

MINUTES OF THE MEETING  
OF THE  
MICHIGAN STATE UNIVERSITY  
BOARD OF TRUSTEES

October 24, 2014

President Simon called the meeting of the Board of Trustees to order at 9:30 a.m. in the Board Room.

Trustees present: Brian Breslin, Dianne Byrum, Joel Ferguson, Mitch Lyons, Brian Mosallam, Faylene Owen, and Diann Woodard (via phone).

Trustees absent: George Perles.

University officers present: President Simon, Provost and Executive Vice President Youatt, Executive Vice President Udpa, Vice President and Secretary Beekman, Vice President and General Counsel Noto, Vice Presidents Burnham, Dawkins, Gore, Groves, Haas, Hsu, Maybank, and Swain. Faculty liaisons present: Martin Crimp, William Davidson II, William Donohue, Deborah Moriarty, and Mariam Sticklen. Student liaisons present: Emily Bank, James Conwell, Dontae Freeman, and Adam Grajewski.

All actions taken were by unanimous vote of the Trustees present, unless otherwise noted.

1. On a motion by Trustee Ferguson, supported by Trustee Breslin, the **BOARD VOTED to approve** the agenda.
2. On a motion by Trustee Byrum, supported by Trustee Ferguson, the **BOARD VOTED to approve** the minutes of the August 29, 2014 Board of Trustees meeting.
3. President's Report

President Simon provided the following report to the Board.

A. Capital Campaign

This will be a special weekend on campus as "Empower Extraordinary: The Campaign for MSU" kicks off. The research presentation this morning will provide a wonderful example of Empowering Extraordinary, and the Board will be asked to approve a goal for the campaign later in the meeting.

B. Title VI Awards

Over the next four years, MSU will receive more than \$7 million in Title VI grants from the U.S. Department of Education. The centers receiving grants this year include the African Studies Center; the Asian Studies Center; a partnership between the Center for the Advanced Study of International Development and the Center for Gender in a Global Context; the International Business Center in the Eli Broad College of Business; and the Center of Language Education and Research. These awards are a testament to the dedication of the MSU faculty and staff who provide a comprehensive international education for MSU students and scholars.

C. 2014 Distinguished Physician Award

Michael Andary, MSU Professor of Physical Medicine and Rehabilitation, is the recipient of the American Association of Neuromuscular and Electrodiagnostic Medicine's 2014 Distinguished Physician Award. This award recognizes a member's superior achievements as a clinician, educator, and association volunteer.

D. Presidential Green Chemistry Challenge Award

The Environmental Protection Agency has honored five MSU chemistry professors—Robert Malezka, Mitch Smith, John Frost, Karen Draths Frost, and James Dye—with the Presidential Green Chemistry Challenge Award. No other university has been so honored more often.

E. Academy of Community Engagement Scholarship

Hiram Fitzgerald, Associate Provost for University Outreach and Engagement, has been inducted into the Academy of Community Engagement and Scholarship (ACES). Dr. Fitzgerald was nominated and selected by his peers in recognition of his long career and many accomplishments in collaborating with communities to address critical issues of societal and scholarly significance.

F. MSUBA 2014 Distinguished Alumni Honorees

Michigan State University Black Alumni Association, Inc., named Senior Advisor and Director Paulette Granberry Russell one of its

2014 Distinguished Black Alumni Award honorees. The MSUBA recognizes the individuals for their extraordinary dedication to education, professional achievement, leadership, and service to the community.

G. Five MSU Students Nominated for Major International Awards

Five MSU Honors College students across an array of majors have been nominated for prestigious scholarship awards—the Marshall Scholarship, Mitchell Scholarship, and Rhodes Scholarship.

H. Filming on Campus

MSU was pleased to have Warner Brothers Pictures on campus at the Broad Art Museum last week shooting scenes for an upcoming major motion picture. Kevin Epling led the Team MSU effort. He tirelessly worked with Warner Brothers for months and helped to show off the campus in a spectacular way.

I. MSU Sustainability Report

Ms. Jennifer Battle, Director of Campus Sustainability, provided a summary of the Sustainability Report and noted that the full report is available on the MSU website:

<http://sustainability.msu.edu/report/2014/#/>

4. There was no Public Participation on Issues Germane to the Agenda.

5. Personnel Actions

Provost Youatt presented the following personnel actions:

DiRita, Victor, J., AN—Professor, RH Hugh Chair in Microbial Pathogenesis, Department of Microbiology and Molecular Genetics, \$225,000, with Tenure, effective June 1, 2015.

Petroff, Brian K., AN—Associate Professor, Department of Pathobiology and Diagnostic Investigation, \$125,000, with Tenure, effective October 1, 2014.

Trustee Ferguson **moved to approve** the recommendations, with support from Trustee Lyons.

**THE BOARD VOTED to approve** the recommendations.

6. Finance Committee

Trustee Owen presented the Trustee Finance Committee Report and the following recommendations and resolutions.

A. 2015-16 Appropriation Request and Capital Outlay

It was recommended that the Board of Trustees adopt Michigan State University's 2015-16 Appropriation Request, including requests for the University General Fund, AgBioResearch, and Michigan State University Extension. (Appendix A)

Be it resolved that the Board of Trustees of Michigan State University hereby adopts the 2015-16 Appropriation Request.

Trustee Owen **moved to approve** the resolution, with support from Trustee Byrum.

**THE BOARD VOTED to approve** the resolution.

B. New Investment Manager—Wingspan Investment Management, LP

It was recommended that the Board of Trustees select Wingspan Investment Manager, LP, an investment manager in the Common Investment Fund's marketable alternatives asset class.

Be it resolved, that the Board of Trustees of Michigan State University hereby selects Wingspan Investment Management, LP as an investment manager.

Trustee Owen **moved to approve** the resolution, with support from Trustee Mosallam.

**THE BOARD VOTED to approve** the resolution.

C. Fund Functioning as an Endowment—Richard A. Faber Scholarship Fund

It was recommended that the Board of Trustees establish a fund functioning as an endowment to provide scholarships to students enrolled in the School of Hospitality Business.

Be it resolved, that the Board of Trustees of Michigan State University hereby establishes a fund functioning as an endowment entitled "Richard A. Faber Scholarship Fund."

Trustee Owen **moved to approve** the resolution, with support from Trustee Ferguson.

**THE BOARD VOTED to approve** the resolution.

D. Authorization to Plan—Cyclotron Building—Office Addition—Phase III

It was recommended that the Board of Trustees authorize the Administration to plan for an addition to the Cyclotron building.

Be it resolved, that the Board of Trustees of Michigan State University hereby authorizes the Administration to plan for the project entitled “Cyclotron Building—Office Addition—Phase III.”

Trustee Owen **moved to approve** the resolution, with support from Trustee Lyons.

**THE BOARD VOTED to approve** the resolution.

E. Project Approval—Authorization to Proceed—Duffy Daugherty Football Building—Renovate Locker Room and Training Room

It was recommended that the Board of Trustees authorize the Administration to proceed with renovations to the locker room and training room in the Duffy Daugherty Building.

Be it resolved, that the Board of Trustees of Michigan State University hereby authorizes the Administration to proceed with the project entitled “Duffy Daugherty Football Building—Renovate Locker Room and Training Room” with a project budget of \$5,500,000.

Trustee Owen **moved to approve** the resolution, with support from Trustee Breslin.

**THE BOARD VOTED to approve** the resolution.

F. Project Approval—Authorization to Proceed—Berkowitz Basketball Complex—Alterations to Basketball Offices

It was recommended that the Board of Trustees authorize the Administration to proceed with renovations to the offices in the Berkowitz Basketball Complex.

Be it resolved, that the Board of Trustees of Michigan State University hereby authorizes the Administration to proceed with the project entitled "Berkowitz Basketball Complex—Alterations to Basketball Offices" with a project budget of \$3,800,000.

Trustee Owen **moved to approve** the resolution, with support from Trustee Lyons.

**THE BOARD VOTED to approve** the resolution.

- G. Project Approval—Authorization to Proceed—Kellogg Center—Replace Absorption Chilled Water System (budget adjustment)

It was recommended that the Board of Trustees authorize the Administration to amend the budget for the replacement of the chilled water system at the Kellogg Center due to unfavorable bidding conditions.

Be it resolved, that the Board of Trustees of Michigan State University hereby authorizes the Administration to proceed with the project entitled "Kellogg Center—Replace Absorption Chilled Water System" with a revised project budget of \$3,400,000.

Trustee Owen **moved to approve** the resolution, with support from Trustee Ferguson.

**THE BOARD VOTED to approve** the resolution.

- H. Project Approval—Authorization to Proceed—Bio Engineering Facility—Scope Adjustment—Partial Build-Out of Floors Three and Four

It was recommended that the Board of Trustees approve an adjustment to the scope of the Bio Engineering Facility project which will authorize use of the projected savings in construction costs to build out as much of the Facility's third and fourth floors as those funds will permit.

Be it resolved, that the Board of Trustees of Michigan State University hereby authorizes the Administration to proceed with the project entitled "Bio Engineering Facility—Scope Adjustment—Partial Build-Out of Floors Three and Four."

Trustee Owen **moved to approve** the resolution, with support from Trustee Lyons.

I. Project Approval—Authorization to Proceed—Life Science Building—B-Wing Fume Hood Ventilation Modifications

It was recommended that the Board of Trustees authorize the Administration to proceed with fume hood ventilation modifications in the Life Science Building B-Wing.

Be it resolved, that the Board of Trustees of Michigan State University waives any requirements under Board Policy 02-06-01 that the Administration obtain authorization to plan for the project entitled “Life Science Building—B-Wing Fume Ventilation Hood Modifications;” and

Be it further resolved that the Board of Trustees hereby authorizes the Administration to proceed with that project with a budget of \$2,000,000.

Trustee Owen **moved to approve** the resolution, with support from Trustee Breslin.

**THE BOARD VOTED to approve** the resolution.

7. Policy Committee

Trustee Byrum presented the Trustee Policy Committee Report and the following recommendations and resolutions.

A. New Department in the College of Engineering

It was recommended that the Board of Trustees establish a new department in the College of Engineering called the Department of Biomedical Engineering.

Be it resolved, that the Board of Trustees of Michigan State University authorizes the establishment of the Department of Biomedical Engineering in the College of Engineering, effective January 1, 2015.

Trustee Byrum **moved to approve** the resolution, with support from Trustee Ferguson.

**THE BOARD VOTED to approve** the resolution.

B. Approval of Contract Terms

It was recommended that the Board of Trustees approve a contract between Michigan State University and *Black Pine Engineering, LLC*, a company in which faculty member Dr. Norbert H. Mueller holds a financial interest.

Be it resolved that the Board of Trustees approves a patent license option agreement with *Black Pine Engineering, LLC*, consistent with earlier public notice given at a Board meeting and with the "Option Agreement Term Sheet" presented to the Board. (Appendix B)

It was recommended that the Board of Trustees approve a contract between Michigan State University and *Ubiquitous Energy, Inc.*, a company in which faculty member Dr. Richard R. Lunt holds a financial interest.

Be it resolved that the Board of Trustees approves a patent license option agreement with *Ubiquitous Energy, Inc.*, consistent with earlier public notice given at a Board meeting and with the "Option Agreement Term Sheet" presented to the Board. (Appendix C)

Trustee Byrum **moved to approve** the resolutions, with support from Trustee Ferguson.

**THE BOARD VOTED to approve** the resolutions.

B. Notice of Intent to Negotiate Contracts

Pursuant to State law, Trustee Byrum gave public notice of the University's intent to negotiate contracts with *Guangzhou Wolbaki Biotech Company Ltd.*, a company based in Guangzhou, Guangdong, China.

Dr. Zhiyong Xi, an Associate Professor in the Department of Microbiology & Molecular Genetics, and his family own or have options to buy an ownership interest of more than one percent of the company. Dr. Xi is also an officer of *Guangzhou Wolbaki Biotech Company Ltd.*

Pursuant to State law, Trustee Byrum gave public notice of the University's intent to negotiate contracts with *HAO Tech, LLC*, a company based in East Lansing, Michigan.

Dr. Guoliang Xing, an Associate Professor in the Department of Computer Science and Engineering, and his family own or have



options to buy an ownership interest of more than one percent of the company. Dr. Xing is also an officer of *HAO Tech, LLC*.

Pursuant to State law, Trustee Byrum gave public notice of the University's intent to negotiate contracts with *VL 29, Inc.*, based in Cambridge, Massachusetts.

Dr. Bruno Basso, an Associate Professor in the Department of Geological Sciences, and his family own or have options to buy an ownership interest of more than one percent of the company.

## 8. Audit Committee

Trustee Breslin presented the Trustee Audit Committee Report and recommendations.

The Audit Committee met and reviewed with the MSU staff and the Board's external auditors, Plante Moran, the 2013-14 audited financial statements.

The University received a clean opinion from the auditors, which indicates that MSU followed accounting rules appropriately and that the financial reports are an accurate representation of MSU's financial position as of June 30, 2014.

No significant changes were made to Plante Moran's audit approach, which was reviewed by the Audit Committee prior to the commencement of audit work. No significant adjustments were proposed during the audit, and no material weaknesses in internal controls or accounting policies and procedures were noted.

Based upon this review and report, action was recommended to make official the June 30, 2014 financial statements of the University.

It was recommended that the Board of Trustees approve and make official the financial statements of the University.

Be it resolved, that the Board of Trustees of Michigan State University hereby accepts the audited financial statements for the year ended June 30, 2014.

Trustee Breslin **moved to approve** the resolution, with support from Trustee Ferguson.

**THE BOARD VOTED to approve** the resolution.

9. Gifts, Grants, and Contracts

Vice President Hsu introduced Kalyanmoy Deb, Koenig Endowed Chair and Professor in the College of Engineering. Dr. Deb made a presentation to the Board on the role of optimization in applied problem solving tasks. (Appendix D)

10. Empower Extraordinary, the Campaign for Michigan State University

President Simon and Vice President Groves reviewed with the Board the status of the capital campaign, Empower Extraordinary, the Campaign for MSU.

It was recommended that the Board of Trustees authorize a comprehensive public fund-raising program entitled Empower Extraordinary, the Campaign for Michigan State University, and establish a Campaign goal of \$1,500,000,000, to be raised by December 31, 2018.

Trustee Ferguson **moved to approve** the resolution, with support from Trustee Byrum.

**THE BOARD VOTED to approve** the resolution.

11. Trustee Comments

Trustee Ferguson said that he was excited to kick off the Campaign for MSU and encouraged everyone to attend the Campaign events.

Trustee Lyons thanked Dr. Deb for the research presentation and said that he looks forward to a successful Campaign for MSU.

Trustee Owen thanked the faculty liaison committee members for their work and said that she is proud to be a part of Team MSU.

Trustee Woodard said that she echoed the excitement of her colleagues regarding the Campaign for MSU.

Trustee Byrum said that there was great enthusiasm for the Campaign for MSU and that she would be attending the related events.

Trustee Mosallam thanked Vice Presidents Grove and Swain for their fundraising and branding efforts.

Trustee Breslin said that he also echoed the sentiments of his colleagues with regard to the Campaign for MSU.

12. There was no Public Participation on Issues Not Germane to the Agenda.

13. Request to Adjourn

On a motion by Trustee Ferguson, supported by Trustee Owen, **THE BOARD VOTED to adjourn** at 10:35 a.m.

Respectfully submitted,



William R. Beekman  
Vice President and  
Secretary of the Board of Trustees

## Michigan State University 2015–16 Appropriation Request

Today's higher education marketplace focuses ever more tightly on value, an effect demonstrated every year by MSU's increasing applications for admissions and by post-graduation outcomes and employer validation. MSU is poised to maintain and expand on its land-grant tradition, bringing the latest in science into practice across the state and around the world as it moves from land-grant to world-grant in its posture. Consistently ranked as a top 100 global university, MSU is a leading edge, world-class university committed to Michigan with exemplary undergraduate and graduate education programs.

Having confronted economic challenges without compromising its values and standards, MSU now is poised to seize opportunities presented by the evolving operating environment. President Lou Anna K. Simon's Boldness by Design initiative, framed in 2005, aligned MSU's collective work toward five imperatives, each founded on the institution's core values of quality, inclusiveness and connectivity.

University leaders are building the framework to be Bolder by Design, challenging all of MSU to once again lead the transformation of higher education and, as part of the process, adding a sixth imperative: becoming a model high-performance organization. Bolder by Design establishes the foundation for MSU to continue its role as the world's preeminent land-grant university.

MSU is a vital engine of Michigan's prosperity, leaving an annual \$5.0 billion economic footprint. MSU has a presence in every Michigan County, training physicians at over 35 partner hospitals, operating 14 AgBioResearch centers from Benton Harbor to Saginaw to Escanaba. After graduation, Spartans become leaders, entrepreneurs, volunteers, and contributors to their communities, fulfilling the intent of our 19th-century founders. Currently, over 230,000 alumni reside in the state of Michigan. Additionally, Michigan State University has positioned itself to provide the state with the type of graduates employers demand and who drive economic growth in the 21st century. In fact, over the last ten years STEM-based student credit hours have increased by approximately 29 percent. Non-STEM credit hours have decreased by 2.3 percent over the same period.

MSU is an institution founded on a dynamic balance between the theoretical and the practical, discovery and dissemination, knowing and being. Standing among the 60 great

research institutions comprising the Association of American Universities, Michigan State is yet differentiated in its fidelity to each of its core land-grant values: quality, inclusiveness and connectivity. They are tightly linked and demonstrated in myriad ways, from the university's roster of top scholars and programs to its diverse campus community to its many forms of local, regional and international engagement.

The world's greatest challenges lie where MSU always has been a research and practice leader, and these are where we will increasingly focus our vast capabilities:

- food systems, safety and plant science;
- water quality, security and management;
- energy and matter, including nuclear physics, advanced materials and bioenergy;
- sustainability, whether environmental, economic or societal;
- health, from zoonotic disease to family medicine and translational research; and
- renewable resources, including agricultural products, biomass and energy.

With MSU's broad and interdisciplinary capabilities, these areas involve not just the science and discovery necessary to advance cutting-edge knowledge, but innovative application through our expertise in outreach and engagement, communications, value chains, social and political sciences and other competencies.

## **Strategic commitment**

Within the context of Bolder By Design, planning includes both reinforcement of long-term principles and testing selected innovations.

- Sustain MSU's value proposition of programmatic excellence and opportunity for Michigan residents
- Expand economic impact through both undergraduate and graduate programming including significant economic multipliers, spurring future state growth
- Advance the common global good as one of the world's top research universities continuing to build on MSU's pioneer land-grant commitment to find solutions to the most critical challenges facing individuals and troubled communities in Michigan and beyond

- Further education and research across STEM disciplines including science, technology, mathematics and engineering, sustaining broad academic excellence at both the undergraduate and graduate levels
- Within academic programs, integrate technology and teaching/learning, support interdisciplinary study, close graduation gap, and foster a healthy campus
- Target MSU first-time undergraduate enrollment at 7,700 for Fall 2015 to optimize instructional faculty and facility usage
- Strengthen university initiatives, including plant sciences, engineering disciplines including biomedical engineering, computational sciences emphasizing existing strengths in biology, food and food chain security, population and community health, the environment including food, water, and energy
- Keep MSU faculty at the leading edge of teaching and research while working with businesses and communities across the state to innovate and develop entrepreneurial environments that bolster the Michigan economy and help create sustainable prosperity
- Partner with numerous state and regional universities and community colleges
- Respond to changing financial circumstances with ongoing improvements in efficiency and effectiveness throughout the institution, including constraining personnel costs
- Assess performance across the institution against relevant benchmarks and metrics

## MSU funding

MSU requests recurring FY15 appropriations support for the general fund, MSU AgBioResearch (MABR), and MSU Extension (MSUE) sufficient to sustain FY15 programming levels and invest in Michigan's economic future. The university operates within the context of long-term underfunding and growing enrollment demand, particularly within high-cost disciplines. It is essential that stable, predictable funding be provided to maintain higher quality academic programs and opportunity for Michigan students and to enhance the strategic strengths of MABR and MSUE.

State reductions in higher education appropriations through FY15 resulted in reductions to MSU appropriations of approximately 19 percent since FY02, representing a cumulative loss of over \$600 million in operational resources over 13 years. Over the last ten years through FY14, Michigan ranked 50<sup>th</sup> among the states in changes to

appropriations. For FY15, about 22 percent of general fund revenues are budgeted from appropriations, and approximately 70 percent from tuition and fees, with the remainder composed primarily of investment income and indirect cost recovery. This compares to FY05, when about 40 percent was budgeted from appropriations and approximately 50 percent from tuition and fees.

MSU is accountable to Michigan citizens. It has the highest number of in-state students among Michigan public universities. Michigan is always the first beneficiary of MSU's graduates, as the university delivers high-quality academic programs and global networks with Michigan applications.

MSU continues to be a leader in creating knowledge for the 21st century. As such, it is recognized as one of the world's top 100 universities. MSU received \$528 million in external funding during FY14, of which about 53 percent was research-related. The federal share of research funding was approximately 87 percent. Research and scholarly work of this magnitude has a significant impact on the Michigan economy, both in expenditures and jobs. MSU actively pursues economic growth through programs across the university. An example is the MSU Center for Community and Economic Development, which provides training and consulting services to Michigan communities.

The university is also a key player in the development of Michigan's health care and life science sector, including educating both nurses and physicians. MSU is involved in partnerships with dozens of hospitals to train physicians, while bringing federal graduate medical education funding into those communities. The College of Human Medicine has campuses in seven communities, including Grand Rapids and Traverse City; the College of Osteopathic Medicine has campus locations in East Lansing, Detroit, and Macomb County.

MSU has localized the diverse resources for business outreach, technology commercialization, and new business formation under one roof: the MSU Innovation Center. The Innovation Center is MSU's single site for economic value creations from MSU innovations. Entrepreneurs and established businesses work with Business-CONNECT, MSU's portal for engagement with the business community; they access patented technologies at MSU Technologies (the university's technology transfer office); and they engage in company creation and investment at Spartan Innovations L3C, which focuses on creating sustainable MSU start-ups.

Additionally, the Product Center at MSU helps Michigan entrepreneurs develop and commercialize high-value, consumer-responsive products and businesses in the agriculture, natural resources, and bioeconomy sectors. Since it began in 2004, the Product Center has provided a wide range of venture development services to more than 3,000 clients. It has assisted in the formation of more than 1,583 ventures for new and existing firms, leading to the realized launch or expansion of 396 businesses across Michigan that generated more than \$322 million in annual sales and the creation/retention of approximately 1,791 jobs.

Funding directly impacts the students MSU is able to attract and retain. Entering student ACT scores are up over the last ten years. MSU has 25 academic programs in the top 20 nationally. Four graduate programs and one undergraduate program rank number 1. At MSU, 92 percent of graduating seniors who responded last year to the National Survey of Student Engagement rated MSU's academic quality as good or excellent, and 86 percent said they would attend MSU if they had to do it over again.

MSU's six-year graduation rate for the class of 2012 was 78 percent, which is 8 percentage points higher than the rate predicted by *U.S. News & World Report* based on incoming student characteristics. MSU's plus-8 rate is the second-highest in the Big Ten, exemplifying MSU's willingness to take risks when investing in a student's potential. Moreover, it is a measure of quality that demonstrates how well MSU is using its educational resources to graduate students, even in difficult budgetary times.

## Financial aid: assuring opportunity

MSU is committed to assuring access to higher education for Michigan students. Over 76 percent of undergraduate students and over 70 percent of all students come from Michigan's 83 counties. For FY15, MSU continued to increase financial aid at a rate greater than increases to tuition with approximately \$120.2 million budgeted in financial aid programs, representing a total increase of approximately 4.0 percent for one year and 45 percent over five years.

In FY14, 65 percent of all MSU students received some form of financial aid and 22 percent of undergraduate students received a Pell Grant. In addition to high-need students, MSU carefully monitors the distribution of student-family income and focuses significant aid resources at the students with family income just above Pell levels.



## **MSU AgBioResearch and MSU Extension**

As the nation's pioneer land-grant university, MSU is especially committed to working with Michigan stakeholders to meet the needs of our agriculture and natural resources industries through a variety of means including a programmatic presence in communities across the state. The annual economic impact of the food and agriculture industries in Michigan is more than \$94.1 billion. They are a leading force for economic stability in Michigan. With agribusiness also among the fastest growing economic sectors in the state, MSU AgBioResearch and MSU Extension contribute to Michigan's economy with significant research, educational programs and a community presence to boost economic development and growth related to agriculture and natural resources, community vitality, entrepreneurship, and career preparation for young people. Therefore, it is essential that full recurring support be provided to both MSU AgBioResearch and MSU Extension, including inflationary increases.

MSU AgBioResearch is focusing on the following key research areas:

- Food and health
- Environmental stewardship and natural resource policy and management
- Enhanced profitability in agriculture and natural resources
- Secure food and fiber systems
- Families and community vitality

MSU Extension is focusing on:

- Assisting the agricultural sector with production issues, risk management, and reducing environmental risks
- Preparing Michigan youths for their future as leaders and citizens
- Providing programs on obesity prevention, food safety, and chronic disease management
- Helping develop a robust community food system across Michigan
- Assisting Michigan's citizens with foreclosure prevention and financial education
- Helping to ensure the appropriate use of Michigan's natural resources

In an era of significantly reduced state funding and increasing expenses, MSU continues to build upon its partnerships with local, state and federal government agencies and with the private sector while maintaining its core values and commitments. Leadership continues to

balance increasing the value of our work while ensuring it matches the high quality expected of MSU. We engage our partners, our students, our faculty and the stakeholders and communities we serve, both locally and globally, to shape a shared future of sustainable prosperity.

MSU is also working with stakeholders and the Michigan Department of Agriculture and Rural Development (MDARD) to pursue the agriculture Strategic Growth Initiative to secure a pool of flexible funding above inflationary support for MSU AgBioResearch and MSU Extension core activities, directed toward solving impediments to strategic growth and emerging threats with significant stakeholder input. This is particularly valuable to Michigan, the second most diverse agriculture production state in the nation, and home to 90 commodity organizations.

## Facility for Rare Isotope Beams

The Facility for Rare Isotope Beams (FRIB) is a critical project for American science and the state that not only will keep MSU on the cutting edge of nuclear science, but will ensure the training of the nuclear scientists of tomorrow while bolstering the economies of mid-Michigan and the entire State. FRIB will cost \$730 million to design and build. In FY14, the state made a commitment to bond and service the community cost share of \$94.5 million. Construction began in 2012 and will be completed by 2022, with current forecasts anticipating completion in December 2020. FRIB is projected to create hundreds of jobs in mid-Michigan, while bringing in more than \$1 billion of economic activity to Michigan in the next 20 years. MSU looks forward to continuing its partnership with the State of Michigan to assure the successful completion of this project.

MSU continues to work with the U.S. Department of Energy Office of Science (DOE-SC) in developing FRIB and continues to manage against the annual plan prepared by MSU and approved by DOE. On August 1, 2013 the DOE-SC approved critical decisions CD-2 and CD-3A. CD-2 baselines the scope, cost and schedule (completion by June 2022) and is managing towards completion in December 2020. The project received CD-3B approval in August of 2014 with project progress well in advance of DOE targets, a necessary approval for assuring December 2020 completion.

The centerpiece of the new user facility will be a superconducting linear accelerator that will increase dramatically the reach of rare isotope research in the United States. The accelerator will produce isotopes that normally exist only in the most extreme environments in the universe and will expand the usefulness of isotopes in a broad range of applications from modeling stars to understanding the workings of nanoscale electronic devices.

## Capital outlay

In July of 2013 the state passed an amended construction authorization for MSU's Bio Engineering Facility with a total authorized cost of \$57.7 million. The state share is \$30.0 million and the Michigan State University share is \$27.7 million. Due to a variety of factors, it is expected that there will be cost savings on this project. A request is before the state to apply those savings to build out as much of the shelled 3<sup>rd</sup> and 4<sup>th</sup> floors as possible. Michigan State University is extremely grateful for the continued state support of this key research facility, supports our continued commitment to biomedical and engineering research. The capital outlay requests support programs that have strong national reputations, expanding research bases, and high enrollment demand that will sustain the university and its contributions to Michigan. Funding of these requests will provide economic development in the state, now and in the long term. Our capital outlay top priority remains the Interdisciplinary Science and Technology Building.

### New construction

New construction is needed to support high-priority programs ranging from the sciences to academic/administrative technology. The facilities are needed to support current and future programmatic initiatives in the STEM disciplines with an emphasis on support for the biomedical, biological and engineering sciences, computation and data sciences, water and energy and economic development of Michigan, now and in the long term.

### Renovations and additions

Requests for renovations and/or additions address extensive programmatic and maintenance improvements required by buildings previously funded by the state. Renovations may be needed to reconfigure space in order to support the work of the programs housed in those facilities, upgrades to building systems, and provisions for

barrier-free access. In other cases, due to program requirements, condition, age and long-term value, renovation of a building is warranted.

Requests for major renovations and/or additions include the Plant Sciences-Bioeconomy, Biological Sciences, and Music facilities.

### **Major systems replacement**

Current forecasts anticipate general fund facility and infrastructure needs of approximately \$173.1 million over the next five years. In view of the extensive facility needs it faces, MSU has had to draw upon an increasing amount of internal university resources to address the most critical facility maintenance and programmatic requirements. Self-funding these capital improvements is not sustainable without impact on other programs.

The university seeks funding for more targeted and specific building systems maintenance and instructional space facility upgrades. Examples of systems in need of repair or replacement include roofing, windows, electrical, mechanical, chiller, refrigeration, steam, fire, security and barrier-free access. Instructional space upgrades may include furniture, ceilings, lighting, painting, power, data and technology support, lab benches and fume hoods.

### **Potential State Initiatives**

MSU's continued emphasis and investment in Engineering programs mirrors the state's interest and support for increasing the number of Engineering majors and graduates. Facility investments will provide the infrastructure capacity and support necessary to increase the number of students in Engineering majors, including innovative learning environments and opportunities for research-based experiences.

### OPTION AGREEMENT TERM SHEET

**Party:** Black Pine Engineering, LLC

**License:** Option on patent rights

**Term:** From the effective date of the agreement to October 26, 2015; extendable upon mutual agreement

**Technology:** MSU Invention Disclosure:  
 TEC2011-0071 "Rotor Apparatus" including U.S. Patent Application 14/001,820; and  
 TEC2004-0084 "Woven Turbomachine Impeller" including U.S. Patents Nos. 7,938,627; 8,449,258; and 8,506,254

The parties may add or remove technologies under the agreement, including improvements generated under a separate sponsored research agreement, provided that the change does not affect the financial consideration of the parties or the nature or extent of any pecuniary interest of MSU personnel.

**Technology's Potential Commercial Utilization:** Gas removal compressors

**Payment Terms:** \$5,000 fee payable within 30 days

**Services Provided:** By MSU to Black Pine Engineering, LLC: None contemplated under agreement  
 By Black Pine Engineering, LLC to MSU: None contemplated under agreement

**Organization Type:** Michigan limited liability company

**Personnel Interest:** Dr. Norbert H. Mueller, an Associate Professor in the Department of Mechanical Engineering, and his family own or have options to buy an ownership interest in more than 1% of the company. Dr. Mueller is also an officer of Black Pine Engineering, LLC.

### OPTION AGREEMENT TERM SHEET

**Party:** Ubiquitous Energy, Inc.

**License:** Option on patent rights

**Term:** From the effective date of the agreement to October 26, 2015; extendable upon mutual agreement

**Technology:** MSU Invention Disclosure:

TEC2012-0086 "Transparent Energy-Harvesting Devices" including U.S. Patent Application No. 14/220,850;

TEC2012-0100 "WDE Follow Up," including U.S. Patents Application No. 14/075,498 and 61/774,054; and

TEC2014-0088 "WDE Follow Up," including U.S. Patents Application No. 61/947,187

The parties may add or remove technologies under the agreement, including improvements generated under a separate sponsored research agreement, provided that the change does not affect the financial consideration of the parties or the nature or extent of any pecuniary interest of MSU personnel.

**Technology's Potential Commercial Utilization:** Electronic devices

**Payment Terms:** \$20,000 fee (payable in two installments) and ongoing patent costs

**Services Provided:** By MSU to Ubiquitous Energy, Inc.: None contemplated under agreement  
By Ubiquitous Energy, Inc. to MSU: None contemplated under agreement

**Organization Type:** A Delaware corporation based in California

**Personnel Interest:** Dr. Richard R. Lunt, an Assistant Professor in the Department of Chemical Engineering & Materials Science, and his family own or have options to buy an ownership interest of more than 1% of the company.

**RESEARCH  
PRESENTATION  
TO THE MSU BOARD OF TRUSTEES**

**OCTOBER 24, 2014**

**KALYANMOY DEB  
KOENIG ENDOWED CHAIR PROFESSOR  
COLLEGE OF ENGINEERING**

Facilitated by the Office of the Vice President for  
Research and Graduate Studies

## Kalyanmoy Deb

Kalyanmoy Deb is the Koenig Endowed Chair Professor in the Department of Electrical and Computer Engineering. Prof. Deb's research includes optimization and their application in design, modeling, and machine learning. He has been awarded with a number of recognitions: Infosys Prize, TWAS Prize in Engineering Sciences, CajAstur Mamdani Prize, Edgeworth-Pareto award, and Bessel Research award from Germany, to name a few. He is a fellow of IEEE, ASME, and three main Indian science academies. He has published over 375 research papers with more than 64,000 citations and an H-index of 84. He is on the editorial board of 20 major international journals.



## Role of Optimization in Applied Problem Solving Tasks

### **Kalyanmoy Deb**

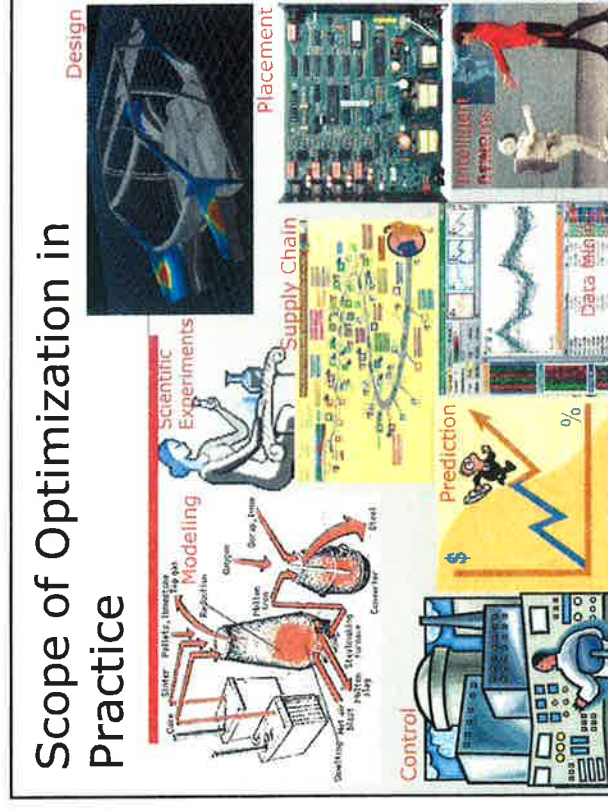
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1



## Optimization Algorithms: Mathematical and Nature-inspired

**Nonlinear Programming**  
 $\nabla f(x) - \sum u_j \nabla g_j(x) - \sum v_k \nabla h_k(x) = 0$

**Linear Programming**  
 $J = 1$   
 $k = 1$   
 $J = 1$   
 $J = 1$

**Math. optimization**  
 $g_j(x) \geq 0$   
 $h_k(x) = 0$   
 $u_j g_j(x) = 0$   
 $u_j \geq 0$

**Evolutionary optimization**

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## Adopted in Practice



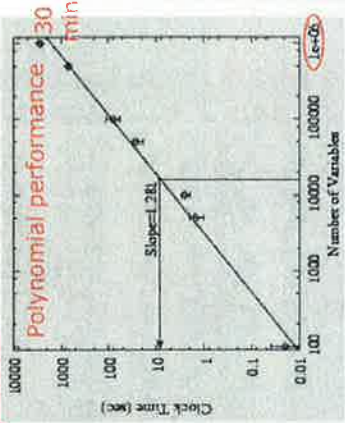
- Nose of Shinkansen (Bullet Train in Japan) N700 Series <http://english.jr-central.co.jp/news/n20040616/index.html>
- KONE elevator's control system ([http://www.kone.com/countries/en\\_MP/Documents/Brochures/KONE%20Alta.pdf](http://www.kone.com/countries/en_MP/Documents/Brochures/KONE%20Alta.pdf))



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### Large-Scale Optimization: Handling a large number of variables

Casting Scheduling






Polynomial performance 30 min

Slope = 2.81

Approximate Solution Quickly: Max 2 kg off in 650-kg vessel

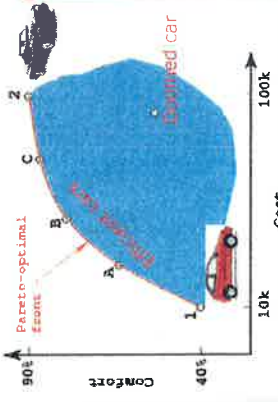
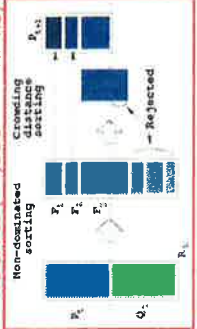
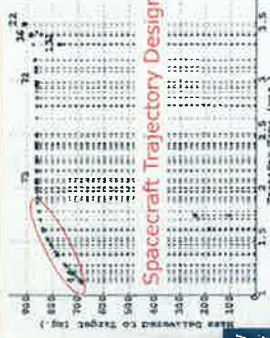
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5


### Multi-Objective Optimization: Handling multiple conflicting objectives

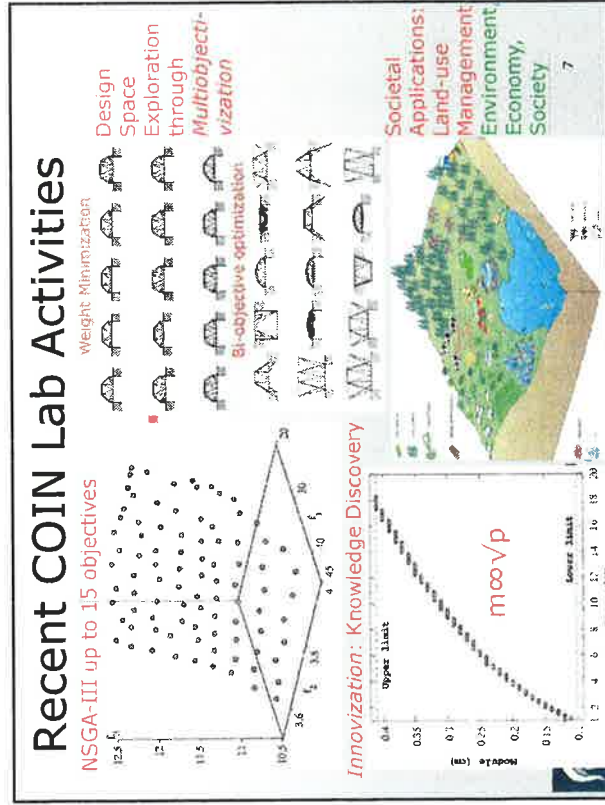
NSGA-II (12,000+ Citations)

Spacecraft Trajectory Design

- ▶ First, find trade-off front
- ▶ Then, make a decision





### Conclusions

- ▶ Optimization – Essential tool for practitioners
- ▶ Industries are ever more interested
  - ▶ Single to multi-objective optimization
- ▶ Many commercial software companies
- ▶ Optimization for knowledge discovery
- ▶ MSU & BEACON Center, a key contributor to optimization research
- ▶ Extension to UG course curriculum is the next step

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8