

THE UNIVERSITY OF TENNESSEE BOARD OF TRUSTEES

MINUTES OF THE
RESEARCH, OUTREACH, AND ECONOMIC DEVELOPMENT COMMITTEE

June 24, 2015
Knoxville, Tennessee

The Research, Outreach, and Economic Development Committee of the Board of Trustees of The University of Tennessee met at 1:15 p.m. EDT, Wednesday, June 24, 2015, in the Hollingsworth Auditorium of Ellington Plant Sciences Building on the UT Institute of Agriculture campus in Knoxville, Tennessee.

I. CALL TO ORDER

Chair George Cates called the meeting to order.

II. ROLL CALL

Mr. Cates asked Dr. David Millhorn, UT Executive Vice President, to call the roll. The following members of the Research, Outreach, and Economic Development Committee were present:

George E. Cates, Chair
Shannon A. Brown
Russ Deaton
Joseph A. DiPietro
Brian W. Donavant
Jalen K. Blue
William E. Evans
David A. Golden
James L. Murphy III
Margaret A. Norris
Rhedona Rose
Miranda N. Rutan

Tim L. Cross, Commissioner Julius T. Johnson, Raja J. Jubran, The Honorable Candice McQueen and David M. Stern were not present at the meeting.

Dr. Millhorn announced the presence of a quorum of the Committee. Other Trustees, members of the administrative staff, public, and representatives of the media were also present.

III. MINUTES OF LAST MEETING

Chair George Cates asked for any corrections to the minutes of the February 25, 2015, meeting of the Committee. Hearing none, the Chair called for a motion to approve the minutes as written. The motion was made by Trustee Brown, seconded by Trustee Evans, and carried unanimously.

IV. YEAR IN REVIEW

Dr. Millhorn noted this past year was one of the best in history for research at the University and he presented a power-point presentation (Exhibit 1) highlighting many of these new opportunities and developments. On March 31, 2015, the UT-Battelle management contract at Oak Ridge National Laboratory (ORNL), begun in 2000, was renewed and extended through 2020; key to renewal was UT-Battelle's extremely strong management performance, as noted by Department of Energy (DOE) Secretary Moniz, which, among other things, created existing public knowledge for little expectation of meaningful competition. This is the position UT-Battelle expects to maintain, Dr. Millhorn stated.

On April 1, Dr. Millhorn said, Dr. Thomas Zacharia returned to ORNL as Deputy Director for Science and Technology after serving for approximately two and a half years as Executive Vice President of Research and Development at Qatar Foundation. At ORNL Dr. Zacharia has primary responsibilities in setting research priorities of ORNL and building the science and technology base to allow for even stronger growth and competition.

Dr. Millhorn noted DOE and the Institute for Advanced Composites Manufacturing Innovation (IACMI) had finalized a cooperative agreement earlier this month. This UT-ORNL award, announced at the February ROED meeting, is the fifth hub of the eight-hub national network for manufacturing innovation, Dr. Millhorn said. IACMI will provide the governance and leadership for the complex hub, involving six states--Michigan, Ohio, Indiana, Tennessee, Kentucky and Colorado--and approximately 123 consortium organizations. IACMI is a private corporation, solely owned by the UT Research Foundation (UTRF), Dr. Millhorn said, and it is the largest grant ever received at the University, with \$259M funding over five years. This award is extremely important to the University, Dr. Millhorn noted, and puts UT in a position to create other productive partnerships. Dr. Craig Blue, also on today's program, Dr. Millhorn said, will expand further on IACMI. The new UT-ORNL Governor's Chair appointee, Dr. Uday Vaidya, who begins his appointment in August, Dr. Millhorn noted, is an expert on composites and will serve as a technology officer for IACMI.

Dr. Millhorn highlighted the Tennessee Manufacturing Innovation Program RevV!, a pilot program begun this year with a \$2.5M award from the state in partnership with UT and ORNL to help recruit and stabilize companies moving to Tennessee. RevV! provides access to world-class researchers and facilities through an industry voucher program and works with manufacturers across the state to assist with challenges in product development and in process innovation to help ensure Tennessee manufacturers maintain a competitive advantage in the global marketplace. Approximately \$1.5M has been allocated thus far in this program and Dr. Millhorn named two outstanding new companies to Tennessee, cvmr and Cirrus Aircraft, with plans to hire respectively 620 and 120 new employees.

Two new Vice Chancellors for Research have been recruited, Dr. Millhorn said: Dr. Joanne Romagni-Colvin at UT Chattanooga (beginning July 1, 2015) and Dr. Steven R. Goodman at UTHSC (beginning August 3, 2015). Dr. Goodman's specialty field is sickle cell disease, a growing research area for both UTHSC and Le Bonheur Children's Hospital. Both new Vice Chancellors are cordially welcomed to UT, Dr. Millhorn said.

Dr. Millhorn noted the National Science Foundation (NSF) EPSCoR (Experimental Program to Stimulate Competitive Research) TN-SCORE (Tennessee Solar Conversion and Storage using Outreach, Research and Education) program is in its fifth and final year at UT. EPSCoR is a program administered by several agencies, including NSF, Dr. Millhorn said, which identifies states that, by formula, do not receive their fair share of federal funding, and the program strategy is to create stronger research infrastructure for these underutilized states to make them more research competitive and productive. Tennessee was an EPSCoR state and competed for a grant, which it received in 2010. The \$20M five-year award, in which UT partnered with Vanderbilt University, Dr. Millhorn noted, created a platform to build research capacity and competitiveness within Tennessee's diverse academic institutions to boost the state's energy-related research and education efforts while emphasizing science and collaboration as keys to success. Tennessee is the first and thus far the only state to graduate from EPSCoR, Dr. Millhorn stated, as statewide NSF funding within Tennessee has increased from \$35.1M in 2009 to \$51.4M in 2014. The initiative has brought hundreds of Tennessee faculty and students together in collaborative efforts and about 49,000 K-12 students have been engaged in TN-SCORE activities. The program has been a huge success, Dr. Millhorn said, with 239 publications, \$20.5M direct new funding, 95 new funded projects, \$10.5M co-funding, 20 invention disclosures, and the creation of two start-up companies.

Dr. Millhorn noted some of the earnings from the West Tennessee Solar Farm have been used to develop other research opportunities, one such project being support for an electrical engineering education project at UT Knoxville for a small solar panel array and electronic equipment, furnished by the Eden Corporation, to give engineering students a hands-on experience in dealing with the conversion of protons into electrons and how this process can be made more efficient.

Highlights were briefly given of the UT Research Foundation (UTRF) as Dr. Millhorn noted Dr. Stacey Patterson (UT Associate Vice President for Research and Vice President of the UTRF) would provide more information in the presentation to follow on this topic. Dr. Millhorn said the UTRF has been named among the Top 100 universities in the world granted utility patents for the second year by National Academy of Inventors (NAI). This speaks volumes concerning faculty disclosing their discoveries and continuing to develop their Intellectual Properties (IP) into patents, Dr. Millhorn said. FY15 ends in an all-time high for licenses and option agreements, due in large part to the diligent work of the staff, Dr. Millhorn noted; in addition, three new UTRF licensed products have been launched, and UTRF and UTRF-licensed companies have more than a \$61M impact in Tennessee in last year alone. UTRF is also, with Trustee Cates' help, Dr. Millhorn said, working with the UT Foundation to improve the mechanism by which the UT Foundation can invest in technologies developed by the UTRF. Thus, UT is investing in its own technologies and striving to grow and create new revenue for the University.

Dr. Millhorn presented pie chart and graph illustrations and described 2015 UT educational and general revenues by source (\$1.852B total revenues), sponsored program expenditures (grants and contracts, restricted funds for dedicated functions), total research expenditures, federal research expenditures (65 percent of higher education institutions have declines in federal research and development awards and expenditures due to sequestration and shrinking federal budgets; FY13, NSF HERD Survey), and research proposal submissions. Dr. Millhorn noted strategies for growing today's research programs in a declining or, at best, stable funding climate, and noted the number of proposal applications has doubled in the last five years, creating an incredibly competitive award process for any available funding. UT's partnership with ORNL, Dr. Millhorn said, significantly enhances proposal collaborations and promotes shared space and technologies without a tremendously risky investment and creates a decisive edge for research opportunities.

Trustee Evans asked Dr. Millhorn to put into perspective federal research revenue vis a vis the Top 25 Public Universities rating to which UT aspires; and, if the IACMI grant of \$259M, rough \$50M annually, would come to UTRF and count officially in UT's federal funding. Dr. Millhorn responded that the federal award will come directly to IACMI, owned by the UTRF, and UT will thus receive credit for the funding amount. Dr. Millhorn recognized Dr. Craig Blue, Director of IACMI and former Director of ORNL Manufacturing Demonstration Facility, and Dr. Taylor Eighmy, UTK Vice Chancellor for Research and Engagement, both present at the meeting, played major roles in the successful IACMI proposal. The IACMI award, Dr. Millhorn stated, will add \$50M per year for the five-year grant towards UT's research revenues and are important in building UT's research portfolio. Dr. Millhorn also noted in past years federal funding at UT was reported within the "Big Orange" (Knoxville, UTHSC, Ag, and UT Space Institute) or one-entity reporting system; now each campus reports as a separate unit. With the IACMI award and if reporting was still handled as one-entity, UT would likely be in the Top 40's, Dr. Millhorn stated. It is a serious competition, Dr. Millhorn said, in reaching the Top 25 Public Research Universities. Trustee Evans asked if the UT-ORNL

relationship would help move UT towards the Top 25 and Dr. Millhorn responded positively, that this is an important partnership, allowing for joint faculty appointments, diminishing the need for new hires and new space, fostering collaborations and lowering investment risks.

Mr. Cates thanked Dr. Millhorn for his report.

**V. ANNUAL REPORT OF THE UT RESEARCH FOUNDATION AND FY 2015
UTRF OPERATING BUDGET**

Mr. Cates recognized Dr. Stacey Patterson to give the annual report (Exhibit 2) on the UT Research Foundation (UTRF). Dr. Patterson reiterated Dr. Millhorn's assessment of a busy and exciting year on many research fronts for the University and UTRF was not an exception, she said. Dr. Patterson showed slides of the new UTRF wordmark--representing growth, innovation, new beginnings and tagline "where discovery and opportunity connect"--and the new UTRF website, which moved from text-heavy, redundant sidebars and difficult navigation to user-friendly, streamlined menus, responsive to mobile devices, and ease for navigation, maintenance and updating. UTRF has categorized its technologies into eight primary groups and weblinks quickly take users to information, including contacts, for each category, Dr. Patterson stated. The new web presence, Dr. Patterson noted, also incorporates the first step to direct licensing application links via TennXC, the Tennessee Crystal Center. This Center, Dr. Patterson said, is a platform for many different research tools to use in licensing directly from the UTRF website. Collaborations with the UT Office of Information Technology (OIT) have developed IDEA (Invention Disclosure Enterprise Application), a comprehensive online invention disclosure application, Dr. Patterson said, which streamlines and speeds up the UTRF disclosure enterprise. Customer feedback to these and other enhancements has been most positive, Dr. Patterson said.

Dr. Patterson noted UTRF provides the federally-mandated (Dole Act of 1980) technology transfer services to system-wide faculty, staff and students, without which services UT would not receive federal funds for contracts, grants and cooperative agreements. She highlighted the impact of UTRF in FY15 (as of April) in its returns to the University and the state totaling nearly \$61M, with almost \$54.5M in venture capital raised by UTRF companies. Over the last decade, Dr. Patterson said, UTRF has had a significant focus on new company starts resulting in approximately 50 start-up companies created as a mechanism to commercialize technologies coming from research; of this number, 22 companies are still in existence and most of them--about 95 percent--reside in Tennessee. UTRF-grown companies, Dr. Patterson said, are truly helping to grow the state.

Along this line, Dr. Patterson said, UTRF, working with Tech2020 in Oak Ridge and Memphis Bioworks Foundation, as well as with their two collaborative funds Innova and Meritus Venture, helped to bring a US Department of Commerce Economic Development Administration (EDA) grant to Tennessee. TenneSeed Fund, a venture capital fund, will focus on seed and early-stage investment funding, an essential component to growing companies in Tennessee.

Dr. Patterson provided UTRF disclosure pipeline, number of new inventors, licensing and option, patent portfolio, licensing revenues and new-company starts statistics from FY2009 to FY2015 (end of April) via bar graphs and pie charts. The number of disclosures has grown significantly over the last few years from hovering in the 80s to over 150 in FY2014; the current year's number is 121. Based on research expenditures, the current year's number of disclosures is about right, Dr. Patterson said, for where UTRF should be on the high national average. UTRF is working hard to reach new inventors; this year's number of new (110) and repeat (115) inventors (a record high in both categories) is about equal and that is the correct equation, Dr. Patterson noted. The key focus is deal flow and generating more "shots on goal" to provide greater opportunities for licenses and options, Dr. Patterson said; these numbers have grown from 16 in FY2009 to 34 thus far in FY2015, another UTRF all-time high.

Dr. Patterson discussed UTRF's current portfolio of 483 total patents and patent applications, noting 45 percent are licensed to outside entities and 10 percent are UT-Battelle inventions; 27 percent or approximately 100 unlicensed patent applications are being heavily marketed to companies (if unable to find interest or if data shows the invention is no longer viable, UTRF takes action to close the files and return the IP rights to their inventors). Revenues from royalty and licensing fees total \$3.19M for FY2015 and includes a \$2.1M one-time fee paid for UTRF stock in a 1999 start-up company; nevertheless, with this one-time amount removed, UTRF is showing a 30-40 percent growth in revenues which bodes well for the future, Dr. Patterson stated.

Four new start-up companies licensed technology from UTRF this year, Dr. Patterson said; and, as previously noted, UTRF companies are having a viable impact on the state's economy as evidenced by 22 UTRF companies still in business generating \$54.5M in venture capital investment in Tennessee in FY15 and one UTRF company experienced a merger and acquisition providing \$51M value in Tennessee this year. Dr. Patterson discussed three new products launched by UTRF this year and the timelines involved in product development from disclosure to launch. Dr. Patterson also described several of the outreach and educational activities undertaken this year by UTRF, including

“Opportunity Now,” an idea-to-market analysis event.

Dr. Patterson concluded her presentation with a slide of the UTRF FY16 budget approved earlier this month by the UTRF Board of Directors. The UT segment of the budget has remained flat over the last three years, Dr. Patterson noted, at \$2.427M. Conservative projections for license and contractual income is just over \$1M, leaving a net revenue of around \$3.4M; UTRF salaries represent a sizeable portion of this expenditures, along with operating costs, protection and royalty distributions. It is a balanced budget, Dr. Patterson stated.

Mr. Cates thanked Dr. Patterson for the presentation, noting good progress is being made at UTRF. He suggested future overviews include a 3-5 year averaging of data, as he believes most people understand the volatility of the commercialization process and averaging will give a better idea of what is occurring at UTRF.

VI. ANNUAL REPORT OF ORNL

Dr. Millhorn recognized Dr. Craig Blue, CEO for the Institute for Advanced Composites Manufacturing Innovations (IACMI) and former Director, ORNL Manufacturing Demonstration Facility, who began his presentation (Exhibit 3) by thanking UT leaders Dr. David Millhorn, Dr. Stacey Patterson, Dr. Jimmy Cheek and Dr. Taylor Eighmy and ORNL leaders Dr. Thom Mason and Dr. Martin Keller for their unwavering support. Dr. Blue noted his presentation focused broadly on the manufacturing activity between these two organizations and initiatives within this spectrum in East Tennessee.

Manufacturing is a significant national enterprise, Dr. Blue stated, making up 12.5 percent of the US gross domestic product, accounting for 12M US jobs, making up 70 percent of US engineering and science jobs, and comprising, among other things, 75 percent of US exports. Achieving a Department of Energy (DOE) directive to increase manufacturing energy efficiency, recognizing 25 percent of energy utilized in the US is in the area of manufacturing, will reduce the energy intensity of US industry, support the development of new products, and strengthen our nation’s competitiveness and economic vitality, Dr. Blue said. Dr. Blue gave highlights of activities taking place within the Manufacturing Demonstration Facility (MDF) and the new Institute for Advanced Composites Manufacturing Innovations (IACMI), noting both are multidisciplinary DOE-funded institutes dedicated to enabling demonstration of next-generation materials and manufacturing technologies for advising the US industrial economy. These two institutes represent significant investments coming into Tennessee, Dr. Blue said. The MDF has been in operation for about four years functioning in public-private partnerships to engage industry with national labs; it is federally funded at \$20M a year and receives a one-on-one match of another \$20M, which equals out to an approximate

\$200M investment over five years. IACMI is funded at around \$70M over five years and receives an additional \$189M in terms of in-kind in-cash from states and companies, Dr. Blue noted; it will organize around five technology areas, three focused on clean energy application areas: Vehicles Wind Turbines and Compressed Gas Storage; and two cross-cutting on Design, Modeling & Simulation, and Materials and Process Technology that will pave the way for the cost effective energy efficient applications for fiber reinforced polymer composites.

Dr. Blue noted the unique advantages of leveraging ORNL's unparalleled core science and manufacturing capabilities within areas of neutron scattering, leadership-class computing, and advanced materials and manufacturing, and supporting industry and R&D with a wide range of additive manufacturing (AM) capabilities. Dr. Blue noted the many key partnerships in integrating the AM supply chain from suppliers to end users--a critical component for commercial viability, he said. Dr. Blue gave an overview of the Technical Collaborations Program involving a variety of agreements with nearly 60 companies in providing opportunities for industry to discover and apply new manufacturing technologies through the MDF model and providing 1:1 cost share, and the Big Area Additive Manufacturing (BAAM) initiative providing, among other things, large-scale printing capabilities in a multitude of industrial and commercial applications, including the Strati, the world's first 3D printed car, in partnership with Local Motors, and the building of 3D printed electric Shelby Cobra which President Obama and VP Biden viewed in their visit last January when they came to Tennessee to announce the UTK-led manufacturing hub, home to 122 public and private partners teaming to develop materials lighter and stronger than steel.

The IACMI signing and inaugural event, Dr. Blue noted, took place at a June 17 event in Knoxville and was signed by Dr. Blue, Dr. Millhorn of UT, and Dr. David Danielson, DOE Assistant Secretary for Energy Efficiency and Renewable Energy; over 300 attendees representing 161 companies participated in the occasion. Dr. Blue emphasized throughout his presentation the importance of partnerships and the many shared collaborations with the University of Tennessee. UT recruitment is also a significant benefit of the many new enterprises occurring within these relationships.

Mr. Cates thanked Dr. Blue for an excellent report and commended him for the outstanding work taking place in the initiative.

Dr. Millhorn recognized Dr. Jeff Nichols, Associate Laboratory Director for Computing and Computational Sciences at ORNL, to make a presentation (Exhibit 4) on Exascale Computing. Dr. Millhorn noted Dr. Nichols is one of the nation's top computing leaders and has moved ORNL into the forefront of global computing. Dr. Nichols introduced two associates attending the meeting to demonstrate Tiny Titan, their invention used to inform state-wide audiences--notably STEM students--about parallel-computing capabilities and technologies, and he invited members to explore the computer following

the meeting.

Dr. Nichols described the types and capabilities of computers at ORNL which have made ORNL one of the most powerful computing facilities in the world. Beacon, he said, is a computer at ORNL operated by UT for the National Science Foundation (NSF). Dr. Nichols noted the tremendous data online-disc storage capacity available with 40-50 petabytes (PB) within the Spider file system. Scientists come from all over the world to utilize data analytics and visualization programs with two power walls at ORNL, Dr. Nichols said, and there is abundant network connectivity of systems with 100 gigabytes (Gbps). These aspects create a gigantic balanced computing ecosystem today at ORNL, Dr. Nichols noted, but complacency is never allowed and work is ongoing to reach better and higher degrees of computing production and efficiency. Dr. Nichols related via power-point slides examples of computational and modeling research regarding genetically-modified lignin in ethanol production and high-temperature superconductor impact on transition metals and metal oxides with a wide range of technological applications. Dr. Nichols noted the wide range of research ongoing activities involving UT and ORNL faculty and staff, including use of the hybrid multi-core Titan and the many-core Mira computing systems.

Dr. Nichols described next-generation DOE systems created through APEX and CORAL collaborations and the 2017 Summit system, a machine with 5-10 times more power (an estimated 250 peak petaflops, PF) than the current Titan system of 27 PF. Dr. Nichols said efforts are already being directed to development of a 2022 DOE Request For Proposal (RFP) for an exascale initiative, OLCF5, based at ORNL. Dr. Nichols concluded his presentation by noting rationale for creating more powerful and improved computing capabilities for ever-growing economic and societal needs and demands. Combining UT and ORNL resources, Dr. Nichols stated, gives outstanding momentum to provide the applications and solutions in this quest.

Trustee Wharton asked how protection of Intellectual Property (IP) is maintained. Dr. Nichols said increasing investments are being made for programs providing protection of security for computers and facilities. Innumerable attempts are made daily by external entities to get into the ORNL system, Dr. Nichols noted, and serious diligence is directed to block these attempts. ORNL has been successful in blocking the vast majority of such attempts, Dr. Nichols said, and surveillance can indicate diverted information flow to a particular nation or location. Dr. DiPietro asked if more powerful machines require increased energy usage. Economics often caps investment devoted for such usage, Dr. Nichols said, and another order of magnitude reduction in power will be needed as the move to exascale is made.

Mr. Cates thanked Dr. Nichols for a most informative report.

VII. UT KNOXVILLE PRESENTATION – CORPORATE AND FOUNDATION ENGAGEMENT

Dr. Millhorn recognized Dr. Taylor Eighmy, UTK Vice Chancellor for Research and Engagement, to give a presentation (Exhibit 5) of activities taking place within the Office of Corporate and Foundation Engagement. Dr. Eighmy noted that Dr. Craig Blue, prior presenter in the meeting, is a Joint Faculty member in the Department of Mechanical, Aerospace & Biomedical Engineering at UTK. He also said, in response to an earlier question by Trustee Evans, most of the expenses incurred within IACMI will be captured by the University as the subcontractor for the initiative; increasing the level of research expenditures is critical in aspiring to be a Top 25 research institution, Dr. Eighmy noted.

Dr. Eighmy recognized colleagues Stacey Patterson, Scott Rabenold, Marc Gibson and Sally Morris as comprising, along with himself, the oversight leadership for the newly-created Office of Corporate and Foundation Engagement. This entity serves as “front door” entry for companies developing strategic partnerships with UT, provides access to campus research and faculty expertise, and also creates and expands partnerships with industry and foundations. These relationships are extremely important in growing UT’s research program, especially in view of a flat federal funding budget for competitive proposals, Dr. Eighmy stated; in the corporate world, he said, R&D is 7-8 times the federal funding level.

An important part of the corporate and foundation growth at UT is UT-Battelle (UT’s RD&D “bedrock”), Dr. Eighmy said, addressing its significant joint programs and resources. Corporations and foundations today now focus on selective strategic partnerships, Dr. Eighmy continued. An example is Boeing Corporation, which used to have partnerships with 350 universities around the world and today these have been streamlined to 40, with UT among this number, Dr. Eighmy stated. Many partnerships are developed through a senior executive UT alum or other UT connection interested in engaging with UT, Dr. Eighmy said. UT is in good company with this development strategy, Dr. Eighmy noted, giving examples of Top 50 public and private institutions such as Duke, Harvard, Yale, Johns Hopkins, NC State, Northwestern and Vanderbilt upon which UT’s program has been modeled. Dr. Eighmy listed prominent current corporate and foundation prospects UT is fostering and described several of them, including Intel, Eastman, Boeing, the Kavli Foundation and the Bill & Melinda Gates Foundation, giving points of strength and advantages for each engagement.

Mr. Cates thanked Dr. Eighmy for his informative presentation.

VIII. UT INSTITUTE OF AGRICULTURE PRESENTATION – FOOD SAFETY RESEARCH

Dr. Bill Brown, Dean for Research and Director of UTIA AgResearch, introduced Dr. Mike Davidson, Professor in the UT Institute of Agriculture (UTIA) Department of Food

Science & Technology, to make a presentation (Exhibit 6) on Food Safety Research. Due to meeting time constraints, Dr. Davidson quickly gave highlights of initiatives and programs involving food safety challenges and solutions. Dr. Davidson cited Center for Disease Control and Prevention (CDC) statistics regarding the impacts of foodborne illness in the US and noted recent industry recalls, fines and lawsuits, such as the 2015 Blue Bell ice cream shutdown due to *Listeria monocytogenes* contamination. Dr. Davidson stated many UTIA scientists are involved in food safety research and education; research funding from a variety of sources totaled \$7.1M over the past five years, he noted, and industry R&D, with such companies as ConAgra, is increasing. Dr. Davidson discussed microbiology research at UT taking place within the food production chain (“farm to fork”) with disease-causing bacteria in poultry production and controls to this problem using genetic mapping and probiotics, an alternative to use of antibiotics. Research at the Plateau Experiment Station in Crossville involving *E. coli* contamination of produce by untreated irrigation water is resulting in successful controls, Dr. Davidson also noted. Dr. Davidson said edible antimicrobial coatings are being used to improve safety of cantaloupe and other fresh fruits and UTIA researchers are helping consumers and food industry who want no synthetic food preservatives by developing natural antimicrobial approaches for food safety. Dr. Davidson also noted that UT is a global leader in determining heat-resistance kinetics of foodborne viruses.

Dr. Davidson concluded his presentation by highlighting the overall impacts of research at UT on microbiological food safety for Tennesseans resulting, among other things, in improved safety of foods for better health, lower medical costs, a more stable economic outlook for Tennessee food producers and processors with better food security for less spoilage and waste, and enabling industry to meet new FDA food safety regulations.

Mr. Cates thanked Dr. Davidson for accommodating the short timeframe remaining for the meeting and for giving an excellent report.

IX. CHEROKEE FARM UPDATE (WRITTEN REPORT)

A one-page written report of June 3, 2015 (Exhibit 7), by Cliff Hawks, President and CEO of Cherokee Farm Development Corporation (CFDC), provided an update on the Cherokee Farm Innovation Campus.

X. OTHER BUSINESS

None.

XI. ADJOURNMENT

There being no other business, Mr. Cates adjourned the meeting at 3 p.m.

Respectfully submitted,

A handwritten signature in cursive script, appearing to read "David E. Millhorn". The signature is written in black ink and is positioned above a horizontal line.

David E. Millhorn, Ph.D.