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BATTELLE PLATFORM PROPOSALS

Action Requested: Consider approval of the universities' Battelle Platform Proposals to be forwarded to the Technology and Commercialization Resources Organization (TCRO).

Executive Summary: House File 2782 appropriated \$8.2 million to the Board of Regents to fund research and commercialization projects related to the Battelle Foundation key platform areas of biosciences, advanced manufacturing and information technology. The legislation also created the Technology and Commercialization Resources Organization (TCRO) to review proposed projects prior to final approval by the Board of Regents. The universities have proposed allocating the \$8.2 million in the following way:

SUI: \$3.69 million

ISU: \$3.69 million

UNI: \$820,000

Through campus-wide solicitation or request-for-proposal processes, the universities have identified several research and commercialization projects in the key Battelle platform areas. Though HF 2782 does not require matching cost share for the platform projects, a majority of the proposals include substantial cost share from the universities, private companies, or other sources.

The proposed projects are summarized in the Attachment. Copies of the full proposals are available at the Board of Regents office.

Project proposals approved by the Board of Regents will be forwarded to the TCRO for review. The TCRO held an organizational meeting on July 18. TCRO Board members agreed to review the universities' Battelle platform proposals and provide recommendations to the Board of Regents in time for final approval by the Regents at the September 27-28, 2006, meeting.

University of Iowa Battelle Platform Proposals – \$3.69 million

The University of Iowa created a 14-person panel review process to select proposals presenting the best opportunity for economic impact in Iowa. Thirty-five proposals were received and nine were selected by the university and are submitted to the Board of Regents for consideration. The panel recommended seven receive funding as requested and one to receive funding for one year. In addition, one proposal was selected which will enhance the university's capability to support bioscience startup companies and to attract small- and medium-sized pharmaceutical and biotechnology companies. Five of the eight proposals clearly stated the intention to form a new company in Iowa while another proposal is in partnership with an existing Iowa company. Two other proposals do not have a defined commercialization pathway but were selected based on the magnitude of the impact of the projects on human health and the size of the potential market. The nine proposals are summarized below:

Commercialization of Santos, A Human Simulation Environment: \$370,000

This proposal is aimed at commercialization of cutting-edge research resulting from the Iowa Virtual Soldier Research (VSR) which has produced a human simulation environment called Santos. The funding requested would advance the Santos software from a research tool to a commercial product. To date, private industry partners have included Caterpillar, Rockwell-Collins, Lockheed-Martin, Ford, General Motors and others. A private company, Dynamo, Inc. will provide human modeling and simulation to aerospace, automotive, construction equipment, manufacturing and other industry sectors. The company projects to create 15 new jobs in the first two years and generate \$131 million in revenue by 2012. Another large company currently involved in marketing similar products has contacted the VSR team regarding licensing the technology. The proposal budget identifies cost-share equal to the grant request, including a commitment by Rockwell-Collins to cost-share for a senior software engineer for the project.

Development of Ad5-TRAIL as a Cancer Therapeutic: \$400,000

A group of SUI researchers has received a patent on a new approach to prostate cancer treatment and has received Food and Drug Administration approval to conduct human clinical trials. This proposal will allow the researchers to conduct those trials by funding production of doses of the drug which previous studies have shown causes the death of prostate tumor cells but not normal prostate cells. The product has the potential to be used across a wide range of cancers. The researchers are consulting with the John Pappajohn Entrepreneurial Center about the formation of a startup company to develop the Ad5-TRAIL drug further.

Designing Transgenic Cells for Biomedical Applications: \$400,000

Two SUI researchers have developed technologies that enhance the ability to target particular genes related to the eventual development of specific diseases. Their intent is to develop drugs or other therapies based on this discovery that could prevent genes from expressing in a manner that results in diseases such as diabetes, heart, vascular, Parkinsons and cancer. The requested funding will be used to produce disease model cell lines based on the technology. A new biotechnology startup company called Repgenix is proposed as a vehicle to commercialize the initial products which would be new proprietary disease model cell lines. These cell lines would also be used in developing animal models from specific species that closely replicate human diseases. Iowa companies which are currently partners in the project include iPIG and TransOva Genetics of Sioux Center, IA which have committed to partner with Repgenix in production of porcine models for cardiovascular and other disease models. Repgenix will generate immediate demand for its cell products by targeting genes for which large research markets exist. The proposal budget identifies cost share of \$628,500 in addition to the \$400,000 request.

Porcine Models of Human Disease: \$400,000

An SUI researcher proposes to establish a new company, iPIG, which will create, breed and sell swine that can be used as models to replicate human diseases. Mice are often used as disease models but are not adequate for certain diseases, which the researcher believes creates a very large market for an alternative animal model. The researcher has already developed a porcine model for cystic fibrosis. Potential customers include the pharmaceutical industry, research institutions and disease-focused foundations. Sioux Center, Iowa-based TransOva Genetics is actively exploring a partnership with iPIG. The iPIG company is also partnering with an Iowa startup company called Repgenix (see above). The proposal budget identifies \$200,000 in Year One cost share in addition to the \$400,000 request.

Development of Peptides for Diagnosis and Therapy of Cancer: \$400,000

A group of SUI researchers proposes to establish a new Iowa company in conjunction with an existing Missouri-based company, BioSynthema, to synthesize and test novel peptide-based products used in the diagnosis and treatment of neuroendocrine cancers and other diseases. The commercial potential for the new company is believed to be significant because there are currently no other facilities in the United States which can prepare dosage forms of these products for testing. The company is expected to generate short term revenue by providing testing and synthesis services to clients but the long-term commercialization potential is believed to be with patents filed for particularly promising peptides. The company's capacity to synthesize these products meeting FDA guidelines is expected to be a significant factor in allowing Iowa to attract and retain new small- to medium-sized pharmaceutical and biotechnology companies to the state. The proposal budget identifies \$627,000 in cost share in addition to the \$400,000 request.

Iowa Neuro-Musculoskeletal Therapeutic Training System (TNMTS): \$130,000

The TNMTS, invented and patented by a SUI researcher, treats patients with central nervous system diseases by applying highly-controlled therapeutic stress to their limbs, eliminating bone and muscle loss thereby improving the patient's quality of life. The funding requested will allow the company to perform additional clinical studies and prove its capabilities in preventing anterior cruciate ligament (ACL) injuries in athletes. The funding will also be used to further improve the product's computer control system, patient interface and software support. The researcher proposes to form a new company, Intell-Ex, that will work with an existing Iowa company, Stand-Aid, to commercialize the product. The two companies project \$100 million in gross sales in the first five years. The proposal budget identifies \$112,000 in cost share in addition to the \$130,000 request.

Iowa Imaging-based Multicenter Trials Organization (I-IMTO): \$400,000

A group of SUI researchers and an Iowa biotechnology company, VIDA Diagnostics, propose to develop and market an in-house lung analysis operation at VIDA that will win contracts for drug and device trials and develop a pay-per-use model of operations. VIDA is a SUI licensee and startup company. The funding requested will allow development of a service model component that will subcontract with pharmaceutical and medical device companies conducting FDA trials. It is believed this proposal will help ensure the commercialization of these products within Iowa, assist in growth of the company and enhance the retention of scientists trained at SUI who might otherwise work out of the state. Centering these new services in Iowa is also expected to attract new developmental and clinical trials to the University of Iowa. VIDA currently has leads with several major pharmaceutical companies which are trial users of the company's software. The company has \$850,000 in federal Small Business Innovation Research (SBIR) funding for research and development. The proposal budget identifies \$400,000 in cost share in addition to the \$400,000 request.

Design and Testing of Novel Toll-like Receptor (TLR) 4-directed Immunomodulators: \$100,000

Toll-like Receptors (TLR) in the body are a crucial defense against infection. New drugs are needed to increase or decrease TLR function in a predictable way in the body. A group of SUI researchers has discovered that particular toxin molecules combined with a protein directly activate the specific TLR-4. The discovery has been patented and is believed to have the potential to enhance immunity against serious infections, such as those caused by bioterrorist weapons. Variants can also suppress an overwhelmingly fatal immune reaction and be used to treat inflammatory bowel disease and bone marrow transplant rejections. The group proposes to use Battelle funding to purify, develop and test these new molecules. While no new company is currently proposed to be formed, the researchers believe the market potential is high pending successful testing and point to a recent \$300 million acquisition of another company's similar drug platform line by Glaxo-SmithKline. The proposal budget identifies cost share of \$100,000 in addition to the \$100,000 request.

Build-out of Space in Myriad Two Building in the Oakdale Research Park: \$1 million

The SUI Office of Vice-President for Research proposes to use \$1 million in Battelle platform funding to build out 7,200 square feet of space in the Myriad Two Building at the Oakdale Research Park. The space will allow SUI to provide temporary space for a California company, Dermacia/NGI, to begin operations in Iowa until more permanent space is constructed for the company. Dermacia/NGI is a wound healing and skin products company which projects 178 jobs and a payroll of \$7.7 million within three years of beginning operations at the Research Park. After Dermacia/NGI vacates the facility, it will be used by the SUI College of Pharmacy's Center for Advanced Drug Development (CADD). The University believes the CADD is central to its efforts to attract small- and medium-sized pharmaceutical and biotechnology companies to Iowa. The facility would be co-located with the Center for Biocatalysis and Bioprocessing (CBB). Together, it is believed the CADD and the CBB present a powerful capability for development of drugs and drug delivery systems and will serve as a magnet for small- and medium-sized companies. The university is also requesting \$1.4 million in Battelle infrastructure funding for the purchase and fit out of the building (see Agenda Item 2c and Agenda Item 3e).

Iowa State University Battelle Platform Proposals – \$3.69 million

Iowa State University has submitted six proposals for Battelle platform funding, four of them related to biosciences, one to information technology and one to advanced manufacturing. The proposals total \$3.69 million. The ISU proposals also identify Battelle infrastructure requests for several of the projects which will be outlined in Agenda Item 2c.

The platform proposals are focused on advancing specific research and commercialization priorities as well as establishing collaborations with business partners. The Vice-Provost for Research and commercialization staff will meet monthly with project leaders to assess project progress and to assess new business opportunities which may result from research and collaboration. The proposals being submitted are summarized below.

Bioeconomy Platform Proposals: \$710,000

Projects submitted in this category are focused on research leading to advancements in energy production, new fuels, lubricants and other materials from biorenewable crops grown in Iowa. Individual projects proposed for funding under this category are:

- Syngas production and clean up
- Enhancing gas-liquid mass transfer
- Syngas fermentation pilot facility
- Ethanol production by combined fermentation and chemical synthesis
- Functional genomics for syngas fermentation
- Developing stable bio-oils from fast pyrolysis

Under these proposals, ISU will establish a syngas fermentation pilot facility and, in partnership with the National Ag Based Lubricants center at the University of Northern Iowa, a bio-oils laboratory and fast pyrolysis reactor.

ISU believes the research conducted will be of significant commercial value to industry and include letters of interest and support of the projects from Cargill, Archer Daniels Midland and Frontline Energy of Ames. The project leader anticipates the greatest near-term commercialization opportunities from Frontline Energy which already has \$10 million in contracts with private companies for biomass gasification installations.

The projects have attracted significant private financial support. Mr. John Pappajohn's firm Equity Dynamics, Inc. has committed \$1.1 million to these specific bioeconomy proposals.

In addition to Battelle platform funding, ISU is requesting \$390,000 in Battelle infrastructure funding for these projects (See Agenda Item 2c).

Advanced Food and Feed Proposals: \$1.006 million

ISU is proposing to use \$1.006 million in Battelle platform funding for specific projects in the area of Advanced Feed and Food. The projects will be conducted in collaboration with the ISU Nutrition and Wellness Research Center (NWRC) which has previously received funding from the Iowa Department of Economic Development through the Bioscience Alliance of Iowa. The projects will focus on the development of novel carbohydrates from Iowa commodities for food applications, such as Resistant Starch (RS) and Slowly Digested Starch (SDS) which have potential impact on human diseases such as heart disease and diabetes related to nutrition and weight control.

The funding requested will be used to establish a core facility and provide faculty startup packages within the NWRC to house five specific projects which are summarized below. All five projects have significant industry or federal support. Patentable technologies are expected from at least three of the projects and researchers in one project are currently developing a startup company.

Matching funds totaling \$1.334 million will be provided by grants from the U.S. Department of Energy, the U.S. Department of Agriculture and by private industry.

Designing Corn Lines With Resistant Starch to Produce Ethnic Foods with Health Benefits

This project will be conducted in conjunction with Genetic Enterprises International of Johnston, Iowa, to develop ethnic foods such as tortillas with RS that could reduce the impact on weight control related diseases.

Flaxseed Lignans for Health

Lignans in crops such as flax have been shown to reduce cholesterol. This project seeks to quantify the impact of flaxseed lignans on cholesterol. A total of \$100,000 in cash and in-kind contributions for the project are being provided by Archer Daniels Midland company.

Role of Complex Carbohydrates from Soybeans on Inflammatory Bowel Disease (IBD)

This project is an extension of a currently funded project with the Solae company, a division of Dupont, and the Midwest Advanced Food Manufacturing Alliance.

Develop RS and SDS from Cornstarch Through Processing

An ISU research team has developed and is pursuing a patent on processing technology to produce starch which is 60% resistant to enzyme digestion. The goal of this project is to use the process to develop novel starches from normal starches and commercialize the starches with industry partners. The current U.S. market for RS and SDS type starches is \$100 million annually and three starch and grain processing companies have expressed strong interest in the project results.

New RS and SDS from Corn Through Plant Biotechnology

This project proposes to test and analyze the impact of RS and SDS on human diseases such as colon cancer and cardiovascular disease. Such starches have significant potential uses in baked goods and other starch-containing food items. The researchers have also recently identified specific genetic lines of corn that produce novel SDS. Two ISU researchers are forming a company to produce and market alternative starch forms and will be a commercial partner in the project.

Biosecurity Proposals: \$450,000

ISU proposes allocating \$450,000 for two primary projects in the area of biosecurity. The goal of the projects is to protect plant, animal and human health through development of new products and technologies. The projects are summarized below:

Natural Antimicrobials and Prebiotic Discovery Initiatives

ISU proposes to develop the first high throughput discovery initiative to focus on bioactive molecule discovery for food systems. ISU researchers have recently discovered natural antimicrobial molecules that control Listeria, an important food safety concern. The project will include research to determine if the molecules have impact on other important food safety issues such as salmonella. The researchers have patented one of the molecules, methanobactin. Another is from grapeseed extract. The researchers propose to commercialize the discovery and believe a significant market exists in the meat industry for use of natural antimicrobials to enhance food safety in the 200 billion pound case-ready meat industry. Kemin Industries of Des Moines has committed \$75,000 in in-kind support. Ag Resources Development Group of Ames has committed \$33,600 in in-kind support.

Iowa Livestock Traceability Project

The ability to trace the origin of livestock in the meat industry is of rapidly growing concern. The use of sophisticated computer equipment could dramatically improve the efficiency and accuracy of livestock traceback from the farm to the eventual consumer. Currently, beef calves sold in Iowa for which specific attributes can be confirmed and traced command a \$6 per hundredweight premium. The Iowa Livestock Traceability Project (ILTP) at ISU was begun with support from the Iowa Veterinary Medical Association. Researchers propose to expand the pilot testing of the ILTP, develop additional software and electronic tracking devices, integrate the ILTP with the USDA National Animal Identification System and explore branding opportunities for the ILTP with private industry. Software has already been prototyped in conjunction with Ames-based Global VetLink. Industry and other matching funds for the project include:

- Global VetLink: \$185,000 cash and in-kind
- Iowa Farm Bureau Federation: \$10,000 in-kind
- University of Northern Iowa (for computer training): \$35,000 in-kind.

In addition to the \$450,000 Battelle platform request, the project budget identifies \$427,798 in matching funds from ISU and \$339,110 in matching funds from industry and other sources such as federal grants. ISU also proposes an allocation of \$271,000 in Battelle infrastructure funds (See Agenda Item 2c).

Animal Systems Proposals: \$573,000

ISU proposes to use \$620,000 in Battelle platform funding for two projects related to the development of large animal genomic models for human and animal health. The projects propose to develop animal models for disease research which can be marketed to companies and scientific institutions for drug testing and food safety applications. The researchers indicate they intend to attempt a startup company to market the new animal models. The two projects relate to neurological and ophthalmological diseases and cellular physiology of fat cells.

A research group proposes to develop enzyme, gene therapy and canine and feline stem cell treatments for animal and human diseases and to develop non-invasive screening technologies for transmissible spongiform encephalopathies (TSEs). The project will also develop several proprietary animal models that have application in understanding fat cell physiology in humans which can be marketed to the private and scientific sector for research and treatment therapies. The project has attracted significant interest from several pharmaceutical companies.

The project budget identifies industry matching funding of \$131,233, ISU matching funding of \$198,832 and federal and other matching funding of \$937,914. The researchers also request \$47,000 in Battelle infrastructure funding (See Agenda Item 2c).

Information Technology: \$650,000

ISU proposes \$650,000 in Battelle platform funding to create an Information Science Technology Institute (ISTI). The ISTI will be housed in the former Engineering Animation facility at the ISU Research Park and will be the focus of collaborative programs with six existing information technology research and development centers at ISU. Research at these existing centers has already resulted in 11 startup companies in recent years. Researchers have established a goal for the project of attracting \$1 million in outside funding and the creation of at least six new startup information technology companies within five years. The ISTI will focus on development of collaborative research and development initiatives with private industry in areas such as Virtual Reality. Private companies including John Deere, Principal Financial Group, Rockwell-Collins, FakeSpace and Lockheed Martin and the United States Air Force have expressed interest in the development of the ISTI and already provide several million dollars worth of grants and other support for research projects in the six existing IT centers.

The project budget includes a Battelle platform request of \$650,000 and identifies \$103,743 in ISU matching funds and \$2.353 million in industry matching funds. The researchers also request \$350,000 in Battelle infrastructure funding (See Agenda Item 2c).

Advanced Manufacturing: \$300,000

ISU proposes to allocate \$300,000 in Battelle platform funding to two initiatives in advanced manufacturing which will be coordinated with existing industry outreach programs such as the Center for Industrial Research and Service and the Manufacturing Extension Partnership. The projects are aimed at assisting private companies with critical training to improve their efficiency and product design and production.

Under the first initiative, ISU will develop a supply chain team to assist companies in analyzing their supply chain links and logistics to identify areas for improvement. The second initiative will develop an innovation team to provide Iowa manufacturers with training on new processes and techniques for product design and production.

The proposal budget includes a request for \$300,000 in Battelle platform funding, and identifies ISU matching funds of \$73,943 and industry and other matching funds of \$226,000.

University of Northern Iowa Battelle Platform Proposals – \$820,000

Eight projects at the University of Northern Iowa totaling \$820,000 have been selected as having the greatest potential to result in commercialization and contribute to economic development in Iowa. UNI proposes to accelerate six additional projects by providing limited support for faculty-student collaborations that have significant potential for developing into commercializable ventures in the future. The proposals are summarized below.

Ethanol and Biodiesel Byproducts as Base Oils for Biobased Industrial Lubricants: \$120,247

Lou Honary (UNI faculty and Director of the National Ag Based Lubricants program) and colleagues will test byproducts from ethanol and biodiesel production as new sources of base oils for manufacturing biobased industrial lubricants. There are nearly two dozen ethanol plants in Iowa producing corn byproducts containing corn oil which are presently marketed as livestock feed for an average of three cents per pound. Research conducted will help determine if corn oil is a viable alternative to soybean oil for production of higher value industrial lubricants. The group expects to develop new commercially viable products to complement their soy-based products currently on the market. Industry partners in the project include Golden Grain Energy of Mason City and West Central of Ralston, both of which have committed in-kind support, and Environmental Lubricants Manufacturing of Waverly. It is the intention of the research group to work closely with Iowa State University's Center for Crops Utilization and the Biorenewables Resources and Technology program. The proposal budget identifies cost share of \$136,036 in addition to the \$120,247 requested.

Development and Commercialization of a Foundry Binder System from Biobased Feedstock: \$71,512

The UNI Metal Casting Center (MCC) proposes to develop an advanced system for using a biobased polysaccharide/furfural alcohol material for binding sand cores used by foundries to cast metal. These biobased binders are made from biorenewable materials and are much less toxic to the environment which will reduce costs for the foundry industry. The MCC proposes to use the Battelle funds for advanced testing and introduction to industry and expects to have produced a salable product within 12 months. The use of petroleum-based foundry binders is currently a \$1 billion market worldwide and Iowa currently has a number of both large and small foundries. The Center has developed partnerships with two major foundry binder companies, Ashland Specialty Chemicals and H.A. International. In addition, Alpha Foundry Resins has agreed to assist the research with in-kind support. Each of these companies expects to license the technology when available. Bender Foundry Service has donated equipment and services in excess of \$34,000. The proposal budget includes this as a total cost-share of \$77,583 in addition to the request of \$71,512.

Robotics-deployed Detection of Biological Agents: \$136,875

A group of UNI researchers proposes to design and develop robotics-deployed detection systems for sensing the presence of dangerous bio-agents, such as anthrax spores. Robotics-based systems can dramatically improve the safety of personnel and first responders in dangerous situations, both military and non-military. Project funding will be used to develop initial prototypes for testing. Cedar Rapids-based Rockwell-Collins has committed to in-kind consultations and advising on advanced communication, navigation and control aspects of the project. The proposal budget identifies \$94,474 in cost share in addition to the \$136,875 request.

Commercialization of Protein Structure Prediction Technology: \$58,767

The goal of this project is to develop novel and improved methods for computational protein structure determination from the sequence of amino acids. The technology could dramatically reduce the cost borne by university and industry researchers to determine the three-dimensional structures of a wide variety of proteins. The final product is expected to be a software package for protein structure modeling that will be commercialized in collaboration with two Iowa-based

companies, Pharmacom, Inc. and Bio:Neos which will be providing \$38,000 in cost share. The proposal budget includes this in a total of \$66,000 in cost share in addition to the request of \$58,767.

Identifying Drought Tolerance Genes in the Reproductive Structure of Barley: \$169,997

The proposal would accelerate research to discover specific genes in barley to be used by Iowa-based companies to develop drought tolerant crops. The researchers recently received a U.S. Barley Genome Project grant to fund a collaborative research effort with Iowa State University and the University of California-Riverside. The proposal budget identifies \$15,000 in cost share in addition to the \$169,997 request.

Commercial Computing Grids: \$64,933

The proposal would create a shared pool of research and computational resources to provide academics and industry with an accessible, secure and scalable computing infrastructure to accelerate scientific discovery and form the platform for future economic development in financial services, engineering and biotechnology industries in Iowa. Currently, companies are required to purchase or lease equipment for their computing needs. Utilizing a grid computing environment as proposed would allow companies to use the resources they need on a demand-basis. The proposal would fund hardware and infrastructure as well as salary for personnel to support the project. The researchers expect to market the service to Iowa companies with large computing needs such as those in biotechnology research, financial services and advanced manufacturing. Cedar Falls-based Team Technologies company has committed \$33,800 in in-kind cost share for the project. The proposal budget identifies a total of \$118,865 in cost share in addition to the \$64,933 request.

Commercialization of Leading Edge Paint Removal Technologies: \$119,837

The Iowa Waste Reduction Center (IWRC) proposes development of a VirtualBlast system that will effectively train technicians in the blasting industry. Abrasive blasting is utilized as an alternative to chemical stripping of painted and coated surfaces on bridges, dams, buildings and in the automotive industry. The Center has previously developed successful virtual training tools for the painting and coatings industry which improve effectiveness of painting processes while eliminating substantial amounts of product waste. The IWRC will partner with the Davenport-based Marco company to distribute and sell the technology. Laser-guided blasting technology will also be transferred to Marco for development and commercialization as an addition to their present line of products. Marco is North America's leading supplier of abrasives, blasting, painting and safety products for the industry. They will become the only company able to offer laser-guided blasting equipment which will place them at a significant advantage in the market. The VirtualBlast product will be patented and assigned to the UNI Research Foundation. The proposal budget identifies \$143,156 in cost share in addition to the \$119,837 request.

Faculty/Student Collaboration on Commercializable Research: \$77,832

Funds are requested to accelerate six research projects that have significant potential for developing into commercializable ventures. The inclusion of student collaborators is expected to speed the advancement of these projects and bring the researcher closer to proof of concept or product development. The specific projects are:

- Development of a Comprehensive Nanoscience Laboratory
- Establishment of a Bio-based Metal Working Fluid Research Program
- Isolation of Disease Resistance Genes for Fusarium in Corn
- A Novel Automatic Utility Data Collection and Management System
- Two Novel Applications of a Unique Miniature Laser Interferometer
- Genetic Engineering of Humulus Lupulus for Production of Plant-Made Pharmaceuticals.