring potential funding sources related to the egg industry

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Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress):
In close collaboration with the CFSPH team at Iowa State, between January 2015 and May 2015, GlobalVetLINK delivered the following functionality in the national Secure Egg Supply portal in Phase I of the RIF grant:

- Implemented the SES portal prototype complete with SES branding and sample data
- Created three user role types (Production Manager, Incident Command, Auditor)
- Established data architecture
- Created beta API for data inputs and outputs with minimal usage documentation
- Implemented basic functionality for an SES Producer
  - Premises maintenance
  - House maintenance
  - Daily reporting
  - Enhanced cleaning and disinfecting checklists
- Implemented basic functionality for an SES Auditor
  - Associate a third party audit "sign-off" with a premises
- Implemented basic functionality for an SES Incident Commander
  - View premises, daily production data and bio-security data by premises

Implemented a user sign-up process
Phase II of the project began on June 1, 2015.

RIF FUNDING: PROGRESS REPORT

Report Type: Interim

Title: Screening and Discovery of New High-Value Probiotic Strains: Phase II

PI: Byron Brehm-Stecher

Company Partners (if applicable, company names only): ProbioFerm, LLC

Project Goal:
1. Continue characterization of lead probiotic bacterial strains identified in our Phase I project.
2. Continue exploration of new added-value product opportunities based on cell-free supernatants currently disposed of as waste material.

Publications/presentations based on project: 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 Phase II, we have continued our characterization of the lead probiotic bacterial strains identified in our Phase I project. Specific objectives include examination of antibiotic resistance profiles and bacterial generation of hydrogen peroxide, a phenotype associated with improved competitiveness within the host. Antibiotic susceptibility or resistance was examined using disk diffusion testing with compounds representative of several clinically important antibiotic families. Disk diffusion tests were performed against lead probiotic strains using a modified Clinical Laboratory Standards Institute (CLSI) method. Antibiotics tested included chloramphenicol, vancomycin, tetracycline, gentamicin, polymyxin B, ciprofloxacin, linezolid, imipenem and ampicillin. Zone of inhibition standards for resistance or susceptibility against different antibiotics were made according to established procedures. Five strains, *Lactobacillus casei* 0546P, *L. gasseri* JPS, *L. leichnannii* 0235P, *L. paracasei* KE 99 and *L. rhamnosus* 0989P, showed increased susceptibilities to the tested antibiotics. Combined with our Phase I data on cell growth parameters, these results provide further support for the probiotic and commercial potential of these strains.

In Phase I, liquid cell-free supernatants (CFS) were shown to have promising antimicrobial activities against the human pathogens *E. coli* O 157:H7, *S.* Typhimurium and *L. monocytogenes*.. Our Phase II work includes practical demonstration of value-added applications for CFS generated during probiotic fermentation. A food-grade edible film comprised of soy protein isolate, glycerol and spray-dried CFS from *Lactobacillus casei* 0546P was made as a potential means for generating clean-label solutions for natural control of pathogens on produce or other food surfaces. Study of the impact of CFS concentration on the physical and antimicrobial attributes of CFS-amended edible films is currently underway. In addition to characterizing the impact of added CFS on edible film properties, the remaining work toward completion of Phase II goals includes evaluation of hydrogen peroxide formation in *L. gasseri* JPS. Together, these data will be used to document commercially advantageous properties of these strains in support of ProbioFerm's continued growth and commercial competitiveness.

RIF FUNDING: PROGRESS REPORT

Report Type: Final

Title: Nutritional and Exercise Intervention to Improve Muscle Function, Strength and Activities of Daily Living in Older Adults

PI: Rick Sharp

Company Partners (if applicable, company names only): Metabolic Technologies, Inc. (MTI)

Project Goal: To evaluate the possible interactive role of vitamin D and HMB dietary supplementation when combined with resistance exercise in slowing or reversing the loss of muscle mass and muscle function in older adults. Specifically, the RIF project seeks to examine measures contributing to decreased risk of falls.

Publications/presentations based on project: none

Invention disclosures:

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

NIH SBIR grant # R44AG034722 through National Institute of Aging has funded the overall project.

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

Our project depends on recruitment of older adults with low vitamin D status. At time of the interim report, we had screened 38 possible participants and enrolled 6 participants. To increase enrollment, we have increased our recruitment and screening efforts, and have added an additional research site in Des Moines where we are collaborating with Des Moines University. At this point, we have now screened 142 and enrolled 27 participants who are at various stages in their year-long intervention. Since our target is 160 total participants, we will continue to recruit, screen and enroll throughout the next year. Adding the Des Moines site has started to result in a greater number of participants as we move into fall and winter.

The RIF funding allowed us to expand our recruitment efforts both in Story County and Des Moines, initiate additional outcome measures related to mobility and fall risk, and to increase access to the resistance training machines for the participants. Specifically, we were able to add additional TechnoGym equipment at the Nutrition and Wellness Research Center that serves as our main testing and resistance training site. The benefit of this is that a larger number of participants can be accommodated, thus allowing us to increase recruitment.

At this time, we are unable to provide outcome results of our participants as only two of our participants have completed their full year of testing. In addition, because our study is being conducted double blind, we will have no way of knowing which participants are in the placebo feeding group and which are in the experimental supplement group. Once all the participants have completed their year-long intervention, we will be able to break the code and conduct analyses of effectiveness of the interventions. We anticipate those analyses within the next year and will result in at least 3-4 published papers and provisional patents as well as additional federal grant funding for follow-up studies.

RIF FUNDING: PROGRESS REPORT

Report Type: Final

Title: Evaluation of α-Synuclein Immunotherapeutics in Animal Model of Parkinson's Disease

PI: Balaji Narasimhan

Company Partners: PathoVacs, PK Biosciences

Project Goal: To delay onset and/or retard progression of PD in a proxy murine model of human PD using high affinity polyclonal antibodies (HA-PAbs) generated against epitopes unique to pathologic aggregates of human α-Syn.

Publications/presentations based on project: None

Invention disclosures: A disclosure based on the work done in Phase I will be submitted to ISURF shortly.

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

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We have successfully accomplished the objectives proposed in phase I studies, namely, the generation of high affinity polyclonal antibodies (HA-PAbs) directed against epitopes unique to aggregated form of recombinant human α-Syn and characterization of such HA-PAbs in human biological samples.

Generation of HA-PAbs against aggregated human α-synuclein: Toward this, we aggregated commercially available pure monomeric recombinant human α-Syn protein in the laboratory and confirmed aggregation using transmission electron microscopy. We immunized mice with the aggregated α-Syn, generated polyclonal ascites fluid (PAF) containing high titer, HA-PAbs at the ISU Hybridoma Facility, and then confirmed specific reactivity of both mouse hyper-immune sera and PAF against aggregated α-Syn. Next, we selectively enriched for PAF-HA-PAbs directed against aggregated α-Syn (subtracted or sHA-PAbs), and simultaneously depleted HA-PAbs directed against epitopes unique to native/linear protein, as well as those shared by both aggregated and native α-Syn. Following confirmation of differential reactivity, we next compared the HA-PAbs specificity with commercial available monoclonal antibody against serially diluted non-aggregated and aggregated α-Syn in Dot-Blots. We demonstrated that only HA-PAbs was able detect aggregated α-Syn, on the other hand commercially available antibody was detecting to both non-aggregated and aggregated α-Syn suggesting that epitope detected by HA-PAbs is unique to aggregated α-Syn, whereas epitope detected by commercial monoclonal antibody is shared by both non and aggregated α-Syn. Finally we evaluated HA-PAbs against CSF and serum form Parkinson's disease and age-matched non–PD patients. HA-PAbs were able to detect significant aggregated α-Syn in CSF and serum of PD patients compared to age-matched controls. Experiments are ongoing to further characterize the HA-PAbs in human PD tissues.

RIF FUNDING: PROGRESS REPORT

Report Type: Final

Title: Optimizing Fermentation Process to Scale up a Technology for the Production of Monounsaturated Fatty Acids

PI: Basil Nikolau

Company Partners (if applicable, company names only): VariFAS Biorenewables, LLC

Project Goal: Partner with VariFAS and develop a scalable innovative technology to produce highly specific monounsaturated fatty acids (MUFAs) from biomass sugar feedstocks.

Publications/presentations based on project: No

Invention disclosures: No

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

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

Research progress:
Evaluated productivity of MUFAs in response to the following attributes:

- Effect of oxygen level on MUFA productivity.
- Different media are being tested to determine the optimal medium for MUFA production.

Updates – June 30, 2015

1. Fed-batch fermentation of *E. coli* strain C8-81G/K27
   The E. coli strain C8-81G/K27 was used to conduct a fed-batch fermentation in 250 mL LB medium in a 500-ml Multifors Bioreactor. The culture was induced by IPTG at 10 μM supplemented at the beginning of cultivation. The cultivation was maintained at 30 °C, dissolved oxygen of 30%, and pH of 6.8 which was controlled by addition of 4N KOH and/or 5N H2SO4. After glucose in the initial medium was depleted, 200 g/L glucose was supplemented to keep residual glucose concentration below 5 g/L. The fermentation broths were collected for fatty acid and glucose analyses. The final total free fatty acid achieved 3.4 g/L. For the further improvement, the significant factors such as initial glucose concentration, glucose feeding rate, IPTG induction strategy should be investigated for high free fatty acid production by the engineered *E. coli*.
2. A mutant strain produced ~8 g/L fatty acids, the highest titer we've ever achieved
   A mutant strain J32 was isolated from a mutant library. The fatty acid production of strain J32 under different induction conditions was analyzed. When induced by 100 uM IPTG, the strain J32 produced ~8 g/L fatty acids, the highest titer we've ever achieved. This is more than two fold of the production of our previous best strain. The yield is 0.11 gram FA/gram glucose, 32% of the maximum theoretical yield. This strain will be used in further fermentation optimization.
3. Manufacture lubricants from VariFAS's MUFAs
   To produce enough quantity of fatty acids for manufacturing and evaluating prototype lubricants, large scale fermentation was conducted in 2-L flasks. A total of 32 grams of fatty acids were extracted and purified. Fifteen grams purified fatty acids were used to produce trimethylolpropane (TMP) polyol esters. After reaction, extraction, and separation, 5 grams TMP polyol ester was obtained in the end. This product is named TMP-VF55, and is our first prototype lubricant product. TMP-VF55 is pale yellow viscous liquid

at room temperature. It pour point is between -6 to 0 °C. The friction and wear test will be performed in collaboration with Dr. Sriram Sundararajan at Iowa State University. Other properties including viscosity and oxidative stability will also be evaluated.

Commercialization progress

The market opportunity for VariFAS has been explored and defined by market analysis and interviewing industry representatives. VariFAS will initially produce MUFA mixtures containing mainly 14:1Δ7 and 16:1Δ9 as Minimum Viable Product (MVP). This will enable the delivery of products sooner to the market to obtain quick feedback from the market, and also generate revenue for further technology development. From the perspective of technology and market, this mixture of MUFAs is the low hanging fruit. If needed, homogenous source of each MUFA can also be prepared for even higher value applications. VariFAS technology can be used in automotive gear lubricants to prevent wear and as anti-oxidants to protect crankcase lubricants from decomposition and facilitate metal removal in metal working applications. Specifically, VariFAS's MUFA mixture will be targeted to making high performance lubricants for wind turbines and for industrial and automotive lubricants. Beyond lubricants the VariFAS technology will be useful in making new cleaning surfactants for both home cleaning such as dishwashing detergents and as institutional cleaners in assisting with maintaining food safety in food processing plants.

The commercialization strategy involves first entering the high-performance lubricants market, in partnership with lubricant or additive companies. Conversations have been initiated with Lubrizol and Elevance. Both companies are interested in evaluating our MUFAs compositions for application development if sufficient quantities (1-2 kg) of MUFAs can be produced by VariFAS. Our MUFAs can be easily converted into oligomerized dimer and trimer acids, and further reaction of these acids with mono and poly alcohols yields materials useful as synthetic base fluids. Using Elevance's metathesis technology, VariFAS's MUFAs can be converted into C10 to C22 straight chain dicarboxylic acids which are compounds with exceptional physical and chemical properties. The current task for VariFAS is to scale up the fermentation capability to produce enough MUFAs that can be evaluated by lubricant companies.

Additional funding to support the technology development and commercialization is being sought through an application for a SBIR phase II award.

Updates – June 30, 2015

VariFAS's first prototype lubricant TMP-VF55 has been produced. We chose to produce polyol ester, because polyol esters represent the highest performance synthetic lubricants. The lubrication properties of TMP-VF55 is being evaluated. The commercialization strategy is to obtain initial performance data of our lubricant and seek partnership with larger lubricant companies who will be interested in our product and would like to develop high performance lubricants from VariFAS;s MUFAs. The sooner we put our products in the market, the sooner we will get feedback from customers. Then second generation product will be developed and marketed.

Additional funding to support the scale-up of our manufacturing platform is being sought through an application of VentureNet Iowa Demonstration fund. If we get funded, larger quantity of prototype lubricant will be produced and more comprehensive performance data will be obtained. These data set will be used to attract interested lubricant companies and eventually partnership will be established.

A conversation with Iowa Energy Center has been initiated to discuss possible support or collaboration. SBIR Phase II application is being prepared and will be submitted at the end of July. This funding is to support further technology development and commercialization. If funded, we anticipate to generate sales revenue in 2018.

RIF FUNDING: PROGRESS REPORT

Report Type: Interim

Title: "Development of a Genetic Test for Salmonella Resistance in Cattle"

PI: Steve Carlson

Company Partners (if applicable, company names only): PSR Genetics

Project Goal: The goal of the project is to identify a genotype that confers *Salmonella* resistance to black cattle. Our previous studies identified the genotype in non-black cattle, which compromise only 20% of the cattle in the U.S. And thus the aim of this project is to expand the scope of this genotype, and thus the marketplace for a genetic test, to the majority of U.S. cattle.

Publications/presentations based on project:

Invention disclosures:

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

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

PSR Genetics previously found that the *PSR/PSR* genotype consistently leads to *Salmonella* resistance in certain cattle, specifically those that are non-black (*e.g.*, Red Angus, Charolais, Piedmontese, Braunvieh, Shorthorn, Tarentaise, *etc.*) and have the coat color genotype designated as either *E+E+* or *ee*. For black cattle, the resistance is rare and only occurs sporadically. We identified a herd of beef cattle that have a few black-appearing cattle (black with a cinnamon background) that are resistant to *Salmonella*. These cattle are a cross between Braunvieh and Shorthorn, have the *PSR/PSR* genotype, and have the coat color genotype designated as *E+e*. We also found that not all *PSR/PSR::E+e* cattle are visibly black. Therefore, it appears that the black-appearing *PSR/PSR::E+e* cattle have one or more "darkening" genes that override the brown and red coat color backgrounds contributed by the Braunvieh and Shorthorn, respectively. We are currently performing genetic analyses on the black-appearing *PSR/PSR::E+e* cattle. We anticipate receiving all of the genetic data by October 2015. Upon receipt of these data, we will be able to identify the darkening genes, and thus create a genetic test that identifies black-appearing cattle that resist *Salmonella*.

RIF FUNDING: PROGRESS REPORT

Report Type: Interim

Title: Development of a Plant Derived Feed Additives that Eliminate *Salmonella* from Poultry

PI: Steve Carlson

Company Partners (if applicable, company names only): Diamond V

Project Goal: To determine if certain essential oils will dislodge *Salmonella* from the intestinal tracts of chickens.

Publications/presentations based on project:

Invention disclosures:

External funding applied for (indicate received/denied/pending): Based on the PI's relationship with Diamond V (developed because of this funding), an NIH R21 will be submitted for the June 16, 2015 deadline (*i.e.*, pending).

Progress report (300 word maximum, please focus on results in non-technical terms and commercialization progress): In our first phase of experiments, we found that an essential oil (EO) dislodged *Salmonella* from the intestinal tracts of chickens. This dislodgement was equivalent to that observed with a proprietary Diamond V product designated as XPC. Both the EO and XPC minimized the virulence of the *Salmonella* that were present in the chicken intestinal tract. No synergism was noted for the EO+XPC combination in regards to the dislodgement. Unfortunately it was noted that the EO and XPC antagonized each other in regards to the virulence of the *Salmonella*, *i.e.*, the virulence increased in the presence of the EO+XPC combination. Thus this combination will not be pursued further. In the next phase of experiments we will assess the synergism between the EO and a Diamond V prototype, in hopes of finding synergism between the two products. If synergism is noted, the combination will be commercialized. If no synergism is noted, commercialization will commence for the EO.

RIF FUNDING: PROGRESS REPORT

Report Type: Interim

Title: Novel Machine Learning Based Approaches for Low-light Image or Video Denoising

PI: Namrata Vaswani; Soumik Sarkar

Company Partners (if applicable, company names only): Rockwell Collins

Project Goal: Development of denoising algorithms for low-light images and videos

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Publications/presentations based on project:

*1. Technical report submitted to Rockwell Collins***:** Literature Review: Low-light Images & Videos, Noise types and Denoising Algorithms

*2. Review presentation made to Rockwell Collins***:** Low-light Images & Videos, Noise types and Denoising Algorithms

Invention disclosures: None

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

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

In the first five months of this Phase – I project, the goal was to understand the problem low-light images and videos and various noise types associated with the problem. The team has characterized the noise in a statistical sense and reviewed the state-of-the-art image and video denoising approaches along with their pros and cons. The major competitive methods were identified and it turns out that although they perform reasonably well in regular denoising operations, they are not as effective in the low-light scenarios. A large number of example images and videos were collected as a part of this project to perform these evaluations. Finally, deep learning and ReProcs based methods were proposed by the team and initial results show significant promise. Rockwell Collins representatives have reviewed the progress with the team and provided guidance towards next steps.

RIF FUNDING: PROGRESS REPORT

Report Type: Interim

Title: Identification of a Drug that Prevents BRD at the Feedlot

PI: Tim Day

Company Partners (if applicable, company names only): AeroGenics LLC

Project Goal: The goal of this study is to perform a small pharmacokinetic study to establish that the non-antibiotic drug reaches therapeutic levels and does not leave residues in meat at two weeks after the drug has been discontinued.

Publications/presentations based on project:

Invention disclosures:

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

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

The pharmacokinetic study will be performed during August 2015, and will form the basis for an SBIR application to fund a full field trial during 2016.

RIF FUNDING: PROGRESS REPORT

Report Type: Interim

Title: Establishment of a Mobile Revolving Algal Biofilm (RAB) Cultivation System for Treating Industrial and Municipal Wastewater on Site

PI: Zhiyou Wen

Company Partners (if applicable, company names only): Gross-Wen Technologies

Project Goal: To develop a pilot-scale mobile Revolving Algal Biofilm (RAB) cultivation system that can be used to treat effluents produced by industrial manufacturing facilities and municipal wastewater treatment plants.

Publications/presentations based on project: N/A

Invention disclosures: N/A

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

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

In this project, we propose to develop a pilot-scale mobile Revolving Algal Biofilm (RAB) system that can be used to treat effluents produced by industrial manufacturing facilities and municipal wastewater treatment plants. In particular, we will build a mobile RAB system in a trailer that can be transported into on-site in either industrial facility or municipal wastewater plant.

Since the project was started in April, 2015, we have been working on the system design, development of operational protocol of the RAB system, procurement of large equipment (such as pilot-scale RAB system and the customer trailer). During the project period (April – June 2015), we have identified the major vendor (Vulcan Industry) for helping us for design and fabrication of the pilot-RAB system. We also finalized the final drawing of the customer-oriented mobile trailer system, and the bidding of this trailer is under way. As this project is still at its earlier stage, we have not obtained the quantification data for the algal growth and the wastewater treatment capacity. We expect that with the completion of the trailer system and the algal culture reactors, we will begin to generate the data regarding the cell growth on different types of wastewater.

RIF FUNDING: PROGRESS REPORT

Report Type: Interim

Title: A Novel Assay for Rapidly Identifying Bovine STEC Carriers in Feedlots

PI: Jim Reecy

Company Partners (if applicable, company names only): PathoVacs; USDA

Project Goal:

Publications/presentations based on project:

Invention disclosures: June 15th Provisional Patent Application submitted.

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

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

We have initiated the laboratory analysis of 12 additional serum samples. In short, serum samples are extracted and small molecules present are quantitated with a gas-chromatograph mass spectrometer. Based on previous work, we expect to quantitate ~400 molecules.

University of Northern Iowa
Annual Economic Development and Technology Transfer Report

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

The University of Northern Iowa (UNI) provided economic development assistance throughout all of Iowa during the past year. Focus remains on serving businesses, communities, and organizations in all 99 counties. Specific areas of service offered by UNI include: entrepreneurship, community and economic development, market research, environmental research and service, sustainability, advanced manufacturing, metal casting, and new Iowans. UNI's economic development outreach programs are housed in the Business and Community Services (BCS) division. Since 2000, BCS has engaged the entire university community in its outreach efforts including faculty, staff, students and alumni – all of whom play a critical role in *Building a Better Iowa*. Outcomes realized by key economic development/technology transfer programs during FY 2015 include:

Overall

- Provided service in all 99 counties to more than 2,800 unique business, community and local government clients with an additional 34,700 engaged in MyEnte.Net/ IASourceLink.
- Reached more than 233,000 Iowans through BCS programs and projects.
- Involved 207 faculty members and nearly 396 students in the delivery of these services and another 3,200 students were touched by BCS programs.
- Leveraged each $1 invested by the state with $5 in private grants, fees or federal funding.

Entrepreneurship, Business Incubation and Technology Transfer

- Provided job growth assistance to 84 second-stage Iowa companies through Advance Iowa, the state's certified Economic Gardening program.
- Entrepreneur participation in IASourceLink online resources, a joint program of UNI and IEDA, increased to 34,700.
- 16 new companies located in the UNI incubators.
- 67 innovators have graduated from the Innovation Incubator and 4th Street Incubator.
- The Business Concierge team provided on-demand business and market information to 1,265 businesses.
- 176 new clients were served by the UNI Small Business Development Center.
- 19 student businesses were tenants in the John Pappajohn Entrepreneurial Center's R.J. McElroy Student Business Incubator and 60 additional student entrepreneurs were assisted by the affiliate program.
- UNI faculty and staff submitted 11 new intellectual property disclosures.
- 3 patents were received and 3 new patents were filed.
- 2 new license agreements were approved and a total of 8 license agreements are currently generating income.
- Formalized an agreement with the Iowa State University Research Foundation to assess and commercialize intellectual property.

Waste Reduction, Environmental Assistance and the Bioeconomy

- Buy Fresh, Buy Local participating restaurants and institutional buyers spent $2.5 million on locally grown foods in 2015.
- The Center for Energy and Environmental Education (CEEE) created the student-led garden on UNI's campus. In the past year, the garden served 630 guests, provided 1,500 pounds of produce to UNI students, and educated 45 volunteers about gardening.
- Green Iowa AmeriCorps weatherized 490 homes and conducted 981 energy audits, saving nearly $1.8 million in utility costs.
- The Tallgrass Prairie Center (TPC) distributed native prairie seeds to 50 Iowa counties as part of its roadside vegetation project.
- The TPC launched a new program teaching restoration techniques for agricultural conservation.
- The Iowa Waste Reduction Center (IWRC) hosted five Iowa Food Waste Reduction Project workshops throughout Iowa.
- Environmental technical assistance and on-site reviews were provided to 459 small businesses.
- GeoTREE developed numerous web mapping/GIS applications that serve Iowa workforce Development, the Waterloo African American Cultural and History Museum, the Iowa Governor's STEM Advisory Council, and others.
- GeoTREE developed a series of story mapping applications in conjunction with the Geographic Alliance of Iowa.
- Recycling and reuse project funding and outreach services were provided to 13 companies and organizations.

Local Economic Development

- The Institute for Decision Making (IDM) and the Center for Business Growth & Innovation (CBGI) continue as a designated EDA University Center and expanded the regional entrepreneurship projects into a third region (Northwest Iowa).
- IDM partnered with Iowa Workforce Development for an analysis of the Skilled Iowa program and its progress across Iowa
- Community clients report creating approximately 1,500 jobs as a result of local economic development technical assistance from IDM.
- Strategic planning and comprehensive technical assistance was provided to 33 community partners and 8 regional groups across Iowa.
- IDM expanded the market for economic development training to include a six-state region through the Heartland Economic Development Course and experienced record enrollment in 2015.
- Restructuring of Iowa's regions was led by IDM in collaboration with Professional Developers of Iowa.
- Strategic Marketing Services and IDM launched Research IQ to help economic developers with advanced research and data projects.
- The New Iowan's program provided training to hundreds of law enforcement officials across the state and participated in anti-human trafficking activities.

Advanced Manufacturing & Market Research

- UNI's Metal Casting Center (MCC) provided custom 3D sand-cast mold printing services to 80 foundries and supply chain companies through its additive manufacturing program.
- The MCC worked on 26 company R&D projects and provided outreach to 30 additional foundries.
- AmericaMakes has contracted with the MCC to provide hundreds of 3D printed molds and cores.
- Market research and competitive intelligence was provided to 19 Iowa companies by Strategic Marketing Services (SMS).

Section 2. Technology Transfer and Intellectual Property

FY 2015

	UNI
Number of disclosures of intellectual property	11
Number of patent applications filed	3
Number of patents awarded	3
Number of license and option agreements executed on institutional intellectual property	2
Number of license and option agreements yielding income	8
Revenue to Iowa companies as a result of licensed technologies	$2,700,000
Number of start-up companies formed, in total and in Iowa	94/94
Number of companies in research parks and incubators	31
Number of new companies in research parks and incubators	11
Number of employees in companies in research parks and incubators	57
Royalties/license fee income	$12,776
Total sponsored funding	$38,900,000
Corporate-sponsored funding for research and economic development and revenue generation (excludes corporate philanthropy - all in Iowa)	$575,000
i. Annual appropriations for economic development ii. Regents Innovation Fund	$1,066,419 $900,000

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 2,800 unique businesses and organizations in the past year and another 34,700 individuals through the MyEntre.Net entrepreneurial development system and IASourceLink.

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

Programs	Services	Those Typically Served	FY 2014 Results	Cumulative Results
Institute for Decision Making (IDM)	Hands-on community and economic development guidance and research	Economic development organizations, chambers, city councils, communities and others	✓ Expanded the EDA University Center Regional Entrepreneurship Project into Region III (Northwest Iowa) and provided technical assistance for Region I & II ✓ Assistance and research provided to 31 community partners and 7 regional development groups ✓ Partnered with Iowa Workforce Development for Skilled Iowa Analysis – snapshot of progress by employer size based on employment and by industry both statewide and by IWD Regions ✓ In collaboration with the Iowa Business Council (IBC), the Iowa Economic Development Authority, Iowa Workforce Development and the Iowa Department of Education, assisted Home Base Iowa in developing profiles of the in-demand occupations to help returning veterans	✓ Served 735 communities, counties and organizations in nearly all of Iowa's counties to date ✓ Community clients report 1,500 – 2,000 new jobs annually as a result of IDM assistance ✓ EDA Regional Entrepreneurship Project Year 1 resulted in 108 new jobs and $2.48 million economic impact ✓ Trained over 1,884 economic development professionals
New Iowans Program (NIP)	Helping Iowa communities, service providers and businesses meet the challenges and opportunities with Iowa's diverse newcomer populations	Communities, state agencies, law enforcement agencies, health care providers, faith-based organizations and businesses	✓ Provided trainings for hundreds of law enforcement officials at the state, county and local level ✓ Under a multi-year contract to address disparities in Iowa's child welfare system ✓ Providing technical assistance for trauma-informed care in NW Iowa ✓ Involvement in anti-human trafficking activities	✓ Training and technical assistance has been provided to more than 200 Iowa companies and organizations ✓ Pioneering technical assistance on vulnerable populations in natural and technical disasters

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

Programs	Services	Those Typically Served	FY 2014 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, students, educators, restoration ecology discipline, and others	✓ Native seed distributed to 50 counties in Iowa via transportation enhancement funding ✓ Hosted Iowa Prairie Conference, 200 registered ✓ Completed revision of IRVM web page ✓ Agronomic production of *Carex* and *Asclepias* seed ✓ Published popular seed info graphic, distributed to over 900 nationwide ✓ Engaged 70 practitioners at two field workshops for prairie restoration ✓ Completed research on seed mixes for prairie biomass production	✓ More than 16,500 acres of Iowa counties rights-of-way have been restored to native vegetation ✓ Increased public knowledge regarding prairie and prairie restoration ✓ Made research information available to restoration ecology community ✓ Made 70 native species available to native seed growers
Metal Castings Center (MCC) and Center for Additive Manufacturing	Metal casting technologies, applied research, testing and training	Iowa casting users, foundries and foundry suppliers	✓ Maintained active contracts with 26 companies, provided outreach projects to four Iowa foundries and technical assistance to 30 additional foundries ✓ Developed new research area for additive manufacturing and component design ✓ Conducted DOD-sponsored research into Additive Manufacturing ✓ Developed several domestic replacements for imported materials ✓ Served 80 companies with additive manufacturing 3D printing services	✓ Over 70 industry-funded research projects have been completed to date

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

Programs	Services	Those Typically Served	FY 2014 Results	Cumulative Results
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	✓ CEEE's Reclaim Your Holidays initiative works with non-formal educators to help Iowans create more meaningful and environmentally friendly holidays. A new initiative, involving 10 Iowa partners, is giving the CEEE the tools and networks to address the environmental impact of "stuff" with new audiences ✓ CEEE's Green Iowa AmeriCorps performed 981 energy audits weatherized 490 homes, resulting in $1.8 million in utility costs, and conducted 867 education and outreach activities ✓ CEEE has an AmeriCorps VISTA Program to improve access to good food to populations in need in Northeast Iowa ✓ Buy Fresh, Buy Local participating restaurants and institutional buyers in the Black Hawk county area spent $2.5 million on locally grown foods	✓ Since 1998, CEEE's Northern Iowa Food & Farm Partnership has facilitated purchase of $20 million worth of locally grown food products from hundreds of area farmers by food vending institutions
Strategic Marketing Services (SMS)	Market research and analysis	Businesses, entrepreneurs and non-profit organizations	✓ Market research and analysis services were provided to 19 Iowa companies	✓ Since 1990, market research and analysis services have been provided to 300 Iowa companies

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

Programs	Services	Those Typically Served	FY 2014 Results	Cumulative Results
Recycling and Reuse Technology Transfer Center (RRTTC)	Recycling and by-products research, education and outreach	Serving the UNI Campus, Iowa businesses the recycling industry and Iowa citizens.	✓ Research project funding and outreach services related to recycling and reuse have been provided to 13 companies and organizations	✓ Over 50 RRTTC funded research projects. Over 170 reports and publications available ✓ Outreach and services provided to more than 9,350 individuals this year, including the UNI campus, Iowa business & industry, K-12 students and teachers, and Iowa citizens
Iowa Waste Reduction Center (IWRC)	Free, confidential, non-regulatory environmental assistance for small businesses	Small businesses throughout Iowa	✓ Environmental technical assistance and on-site reviews were provided to 459 small businesses ✓ Conducted 17 state, regional and/or national presentations related to waste reduction ✓ Provided direct or satellite painter training to 448 military and contractors ✓ Provided 17 industrial-related painter training courses with a total of 215 participants ✓ Sold 21 Virtual Paint training systems (including 17 operator training classes and 2 remote install sessions) and 19 hardware/software upgrades	✓ Provided 5,748 on-site reviews to Iowa small businesses ✓ Provided 3,030 military/contractor painter certification or re-certification since 2003

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

Programs	Services	Those Typically Served	FY 2014 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), UNI Faculty, staff, and groups	✓ Developed numerous web mapping/GIS applications that serve the UNI Center for Educational Transformation, the Waterloo African American Cultural and History Museum, the Iowa Governor's STEM Advisory Council, and the Iowa Integrated Roadside Vegetation Management Program ✓ Supported 8 week Summer Interdisciplinary Research Experience in Hyperspectral Imaging ✓ Developed a web mapping application for Iowa Workforce Development as well as a map book ✓ Began work on mapping solar potential for entire state of Iowa using LIDAR data and GIS based on grant funding from the Iowa Economic Development Authority's Energy Office	✓ Delivered greater than 100 terabytes of geospatial data throughout all counties in Iowa ✓ Provided free geospatial software tools downloaded by users throughout Iowa and the world ✓ Developed numerous web mapping and GIS applications used throughout Iowa ✓ GeoTREE has provided more than 20 training and educational workshops for hundreds of federal, state, local and tribal government staff members

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

Programs	Services	Those Typically Served	FY 2014 Results	Cumulative Results
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	✓ 2,531 businesses and individuals were assisted through all JPEC programs ✓ 19 student business owner were provided space and services in the student business incubator and 60 student business owners were provided services as affiliates ✓ 27 people participated in UNI's first two Venture Schools ✓ 13 MBA students were taught in the new Professional Consulting for the MBA course (MGMT 6280) ✓ Five company projects were completed by the MKTG 3586 Entrepreneurial Strategy student teams ✓ Eight UNI centers were assisted with their business and financial sustainability planning ✓ 85 students, faculty, staff, and community people participated in the first Cedar Valley Start-Up Weekend	✓ The JPEC has provided 56 students with internships through its CIPCO program since FY '05 ✓ The JPEC Student Business Incubator has provided space to more than 75 business owners since FY '05 ✓ The JPEC has consulted with 562 faculty and staff from colleges and universities from around the U.S. and the world on student business incubation since FY '08 ✓ Since FY '13, 1,255 students have learned about and crafted an elevator pitch ✓ Since FY '11, 32 businesses and non-profits have had their projects completed by Entrepreneurial Strategy (MKTG 3586) students

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

Programs	Services	Those Typically Served	FY 2014 Results	Cumulative Results
Center for Business Growth and Innovation, Small Business Development Center, Advance Iowa	Rural/ Urban Entrepreneurship development, online entrepreneurship resources, business consulting, business training, business incubation	Small businesses and their owners, entrepreneurs, entrepreneurial service providers, community leaders	✓ 36,336 Iowans were served in FY '15 by a CBGI program or online resource ✓ The statewide Advance Iowa program served 84 mid-sized existing Iowa companies with advanced research and technical assistance ✓ There were a total of 2,053 attendees at one of 19 live webinars. Average attendance per webinar was 114 ✓ The Iowa Business Concierge provided business intelligence to 1,265 small businesses through 3,387 hours of research ✓ 952 attendees participated at the 8th annual EntreFEST in Iowa City ✓ Dream Big Grow Here attracted 119 contestants from all of Iowa's counties ✓ 896 small business owners from 93 Iowa counties participated in the 2015 Iowa Small Business Survey ✓ 15 companies were served in the Innovation Incubator. ✓ UNI SBDC served 176 small business owners with 1:1 technical assistance	✓ IASourcelink.com add 22,454 new users in FY '15, a total of 64,366 users since it launched. It continues to touch 9,456 users monthly ✓ 8,261 small businesses attended a Webinar since 2003 ✓ 67 businesses have graduated from the RBC and Innovation Incubators ✓ The Innovation Incubator has generated 116 FTE jobs since inception ✓ CBGI's online social media reaches to15,909across Facebook, LinkedIn, Twitter and Pinterest

Section 4: Regents Innovation Funding Report

UNI's 2015 Regents Innovation Funding Annual Report has been submitted as an attachment to this report.

Section 5: Collaborative Projects

Each year, UNI works closely with the other Regent institutions and state and federal agencies on collaborative projects. The following projects represent a sampling of these collaborative projects.

Metal Casting Center (MCC) Collaborates with Ames Laboratory, ISU and UI

- The MCC is collaborating with the Iowa Innovation Corporation and Ames Lab at Iowa State University to investigate the characterization and assistance in the commercialization of spray atomized metal powders for direct metal laser sintering. The MCC is collaborating with the University of Iowa, University of Michigan and Caterpillar tractor on a project funded by the US Department of Energy.

Institute for Decision Making (IDM) Collaborates with Western Iowa Tech Community College, Iowa Workforce Development, Iowa Business Council, Iowa Economic Development Authority, and Iowa Department of Education

- *Marketing Effort to Latino/Spanish Speaking Entrepreneurs*
  IDM collaborated with Western Iowa Tech Community College Small Business Development Center and SCORE of Sioux City to develop a promotional effort to Latino/Spanish speaking entrepreneurs in Woodbury, Monona and Plymouth Counties. The poster developed directs business owners to contact the WIT SBDC to access needed services. The piece also directs business owners to SCORE's online resources that are available in Spanish.

- *Analysis Of Employer Participation In Skilled Iowa*
  IDM assisted Iowa Workforce Development (IWD) understand the current status of statewide participation in the Skilled Iowa Program since its launch in June 2012. The analysis was conducted utilizing employer participation data from the Skilled Iowa Program and Quarterly Census of Employment and Wages (QCEW) data. The report IDM produced provided a current snapshot of progress by employer size based on employment and by industry both statewide and by IWD Regions. The analysis will assist IWD identify IWD regions which may have best practices that can be shared on how to target employers or industries. As part of the project, IDM worked with Geoinformatics Training, Research, Education, and Extension Center (GeoTREE) at UNI to develop a web mapping application for IWD which enables them to visually display employer participation data and monitor long-term changes that may result from IWD's continual improvement of the Skilled Iowa Program.

- *Home Base Iowa*
  IDM, in collaboration with the Iowa Business Council (IBC), the Iowa Economic Development Authority, Iowa Workforce Development and the Iowa Department of Education, is assisting Home Base Iowa in developing profiles of the in-demand occupations of IBC member businesses and marketing information on how those positions match with occupations in the military branches. The objective of this project is to help returning veterans identify potential employment opportunities in Iowa.

Center for Energy and Environmental Education (CEEE) Collaborated on projects with ISU and UI.

- CEEE's new initiative "Stuff" Amplification project is collaborating with UI's Dave Gould, Leisure Studies; CEEE's Reclaim Your Holidays project is collaborating with ISU extension specialists. The on-going initiative seeks to address the need to develop cultural strategies to live meaningful lives while consuming differently. Workshops for teachers and community members are common activities of this initiative.

- CEEE and ISU Extension are working closely together on local food initiatives in Region 9 Extension, which includes Black Hawk and surrounding counties. UNI and ISU Extension have jointly funded a local food coordinator to expand local markets for local agricultural products among institutional buyers, and make locally grown foods visible to the residents of the region.

Center for Business Growth and Innovation (CBGI) Partnerships Key to Success

- IASourceLink: The UNI and Iowa Economic Development Authority IASourceLink partnership continues to deliver one of the most content rich and highly utilized SourceLink models in the nation to Iowa business owners. Efforts to collaborate continue with other state and national resource partners that assist in this program. Co-contributors include ISED Ventures, Women's Business Center, Iowa Department of Revenue, Iowa Commission on the Status of Women, Iowa Innovation Corporation, Technology Association of Iowa, Pappajohn Entrepreneurial Center, Connect Iowa, Iowa Waste Reduction Center, U.S. SourceLink, U.S. Small Business Administration, Iowa Small Business Development Centers, Iowa Farm Bureau/Renew Rural Iowa, Iowa Area Development Group, Iowa Association of Business and Industry, BizStarts, and more. In FY2015, 22,454 visitors sought information and business assistance with 1,265 direct interactions with Iowa business owners via the Iowa Business Concierge services. Additionally, 18 UNI MyEntre.Net powered webinars made available on IASourecLink have attracted 2,053 attendees – an average of 114 business owner attendees per online presentation.

- Dream Big Grow Here: UNI Center for Business Growth and Innovation, the Iowa Bankers Association, VentureNet Iowa, Renew Rural Iowa, the Iowa Economic Development Authority, Veridan Credit Union, and Advance Iowa partnered to conduct the fourth annual Dream Big Grow Here contest. The fourth year contest generated close to one million visitors and tens of

thousands of online votes and comments supporting Iowa small business owners. The contests represented all Iowa counties. The 119 contestants competed for $40,000 in awarded prize money.

UNI programs partner with the University of Iowa to deliver Venture School

- The UNI Center for Business Growth and Innovation and the UNI John Pappajohn Center partnered with UI John Pappajohn Center to deliver two sections of Venture School on the UNI campus. Nine companies participated in the eight-week lean launch approach, which is focused on customer discovery and preparing a business canvas model.

Intellectual Property Collaboration

- UNI's John Pappajohn Entrepreneurial Center and Research Foundation signed a formal collaboration agreement with the ISU Research Foundation to assess, co-develop, and commercialize intellectual property developed by UNI faculty and staff. A complete revenue sharing model has been development. ISU has been assessing UNI's intellectual property and is ready to move forward to protect and commercialize some UNI technologies.

GeoTREE Center Partners with University of Iowa and Iowa State University on the Wind Energy Platform

- The GeoTREE Center is working in collaboration with the University of Iowa and Iowa State University as part of the Iowa NSF EPSCOR program. As part of this collaboration the GeoTREE Center is working on the Wind Energy Platform. GeoTREE Center staff have begun developing a web-based Geographic Information System (GIS) application for providing decision support system capabilities for wind farm/turbine siting.

- In another project, the GeoTREE Center developed a map book series and a web mapping application in collaboration with UNI Business and Community Services and Iowa Workforce Development. The map series and web mapping application are for internal decision support services.

Iowa Waste Reduction Center (IWRC) Collaborates with State and National Partners

- Funded by the Iowa DNR, the IWRC developed a comprehensive, first-of-its-kind study that documented food waste generated from Iowa's industrial, commercial and institutional (ICI) sectors. This project identified 12,367 ICI food waste generators and surveyed 641 to document generation characteristics and calculate food waste generation rates. All of the information was then organized into a Microsoft Access Database to make it easily accessible and provide a stable format to store the data. Using the database allows users the capability to view pre-generated reports and to query the database in order to extract specific generator data when needed.

- The IWRC is working on a Rural Utilities Service (RUS), USDA grant funded project to promote food waste composting in rural counties throughout Iowa that meet both population and median household income criteria. The project is targeting both landfills and the general public through on-site technical training and regulatory assistance related to composting food waste. In addition, the project has created fact sheets, guides, regulatory summaries and videos that have been added to the IWRC's website and distributed during on-site visits. The main goal of the project is to reduce the amount of food waste discarded in Iowa landfills by assisting landfills and the general public in expanding or implementing composting operations.

Strategic Marketing Services (SMS) Partners with Iowa Companies

- Strategic Marketing Services leveraged its Regents Innovation Fund (RIF) allocation to market a branded market research program, MarketSolve. The Iowa Soybean Association benefited by gaining insight into the level of knowledge possessed by residents of the upper Cedar River watershed about topics concerning conservation and water quality. Through SMS's research protocol, the ISA was able to: 1) determine if residents in specific geographic areas believed water quality improvement initiatives were worthwhile; and 2) gauge residents' knowledge of the complex issues involved and the potential solutions available.

Section 6. Suggestions for New or Expanded Programs to Enhance UNI's Impact in Iowa

UNI proposes a combination of new and expanded initiatives to support entrepreneurs and small businesses. Our primary focus is to enhance existing programs that have proven to be effective in building vitality for Iowa's economy. Direct assistance will be provided to entrepreneurs and small businesses in all regions of Iowa and will build on the momentum in Iowa being recognized as a supportive place to start and grow a business. A brief description of the key initiatives are outlined below.

1) Advance Iowa (AI) – The Battelle Memorial Institute has outlined economic development strategies for Iowa and specifically recommended expanding AI (second stage company support) as a strategic priority in the recently released "Economic Development Roadmap for Iowa." UNI's AI program is endorsed by the Iowa Economic Development Authority as Iowa's economic gardening hub. Second stage companies are defined as having 10-99 employees and at least $1 million in sales and are responsible for a significant number of newly created jobs positively impacting our local and state economy. With assistance from AI, Iowa's second stage companies can begin to enter the growth curve and to develop and expand into national and global markets. UNI's AI program has experienced success in delivering strategic assistance and support to 84 Iowa second stage companies in the past year. Additional funding is required to expand the service delivery channel by modestly increasing the staffing capacity through designated regional representatives and supporting entrepreneur roundtables. These expanded efforts will target companies within the state that have the greatest potential for job growth.

2) Business Concierge (BC) –Small business owners need access to business intelligence, connectivity to service and support providers, and timely feedback and guidance. The BC has a tested statewide system of providing direct support to 1,265 entrepreneurs in Fiscal Year 2015, connecting them to follow on service providers. This unique award winning program has received national recognition from major economic development trade associations and other peer organizations. We propose adding three new initiatives within the BC program to more than double the number of small businesses served each year. First, the BC will review business ideas and provide feedback earlier in their development cycle from several statewide support professionals through the use of a technological connectivity solution. The second new initiative will be to create a Service Provider Support service where BC services will be offered directly to support the staff of these organizations who frequently operate with limited resources, but are expected to provide support services to local entrepreneurs looking to increase the profitability and scalability of their businesses. Third, the BC will pilot a focused interaction with female entrepreneurs for greater awareness of BC services with the intent of addressing Iowa's low ranking in female entrepreneurship. Connections will also be made to effective programs such as IA SourceLink and the UNI AppsLab.

3) Additive Manufacturing – Supporting the foundry industry has long been a unique service of the UNI Metal Casting Center. The installation of a large-format 3D sand mold printer has placed UNI in a unique position to help more than 80 companies in the castings industry innovate. However, small- and medium-sized foundries and pattern shops in Iowa need technical assistance prior to effectively using 3D printing technologies. CAD designs and virtual reality modeling are needed for these companies to effectively integrate 3D printing into their operations. The UNI Metal Casting Center is currently partnering with Hawkeye Community College to develop a design center to serve basic industry design needs for 3D printing. With additional investment, the design center can expand services through community college partnerships to provide industry-wide employee training in advanced design techniques and software utilization. Both company employees and students will be provided tailored training to become effective designers and substantially enhance the Iowa workforce. Design services can also be offered remotely to community colleges across Iowa. This expansion of services and partnerships is yet another step toward the UNI Metal Casting Center becoming the premier Additive Manufacturing Center in the United States.