Minutes of the

CENTERS OF EXCELLENCE COMMISSION

May 27, 2016
Room 148 of NDSU Research 1
Fargo, ND

CALL TO ORDER

Mark N, Chairman, called the meeting to order at 8:07 am

Commissioners Present: Mark Nisbet, Mike Ness, Tim Hennessy, Jim Traynor, Kevin Melicher

Commissioners Absent: Greg Stemen

Others Present: Al Anderson, Justin Dever and Christopher Kalash of the Department of Commerce; Mike Moore-UND, Dale Zedoka-NDSU, Susan Felege of UND, Travis Desell of UND, Steven Qian of NDSU, Henry Nowak of NDSU, James Bahr of NDSU, Jordan Brummond of NDSU, Val Kettner of NDSU, Yun Ji of UND, Surjit Gupta of UND, Chad Ulven of NDSU

COMMISSION BUSINESS

Opening Comments

Chairman Nisbet welcomed everyone and asked Dever for an overview of the funds available in the fund.

Presentations from Applicants

Coherent Backscattering of Cloud Particles David Delene, Research ND, UND

Mark Ray of UTC participated via conference call.

Partner is UTC Aerospace Systems Company (Rosemount Aerospace, Inc.) has a facility in Jamestown.

University will develop software to calculate the backscatter of the ice and water particles detected by the laser that UTC has built. Specifically, it will differentiate between water and ice particles and measure their size. Already have hundreds of flights that have collected data. The software that will be developed during this project is the key technology that is missing to make this UTC tool even more useful. The software will analyze the data they have from test flights and make flying safer in icy conditions. Advanced mathematics are necessary to develop the software. One key objective of this project is to get industry acceptance of this new product.

Another commercial option with this technology is that it could be miniaturized and used on UAS for the same reasons it is needed for regular aircraft. Wind energy applications would be for sensing the ice on blades so towers could be shut down if ice was building up on blades.

Delene covered questions the technical reviewers had about his qualifications and experience developing software.

In response to a question from Traynor, Delene said that this will allow sensing of ice crystals. Ray added that this is an issue the FAA has recently passed a rule for new planes. There is a high probability that it will also be required for existing ones in the future.

In response to a question from Hennessy, Delene said we hope that because of the relationship, if this is successful and manufactured, UTC would take a strong look at ND for the manufacturing.

In response to a question from Nisbet, wind farms need to shut down turbines before ice has formed. As a result, this could be used to detect this. For UAS, it will become useful when beyond visual line of sight becomes a reality.

Sensing Earth Environment Directly (SEED) Sensor - Phase II - Chad Ulven, Phase 2 Venture Grant, NDSU

Ulven shared milestone achievements from the SEED Sensor Phase 1 Venture Grant project. Flax fiber is used to reinforce a corn starch based plastic. This is biodegradable. The electronic components are also biodegradable. The antenna design has been refined. Field trials were conducted last year.

The technical reviewers asked what sort of competition exists to this product. SEED is wireless and the information is provided real-time. It does not need to be retrieved because it is biodegradable, the others need to be retrieved. This is why they believe their product is superior. No manual planting, as a matter of fact, we plan to have a planting implement for this. This would give the producer the ability to determine the density of sensors. Sensors should last one to two growing seasons.

A goal of Phase 2 is to further miniaturize the sensor and change the shape into a more 3D shape. This should help make planting easier. We would like to also make the sensors measure additional things (nitrates, salinity, and phosphorus)

In response to a question from Hennessy, Ulven said the competition has larger sensors that are not as easily spread out throughout the field. We measure more things and in more places, because of the size of them.

In response to a question from Melicher, Ulven said the reader can read information from within a meter to a meter and a half. The information is from the soil that is touching the sensor.

In response to a question from Ness, Ulven said the reader can be connected to any farm implement that will go through the field. The sensor sends out a signal only when the reader goes over it. There is no battery.

Ulven described the potential savings of using the SEED sensor. And also the methods for providing the reader (lease) and sensor (purchase). Described some of the results from field trials last year. Data was compared with traditional methods of soil and moisture analysis.

They are getting interest from people who would like to participate in Beta testing of these.

In response to a question from Nisbet, Ulven said the large seed companies are in close contact with us discussing how they might be able to use it.

In response to a question from Traynor, Ulven said the price includes the sensor and the data. We want to be known as a soil data company, not a hardware company.

In response to a question from Hennessy, Ulven said that the information collected this summer will allow them to get the 3D shape. That will get the business ready to be commercially viable by 2018.

In response to a question from Melicher, Ulven said the payment to NDSU Research Foundation is part of the expenses that c2sensor is paying for licensing the technology from NDSU.

Unmanned Aircraft System (UAS) Support to Environmental Assessments for Industry Applications Susan N. Ellis-Felege, Phase 1 Venture Grant, UND

Dr. Travis Dessell of UND's Computer Science Department was also present.

Environmental assessments for industry applications. Pipeline assessments, for instance, require environmental assessments. Using UAS to do these assessments can speed up the process of collecting information about animals

and plant life in the area and make decisions about construction. Camera data paired with high performance computing.

Industry is affecting the habitat of species. UAS offers great way to measure these things. Many sensors are available to be used with UAS. Enormous amounts of data can be collected, and many of the companies that need studies done are on a timetable. The big question is how to you turn the data into reports?

Dessell described that there are many different sensors that are being used. These sensors collect images only. Computer algorithms are necessary to make sense of the images collected.

What do the companies need and how can we provide the data? Using neural networks so that we can use the algorithms to find any species. Most currently used algorithms are written to only one species.

Described some of her current partners (Parks Canada, ND Game and Fish, Ducks Unlimited, National Park Service, USGS). Waypoint Global Strategies has been flying for them. Need to determine what the people we would do this work for need from the data we collect.

See a market with US Fish and Wildlife USGS, national Park Service and state agencies. They lack the expertise and the high performance computing ability so this could create a new business. The more quickly a company can get the information, the more quickly they can report or build (for development companies). Environmental consulting companies are interested in this technology. Also potential application in livestock monitoring and precision ag.

In response to a question from Nisbet, we could use the right sensors to even find dead birds around wind farms. We could even choose the right sensors to determine between different species.

In response to a question from Ness, Felege said we are using some already developed software and also plan to develop more software as we learn of some of the needs that organizations have.

In response to a question from Traynor, Felege said that the reviewer was incorrect about her sensor background and the need for better software. She has been working with them for years now.

Incubated, Real-time-imaged, Automated Perfusion Cell Culture System David Wells, Phase 1 Venture Grant, NDSU

Described cellulation. Drugs can be introduced to the environment at varying concentrations to observe their effects on cells. The goal is to prove that the in vitro cellulation will parallel small animal experiments that have been successful. The data collected will be compared with current methods. If we are getting good results, then this will speed up drug testing and also reduce the number of small animals needed for drug testing.

Will develop the device in house. Multi-disciplinary team. Engineering and biosciences will be working on their respective parts.

Understands that the purpose of this grant program is to launch companies, and mentioned previous successful launches. The purpose of the proposal is for the formation of a new biotech company.

Nisbet asked Melicher about his thoughts on the presentation. Melicher stated that cancer research is very expensive and he noted the fact that this could both eliminate small animal testing and also speed up the process of drug research.

Anderson asked if Wells had any ideas for keeping these new ventures in North Dakota. Cost of space was the one students that took a business out of ND (to Moorehead). Wells said that economic incentives may help to keep the businesses in North Dakota

In response to a question from Hennessy, Wells described the number of employees that some of the startups out of his program have.

Traynor stepped out at 10:20 am

Development of novel anti-microbial materials for clinical and food processing applications Birgit Pruess, Phase 1 Venture Grant, NDSU

The proposal is to develop a new material that will not allow bacteria growth. Use polyurethane and silicone and infuse them with nutrients that will keep biofilm from growing. This could be used in food processing (conveyor belts) and medical equipment (catheters, medical devices, artificial hip materials).

Biofilm is a community of bacteria that adhere themselves tightly to a surface, for example dental plaque. They are difficult to remove and make antibiotic treatments less effective. The product or new surface treatment that they propose to makes will make it more difficult for the bacteria to adhere to the surface, make it easier to remove the bacteria from the surface, or kill the bacteria when it comes in contact with the surface. The molecule that they will use is β-phenyl ethylamine (PEA). It is non-toxic and actually sold in health food stores today. This is infused, using heat, into polyurethane. They will be working with different concentrations. At this time they feel 5% works best to both fight the biofilm and maintain the properties of the polyurethane.

Shared prototype. This was developed with funding from the Agricultural Product Utilization Commission (APUC). This was to test food pathogens. Applications include conveyor belts and cutting boards. Further experimentation will test medical applications. Specifically speaking, catheters will be developed using this material.

Objective 1 is to improve the material. We would like to raise the pathogen reduction higher than the 80% reduction that has been achieved. This will involve using different concentrations of PEA.

Objective 2 will be to make a catheter from the material that has been determined to be the best concentration of PEA during Objective 1 testing.

Objective 3 is the market analysis. Discussed the importance of the market analysis to answer what are infection rates in different areas and what are acceptable rates? Will be using Bird Dog Innovations for this work.

Objective 4 is patent protection with the NDSU Research Foundation. This would lead to commercialization. This could envision selling the patent to different companies for the different products that could be made from this material.

Pruess discussed the timeline and how it fits with the objectives.

In response to a question from Nisbet, Pruess said that Bird Dog Innovations was recommended to by Dale Zetocha at the NDSU Research Foundation. He also seemed to be familiar with working with medical products. Zetocha stated that Bird Dog is based in Minneapolis and has worked with many NDSU PIs.

In response to a question from Melicher, Pruess explained that the product will prevent the buildup of biofilm. Biofilm can cause infections.

In response to a question from Nisbet, Pruess said it can be a coating in industrial and medical applications to prevent biofilm from forming.

Traynor returned at 10:40

Development of Next Generation Agricultural Soil Amendments Feng Xiao and Michael Mann, Phase 1 Venture Grant, UND

This proposal is to produce a novel agriculture soil amendment for controlled release of fertilizer. Background – the US consumes about 17 million pounds of fertilizer each year. It is estimated that 50% of the fertilizer used is wasted as runoff. This causes pollution. The question to be answered is how can the losses of fertilizer be reduced? This will save our clean water supply by reducing runoff and increase income to farmers.

Bio-char is very porous and can hold fertilizer. Infusing bio-char with fertilizer and then adding it to soil will allow slow release of fertilizer rather than runoff. Described how to infuse the bio-char with different levels of novel carbonaceous bio-soil amendment (CSA). Described the experimental process of growing plants in regular soil and soils with different percentages of CSA and recording the results to determine what percentage of nutrient dissolved in the bio-char would provide the best nutrient uptake.

After lab scale trials are completed, field trials will be arranged.

Technical reviewers noted that there was no agricultural specialist involved. Additional funds were requested to add NDSU professor and a plant scientist, Burton Johnson, to the project. A supplemental budget was presented.

In response to a questions from Nisbet, Xiao stated that main benefit to the farmers is the ability to get the same results while using less fertilizer. The carbon and agriculture industries would both be the targets for the business created.

In response to a question from Melicher, Xiao said that the char would be partially burned waste material sourced from farmers. The feedstock would be agriculture waste (stalks of hemp, wheat, flax, corn). The char would be produced at UND from this waste.

In response a question from Traynor, Xiao and Mann said that the decision to include Dr. Johnson was suggested by the technical reviewers and they will include him in the project. He will validate the findings in Task 3.

Development of Intelligent Integrated Networks for Rapid Pipelines Damage Detection and Health Monitoring Zhibin Lin, Phase 1 Venture Grant, NDSU

US has 2.6 million miles of pipelines. North Dakota has thousands of miles of pipeline. Pipelines have had spills recently that have created concerns about their effect on the environment. This technology will monitor pipelines and allow for early detection of problems. Current testing method is smart pig. The cost to use a smart pig is about $15,000-35,000 per mile. These do not work in 42% of gas lines and 11% of liquid lines. This new technology would cost $2,000-3,000 per mile.

System will be battery-less using RF power. This could be wired or the data could be collected by sensors on a UAS. There are also other applications for this technology going forward such as monitoring bridges (demonstrating this now with ND DOT) or wind towers. Collaborating with Midwest X-ray on the project. There is potential to launch a startup company with them.

Lin share that the technical reviewers recognized many strengths of the project. Shared growth in scores from previous submission to this submission. Also shared the ways that this application was improved over the previous one. Shared that this technology received the Ozbun Economic Development Award.

All the sensors will be on the coating (existing pipelines) or in the pipe itself (in newly built pipelines). Next steps will include UAS which could include image analysis on pipelines.

In response to a question from Anderson, Lin stated that there will be a baseline pressure that will change if there is damage.

In response to a question from Traynor, Lin said the sensors would both provide ongoing data and also collected from UAS.

In response to a question from Nisbet, Lin said that they have narrowed the focus and added field testing.

In response to a question from Hennessy, Lin stated that Midwest is consulting on the project and hopefully they will be a partner on a Phase 2 grant after we improve the technology.

In response to a question from Nisbet, Lin said that an existing pipeline can be retrofitted with these sensors.

In response to a question from Ness, this is both continuous and with UAS. That provides real-time information from the sensors at all times. The UAS will provide visual information also.

In response to a question from Anderson, Lin stated that the current running to the pre-existing sensors will not have an effect on these sensors.

Working Lunch

Consent Agenda

The Commission reviewed the consent agenda items

It was moved by Melicher and seconded by Stemen to approve the consent agenda. The motion carried on a voice vote.

Commission Business

Requests to end postaward monitoring - Airspace Integration Team (Enhancement Grant)

It was moved by Traynor and seconded by Hennessy to approve allow the Airspace Integration Team to end postaward monitoring. The motion carried on a voice vote.

Unmanned Aerial Systems for Building Assessment (Research ND) – Change Request for timeline extension until May 15, 2017

It was moved by Ness and seconded by Melicher to table this request and have Chris ask about when the indoor flying will be complete at the new medical school. The motion carried on a voice vote.

Conversion of Vegetable Oils to Waxes, Lubricants, Transformer Fluids, and Low-Toxicity Drilling Fluids (Research ND) – Change Request for timeline extension until January 31, 2017

It was moved by Hennessy and seconded by Ness to allow the timeline extension. The motion carried on a voice vote.

Structural characterization of Candida vaccines – Change Request for timeline extension until August 31, 2016

It was moved by Hennessy and seconded by Traynor to allow the timeline extension. The motion carried on a voice vote.

Novel Anti-Inflammatory Drugs for Treating Alzheimer's Disease – Change Request for timeline extension until December 14, 2016

It was moved by Melicher and seconded by Ness to allow the timeline extension. The motion carried on a voice vote.

Due dates for future Research ND grant rounds

Kalash proposed August 19, 2016; November 18, 2016; February 17, 2017; May 19, 2017 be the next four dues dates for Research ND grants.

It was moved by Melicher and seconded by make those the due dates. The motion carried on a voice vote.

Administratively Approved items

Kalash reviewed the administratively approved items. No concerns were raised.

Other Info

Kalash shared Quarterly reports from COEs and COREs and Interim reports from Research ND and Phase 1 Venture grants. No concerns were raised.

Presentations (continued)

2,3-Butanediol Production via Fermentation, an Alternative Route to Chemical Synthesis, Using Synthesis Gas from Lignite Coal Gasification Ali Alshami, Phase 1 Venture Grant, UND (with Michael Mann of UND)

The goal of this project is to take the syngas and compress it, ferment it and get 2,3 butanediol as a final product. This can take the place of some petroleum based products. This is a building block of rubber. It is the 36th most produced chemical in the US. $28 billion industry with 46.5% growth projection in the next 5 years.

Currently it is produced by thermal cracking of crude oil derivatives. The fermentation of syngas would be more environmentally friendly.

No one is producing this from goal gas at this point. The companies in competition are all biotech companies. Only working at bench scale. This project proposes to produce 90g/L of product from lignite coal gasification (syngas). None of the patents researched use coal gasification. All are using biomass. The next closest yield is claiming 14 g/L.

In this project the aim is to optimize the fermentation process and demonstrate how to go from pilot scale to full scale production. Have been in talks with DGC regarding this process. They have expressed interest in knowing of the results of this research.

Discussed the concerns of the technical reviewers.

In response to a question from Ness, Alshami said that the challenge to getting to the yield was getting enough of the microorganism on a mass scale for the fermentation process to be done on a larger scale. We have done that.

In response to a question from Ness, Alshami and Mann said that they are not using product from DGS yet. They are currently using simulated syngas. Will work with them as pilot is up and working.

In response to a question from Traynor, if we do not refine the downstream process to recover the gas, we could be held up in staying on schedule.

In response to a question from Ness, EERC gave us the use of equipment and technical advice. We have not reached a point where others are ready to invest, only others who are interested in what we are doing.

In response to a question from Nisbet, initially, it would be easiest to rely on DGS for their infrastructure to get syngas. Down the road it could be a stand-alone plant.

ElectroMagnetic Inducible Digital Protein Expression Switch or EMID ProSwitch Daniel Ewert, Phase 1 Venture Grant, NDSU (with Ben Brooks, NDSU)

Use RF to stimulate genes to create their own fixes to problems (disease). RF energy can be therapeutic or act like a vaccine. Specific absorption rate (SAR) is essentially how much power you put into something before you start to cook it.

New way of how RF interacts with tissue. Have proven this on the bench and in animals. Found specific bands of frequency that interact with DNA. These two ideas are being combined in this project. Believe that the applications will be targeted gene and vaccine therapy, protein production without chemicals and agricultural uses.

Discussed reviewers' concerns.

Brooks stated that the goal is to use RF energy to induce cells to produce a protein that can heal the cells. Described steps to move forward from using mouse cells to using bacteria cells.

Ewert stated that the group will be varying the amount of exposure to see what the results are from different levels of exposure.

In response to a question from Traynor, Brooks said that the reviewers' comments made them reevaluate and improve their approach and helped us improve the proposal. Ewert said that the reviews actually moved the idea forward.

Melicher made the comment that any time drug delivery can be improved and more targeted and effective this is a great move forward.

Use of Unmanned Aerial Inspection Systems for Electrical Generation Boiler Inspection Bruce C. Folkedahl, Phase 1 Venture Grant, UND-EERC

Costs of boiler shutdowns (planned or unplanned) cost large amounts of money. Currently, large scaffolding must be assembled to do inspections. This idea will target the resources used and save time and money in repair work. To do this the project proposes to use UAS to conduct the inspections. Boilers are GPS denied areas. As a result, they need to be tethered or in line of sight.

Identify non-destructive techniques that can be used, what sensors are available and what advantages each of them could provide. Determine what UAS will be needed so that the payload (sensors) does not cause a problem. Only one published science article on use of drones in boiler inspection.

Shared tasks and stated that some of the tasks were rearranged based on reviewer comments. A boiler has been found that can be used in a demonstration. Robots were suggested and they have drawbacks such as the fact that they use magnets that are not effective in certain situations. If the walls of the boiler are unclean enough, they may not be able stay attached to the wall. UAS does not need to attach to the wall of the boiler.

Reviewed the makeup of the team.

In response to a question from Ness, Folkedahl explained how the funds budgeted for personnel would be allocated to different staff at UND

In response to a question from Ness, Folkedahl said that the project is not just for power plants, but we will initially focus on boilers in North Dakota power plants. Beyond that there could be many applications.

In response to a question from Ness, Folkedahl said we will both look at both damage that cause outages and inspect for things that need repair before the problems happen.

In response to a question from Hennessy, Folkedahl said that the utilities are expressing interest in this. This is more specific. This will be systematic mapping of the boilers to establish baseline data and compare it with the data collected in future flights.

In response to a question from Nisbet, Folkedahl said that EERC is happy to be doing work using drones, but they are not interested in developing the drones themselves.

In response to a question from Traynor, Folkedahl said we see this as a maintenance service. It would be a joint application between the utility and an organization that licenses this.

A Self-Renewing Heparin-Binding Anti-Microbial Device Surface Coating Amanda Brooks, Phase 1 Venture Grant, NDSU

Catheters are susceptible to problems due to thrombosis. The goal of this project is to bind spider silk and heparin. This material will then be used to coat the inside of a catheter to reduce the incidence of thrombosis. Spider silk resists adhesion. It is biocompatible. It is strong. It resists degradation. It is flexible, which is important to coating a catheter.

There are certain protein sequences that bind with heparin. Spider silk is an ideal protein for doing this.

Objectives are to immortalize silk producing cells isolated from the spider's silk gland and then genetically engineer the immortalized silk-producing cell line to secrete a full-length silk protein with an integrated heparin binding domain. This can be one product. The second product is the genetic engineering. The second means that the genetic engineering can be used to create other proteins for additional products.

In response to a question from Traynor, after separating the cells from the spider, they will reproduce for a period of time (6-8 months).

After growing the cells, the DNA will be edited with a heparin binding sequence. Have preliminary data that shows this can be done.

Shared timeline. Phase 1 will be getting a full length silk protein. Phase 2 will be the work involving binding of the protein with the heparin.

Described the team that will be doing the work and its background. Described interest from the private industry. Provisional patent is filed. Described adjustments made to the budget based on the technical reviews.

In response to a question from Traynor, Brooks said bacteria cannot produce something as large as spider silk. Spider silk cells secrete much more protein than bacterial. The genome editing is what I feel will be the most challenging. That was the reason for the original proposal of 3 ways of developing the protein. This was changed that to just doing one based on the technical reviews.

In response to a question from Hennessy, Brooks said that 3-6 months after the year-long grant would be when they are ready to adhere the material to the surface of a catheter. We need to get the chemistry right first so we are getting a sufficient yield.

Low-Cost Self-Cooling for Microchips Using Advanced Composite Coating Jinhui Wang, Phase 1 Venture Grant, NDSU

The proposal is to create a microchip with a layer of Phase Change Material (PCM) graphite composite material that would turn from solid to liquid as the chip heats and use a heat sink to cool the chip as the composite returns to a solid state. This material offers high reliability and efficiency for cooling the microchip.

Microchips are used in vehicles, phones, cars, light bulbs, many things. It is a $335.2 billion industry. Overheating is a problem with microchips. 90% of the damage to them is from overheating. This can ruin the product or even cause a fire. Air cooling has low efficiency and it is noisy. Liquid cooling is expensive uses a large amount of space. Also, if it leaks the liquid can ruin the device.

Completed preliminary work already. Goal of project is to optimize the composite to make it compatible with different microchips, test its long-term reliability, and to prepare for commercialization. The prototype is showing that it is not heating as much as a traditional chip.

Shared private companies that have expressed interest (Packet Digital, Microsoft, John Deere, Intel, AMD, Google)

Described team qualifications and publications.

In response to a question from Nisbet, Wang said that the unique aspect is the phase change of the graphite based material. It takes heat from the chip and transfers it away from the chip to cool it.

Commercialization of Novel Lignin Reinforced Bioplastics by Using Game Changing Additive Manufacturing Practices Surojit Gupta, Phase 1 Venture Grant, UND (with Yun Ji of UND)

The goal of this project is to design materials with transformative properties from green materials using green manufacturing. Using this will lower the environmental impact of the use of fossil fuels.

Lignin comes from plant materials (switch grass, trees, residue from pulp and paper wheat straw, sunflower – any plant material has cellulose and lignin) it is treated as industrial waste and typically burned to make steam. The purpose of this project is to use the lignin to create bioplastics rather than burning it for fuel. Since ag waste is the feedstock, this could create an entire industry in North Dakota.

Advantages of lignin are that it is tough, biodegradable, and improves flame resistance. The challenges are that it is chemically heterogeneous, incompatible with some other polymers and it cannot be melt processed.

The work will focus on characterizing the mechanical, physical behavior of lignin based plastics to determine the best uses of it. Automotive companies are already using bioplastics. Bosch Brake Components, LLC has indicated it is interested in this research.

Ji visited the USDA facility in Pennsylvania and spoke with them about food packaging options. One drawback is that they do not like the color and smell of the product. Work has been done in the lab to remedy this.

End goal is manufacturing of all four products.

Tech rev concerned about the chemicals used- exploring other chemicals.

In response to a question from Melicher, said that are many different materials that are used for bioplastics, but yes corn is one of the most common.

In response to a question from Nisbet, the best reason for using lignin is to reduce the cost of the plastics and increase the performance.

In response to a question from Kalash, the change in the color that was mentioned in the presentation does not change the properties of the plastic.

In response to a question from Traynor, lignin is essentially the same from all plants, so we won't have to change the process for different plants.

In response to a question from Nisbet, the sunflower and wheat industry sell the feedstock at a low cost as feed for livestock. $20-30 / ton.

Discussion and Decisions Related to Research ND Proposals

The Commission members submitted their scoring sheets and discussed the merits of the Research North Dakota proposals. Dever share the tabulated scores and shared average scores for each. Discussion was held about the strengths of each of the proposals.

It was moved by Hennessy, seconded by Melicher, and carried on a roll call vote to approve the Research ND proposal entitled "Coherent Backscattering of Cloud Particles" Ness, Melicher, Hennessy, Nisbet, Traynor voted "aye." No negative votes were cast.

It was moved by Melicher, seconded by Traynor, and carried on a roll call vote to approve the Phase 1 Venture grant proposal entitled "Unmanned Aircraft System (UAS) Support to Environmental Assessments for Industry Applications" Ness, Melicher, Hennessy, Nisbet, Traynor voted "aye." No negative votes were cast.

It was moved by Melicher, seconded by Ness, and carried on a roll call vote to approve the Phase 1 Venture grant proposal entitled "Development of novel anti-microbial materials for clinical and food processing applications" Ness, Melicher, Hennessy, Nisbet, voted "aye" Traynor abstained as he was out of the room for the presentation. No negative votes were cast.

It was moved by Ness, seconded by Hennessy, and carried on a roll call vote to approve the Phase 1 Venture grant proposal entitled "Development of Next Generation Agricultural Soil Amendments" with the additional budget that was presented to include funding for Dr. Burton Johnson of NDSU to serve as an advisor on the project Ness, Melicher, Hennessy, Nisbet, Traynor voted "aye." No negative votes were cast.

It was moved by Traynor, seconded by Hennessy, and carried on a roll call vote to approve the Phase 2 Venture grant proposal entitled "Sensing Earth Environment Directly (SEED) Sensor" Ness, Melicher, Hennessy, Nisbet, Traynor voted "aye." No negative votes were cast.

It was moved by Hennessy, seconded by Ness, and carried on a roll call vote to approve the Phase 1 Venture grant proposal entitled "Development of Intelligent Integrated Networks for Rapid Pipelines Damage Detection and Health Monitoring" Ness, Melicher, Hennessy, Nisbet, Traynor voted "aye." No negative votes were cast.

It was moved by Ness, seconded by Traynor, and carried on a roll call vote to approve the Phase 1 Venture grant proposal entitled "2,3-Butanediol Production via Fermentation, an Alternative Route to Chemical Synthesis, Using Synthesis Gas from Lignite Coal Gasification" Ness, Melicher, Hennessy, Nisbet, Traynor voted "aye." No negative votes were cast.

It was moved by Melicher, seconded by Traynor, and carried on a roll call vote to approve the Phase 1 Venture grant proposal entitled "ElectroMagnetic Inducible Digital Protein Expression Switch or EMID ProSwitch" Ness, Melicher, Hennessy, Nisbet, Traynor voted "aye." No negative votes were cast.

It was moved by Melicher, seconded by Hennessy, and carried on a roll call vote to approve the Phase 1 Venture grant proposal entitled "Commercialization of Novel Lignin Reinforced Bioplastics by Using Game Changing Additive Manufacturing Practices" Ness, Melicher, Hennessy, Nisbet, Traynor voted "aye." No negative votes were cast.

It was moved by Traynor, seconded by Ness, and carried on a roll call vote to deny the Phase 1 Venture grant proposals entitled "Incubated, Real-time-imaged, Automated Perfusion Cell Culture System", "Use of Unmanned Aerial Inspection Systems for Electrical Generation Boiler Inspection", "A Self-Renewing Heparin-Binding Anti-Microbial Device Surface Coating", and "Low-Cost Self-Cooling for Microchips Using Advanced Composite" Ness, Melicher, Hennessy, Nisbet, Traynor voted "aye." No negative votes were cast.

Discussion was held about the amount of funding remaining in the Phase 1 Venture grant line. Kalash will be gathering information from UND and NDSU regarding how many of the existing Phase 1 Venture grants are anticipated to be applying for Phase 2 Venture grants during the biennium from each research university.

ADJOURNMENT

There being no further business, the meeting adjourned at 4:12 pm

8-16-16

Mark Nisbet, Chairman Date

8/10/2016 approved by COE Commission

Christopher Kalash, Recording Secretary Date