



**BUILDING A NATION OF MAKERS:
UNIVERSITIES AND COLLEGES PLEDGE
TO EXPAND OPPORTUNITIES TO MAKE**

Executive Office of the President

JUNE 2014



Colleges and Universities Building a Nation of Makers

The spirit of ingenuity, exploration, and creation, which has driven the American experience from its founding, has long taken root in the Nation's institutions of higher education. Colleges and universities continue to prepare the next generation of Americans to face the challenges of tomorrow, while fostering a culture of curiosity that keeps America on the cutting edge. Colleges and universities have also contributed significantly to the Maker Movement, and continue to demonstrate leadership moving forward.

JOINT LETTER TO THE PRESIDENT ON MAKING

As part of first-ever White House Maker Faire, and in a joint letter to the President, over 150 institutions are committing to take one or more of the following steps to promote Making:

- Allowing students that are applying for admission to these institutions to submit their Maker portfolio;
- Investing in Makerspaces that are accessible to students across the campus, or serving as “anchor tenants” for commercially-operated Makerspaces;
- Supporting education, outreach and service-learning that is relevant to Making, such as encouraging students to serve as mentors for young Makers;
- Supporting research that advances Making technologies and facilitates greater access to Making experiences such as the development of new tools for desktop manufacturing;
- Expanding access to university shared facilities and scientific instrumentation to Makers;
- Encouraging students to use their senior design projects to experiment with Making and Maker-preneurship;
- Providing scholarships to students based upon excellence in Making.
- Participating in regional efforts to create a vibrant Maker ecosystem that involve companies, investors, skilled volunteers, state and local officials, libraries, museums, schools, after-school programs, labor unions, and community-based organizations.

INSTITUTION-SPECIFIC ANNOUNCEMENTS BEING MADE TODAY

In addition to the joint letter to the President, a number of institutions have written institution-specific letters describing in further detail the specific actions they will take. Key areas for commitments include:

Creation or expansion of open and innovative Makerspaces on campus

Makerspaces provide a stimulating environment for users to learn, ideate, design, create, and build. They are labs of invention, iteration, creativity and collaboration where students can learn techniques to master the tools of the future. Several universities will be launching new Makerspaces on their campus. For example:

- Case Western Reserve University will start construction on Think[box], a 50,000 square-foot, 7-story complex for ideation, prototyping, production, entrepreneurship, and mentorship in Fall of 2014.
- Spelman College will create its first on-campus Makerspace this summer, and faculty and students.
- Morehouse College will have expanded access to Maker tools this fall.
- Oregon Institute of Technology will open a new engineering building to provide space for students to engage in student projects, inventions, and entrepreneurial activities.
- Houston Community College is working closely with members of local industry and Rice University in developing a Makerspace on its newest campus, the West Houston Institute for Sciences.
- The University of Texas at Austin will soon break ground on the Engineering Education and Research Center, a 430,000 square-foot building designed to provide students with opportunities for multi-disciplinary learning, collaboration and hands on projects.
- Bucknell University will add cutting-edge tools to its Craft Center, creating a new hub for campus Makers in 2015.
- Georgia Institute of Technology continues to expand the Invention Studio, a free-to-use, student-run, 3,000 foot Makerspace used by more than 1,000 students every month.
- University of Hawai'i Mānoa's Fabrication Lab will expand collaboration of faculty, researchers and students from various departments, where individuals from the medical school, schools of agriculture, architecture, ocean and earth science and astronomy have already worked together on various projects and research.
- Youngstown State University's Launch Lab will continue to provide an open space for a cross-disciplinary group of students to gain hands-on experience tailoring physical products to conceive, design, and bring ideas into reality.

Campus education in making and entrepreneurship

Campuses across the country are supporting students as Makers, including increased participation by women and underrepresented groups. These schools have developed a number of exciting opportunities for Making and entrepreneurship through classes, student clubs, and competitions. For example:

- The University of Iowa's College of Engineering is providing scholarships to students based on excellence in Making.
- Georgia Institute of Technology created a competition, the InVenture Prize @ Georgia Tech. Called "American Idol for Nerds," this annual competition features 500+ undergraduate inventors, free patents, \$30,000 in prizes, and a live televised broadcast of the finals.
- Santa Clara University hosts an annual "entrepreneurship Maker challenge," in which student teams work together to design, produce and market unique products that are then sold in the campus bookstore.
- Howard University has adapted Steve Blank's Lean LaunchPad curriculum to offer a new Department of Systems and Computer Science course that challenges students to propose and develop an innovation alongside a commercialization business model, and test its market feasibility.
- New York University's Polytechnic School of Engineering introduces all freshmen to Making through the Innovation in Engineering and Technology Forum, a required course focuses on invention, innovation and entrepreneurship.

Creating life-changing technologies through Making

The ability to make almost anything opens up enormous possibilities, and campus maker spaces are enabling research and inventions that change lives. For example:

- At the University of California, Irvine, students designed and made a 3D-printed wheelchair model to traverse over a variety of terrains, and a 3D-printed replica of a blind Marines' skull that helped surgeons restore his sight.
- At the University of St. Thomas, students are working with the nonprofit Magic Arms for the World to design 3D printed custom devices for young children with arthrogryposis.
- At the University of Toledo's College of Engineering, students have built 150+ assistive devices to aid physically disabled members in their community.
- At Iowa State University, students and faculty are using their Making skills to develop and test a system to prevent tractor-rollover fatalities.
- At the University of Delaware, students in physical therapy, fashion and engineering developed a garment-based exoskeleton to assist children with palsy.

Training younger Makers

In addition to undergraduate education in Making, innovation, and entrepreneurship, many institutions of higher education are working with local K-12 schools to inspire and empower the next generation of Makers. For example:

- The Bagley College of Engineering at Mississippi State University sponsors student projects at the Mississippi School for Math and Science High School.
- Cuyahoga Community College's Youth Technology Academy is providing underrepresented high school students in Cleveland with after school and weekend technology education, Maker-mentors, and summer employment opportunities focused on electrical engineering, robotics, and manufacturing.
- The University of Tennessee, Knoxville is hosting free summer opportunities and faculty mentorship for middle- and high-school students to design, make, and present science and engineering projects.
- Fox Valley Technical College's Fab lab, with support of local industry, is developing innovative science, technology, engineering, and math (STEM) programming geared towards middle school girls, such as a recent guitar building workshop.
- James Madison University, well known for its Teacher Education programs, is creating a Makerspace in its College of Education, aimed at educating aspiring teachers on how to build Making into lesson plans and curriculum and use cutting edge technologies in the classroom.

Growing the Maker Movement and economic development in local communities.

Many colleges and universities are cultivating relationships in their communities and extending the opportunities in the Maker Movement to the broader public. For example:

- Morgan State University is working to make its facilities available to local businesses to increase economic development in Northeast Baltimore.
- James Madison University recently launched a Maker Space open to the Harrisonburg community at large. Housed in a refurbished ice factory, this space provides opportunities for student-public collaboration and local economic development.
- The University of Massachusetts Amherst is partnering with the Town of Amherst to establish a "town-gown Makerspace" that will host community and youth programs in science, technology, engineering, art, and math. Together with Amherst Media, a team of faculty will host a series of Maker workshops and weekly open Makerspace hours.
- At Georgia Institute of Technology, a recent university-hosted Mini-Maker Faire drew over 10,000 attendees.

Connecting university Makers to industry and manufacturing

Several universities are providing opportunities for students to partner with industry through courses and design projects. Furthermore, universities are promoting the regional economic growth through Making and manufacturing. For example:

- The School of the Art Institute in Chicago collaborated with CB2 to produce a number of products that were selected for manufacturing and sale in CB2 stores.
- Carnegie Mellon University is developing a new Advanced Manufacturing Facility for nano- and bio-additive manufacturing.
- The University of Notre Dame is contributing to Chicago and Detroit Manufacturing hubs for lightweight metal manufacturing and digital manufacturing and design.
- The North Carolina Agricultural and Technical State University is encouraging engineering students to develop and prototype innovative solutions to solve real industry problems as part of the Senior Design Program.
- Youngstown State University, a founding member of America Makes, the National Additive Manufacturing Institute, continues to bring new faculty members on campus to lead additive manufacturing research and courses.
- At the University of St. Thomas, students have the opportunity to work closely with regional industry partners through the Engineering Senior Design Clinic, where sponsors from organizations such as 3M, Medtronic and the Mayo Clinic engage with them throughout the design, testing and prototyping process.
- University of Delaware's Interdisciplinary Design Program is bringing together students in engineering, business and the arts to solve pressing challenges from the private, non-profit, and academic sectors. Each year, the program partners with over 30 companies and produces 12+ patents.

The commitments and initiatives made by the higher education community reflect a recognition of the critical role of Maker activities in education, research, entrepreneurship, economic development and STEM. The individual and shared commitments by these higher education institutions reflect a strong desire to find ways to work together as a community to ensure that the full potential of the Maker Movement is realized.

Attached are letters to the President from the colleges and universities outlining these efforts in greater detail.

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A Letter to President Obama on Fostering a Generation of Makers

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

June 18, 2014

Dear President Obama:

In recent years, the United States has benefitted from the democratization of the tools needed to design and make just about anything. More Americans have access to 21st century tools such as 3D printers and scanners, computer-aided design software, laser cutters, and computer-numerically controlled machine tools.

Hundreds of thousands of families are participating in Maker Faires, and communities across the country are investing in Makerspaces, FabLabs, and TechShops. Expert Makers are “passing it on” by serving as mentors for young Makers. This is empowering Americans to become producers of things, not just consumers of things. Moreover, the growth of the “Maker Movement” can help advance a number of our shared priorities, such as STEM education, innovation, entrepreneurship, and advanced manufacturing.

As the leaders of colleges and universities, we want to do our part to make the most of these opportunities. As the White House prepares to hold its first-ever Maker Faire, each of our institutions is committed to take one or more of the following steps to promote Making, including:

- Allowing students that are applying for admission to our institutions to submit their Maker portfolio;
- Investing in Makerspaces that are accessible to students across the campus, or serving as “anchor tenants” for commercially-operated Makerspaces;
- Supporting education, outreach and service-learning that is relevant to Making, such as encouraging students to serve as mentors for young Makers;
- Supporting research that advances making technologies and facilitates greater access to making experiences such as the development of new tools for desktop manufacturing;
- Expanding access to university shared facilities and scientific instrumentation to Makers;
- Encouraging students to use their senior design projects to experiment with Making and Maker-preneurship;

- Providing scholarships to students based upon excellence in making.
- Participating in regional efforts to create a vibrant Maker ecosystem that involve companies, investors, skilled volunteers, state and local officials, libraries, museums, schools, after-school programs, labor unions, and community-based organizations.

We are working together to develop a more comprehensive set of steps universities can take and each of our institutions will be developing an outline of our individual commitments to Making. Thank you for your leadership and commitment to advancing U.S. research and education. We look forward to working with you and your Administration to make this effort a huge success.

Signed,

Arizona State University
 Art Center College of Design
 Big Bend Community College
 Boise State University
 Boston University
 Bucknell University
 Bunker Hill Community College
 California College of the Arts
 California Polytechnic State University
 California State University, Northridge
 Cape Cod Community College
 Carnegie Mellon University
 Case Western University
 Catawba Valley Community College
 Cerritos College
 Charles S. Mott Community College
 College for Creative Studies
 College of San Mateo
 Columbia University
 Community College of Allegheny County
 Cornell University
 Crafton Hills College
 Cumberland County College
 Cuyahoga Community College
 Duke University
 Eastern Gateway Community College
 Eastern West Virginia Community and
 Technical College
 Embry-Riddle Aeronautical University
 Florida International University
 Folsom Lake College
 Fox Valley Technical College
 George Mason University

Georgia Institute of Technology
 Green River Community College
 Gulf Coast State College
 Harvard University
 Houston Community College
 Howard University
 Iowa State University
 James Madison University
 Kansas City Art Institute
 Lehigh University
 LeTourneau University
 Lorain County Community College
 Marshall University
 Massachusetts College of Art and Design
 Massachusetts Institute of Technology
 McLennan Community College
 Michigan State University
 Mississippi State University
 Monroe Community College
 Morehouse College
 Morgan State University
 New York Institute of Technology
 New York University
 North Carolina Agricultural and Technical
 State University
 North Carolina State University
 Northeast Wisconsin Technical College
 Northeastern University
 Northern Virginia Community College
 Ohio Northern University
 The Ohio State University
 Oregon College of Art and Craft
 Oregon Institute of Technology

Pacific Northwest College of Art
Pennsylvania College of Art and Design
Pennsylvania State University
Pennsylvania State University Erie, The
Behrend College
Purdue University
Rensselaer Polytechnic Institute
Rhode Island School of Design
Robert Morris University
Rowan University
Rutgers, The State University of New
Jersey
Saddleback College
San Francisco Art Institute
Santa Clara University
School of the Art Institute of Chicago
School of the Museum of Fine Arts, Boston
School of Visual Arts
Sierra College
South Central College
South Mountain Community College
Spelman College
Stanford University
State University of New York at New Paltz
Stevens Institute of Technology
Suffolk County Community College
Sweet Briar College
Tennessee Technological University
Texas A&M University
Texas State University
Tufts University
Tulane University
Tunxis Community College
Union College
Union County College
The University of Akron
The University of Alabama at
Birmingham
The University of Arizona
University at Buffalo, The State University
of New York
University of California, Berkeley
University of California, Davis
University of California, Irvine
University of California, Los Angeles
University of California, Merced

University of California, Riverside
University of California, San Diego
University of Central Florida
University of Cincinnati, College of
Engineering and Applied Science
University of Colorado Boulder
University of Delaware
University of the District Columbia
University of Florida
University of Hawai'i at Mānoa
University of Illinois at Chicago
University of Illinois at Urbana-Champaign
The University of Iowa
University of Louisville
The University of Maryland
University of Massachusetts Amherst
University of Massachusetts Lowell
University of Miami
University of Michigan
University of Michigan-Dearborn
University of Minnesota
University of Missouri System
University of New Haven
University of North Texas
University of Notre Dame, College of
Engineering
University of Oregon
University of Pennsylvania
University of Pittsburgh
University of Pittsburgh at Johnstown
University of Portland
University of Southern California, Viterbi
School of Engineering
University of St. Thomas
The University of Tennessee, Knoxville
The University of Texas at Austin
The University of Texas at Dallas
The University of Texas at El Paso
The University of Toledo
University of Toronto
The University of Vermont
University of Washington, College of
Engineering
Virginia Commonwealth University
Virginia Polytechnic Institute and State
University

Washington University in St. Louis
West Virginia University
Westmoreland Community College
Wright State University
Yale University
Youngstown State University

A Letter to President Obama on Fostering a Generation of Makers

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

June 12, 2014

Dear President Obama:

In recent years, the United States has benefitted from the democratization of the tools needed to design and make just about anything. More Americans have access to 21st century tools such as 3D printers and scanners, computer-aided design software, laser cutters, and computer-numerically controlled machine tools.

Hundreds of thousands of families are participating in Maker Faires, and communities across the country are investing in Makerspaces, FabLabs, and TechShops. Expert Makers are “passing it on” by serving as mentors for young Makers. This is empowering Americans to become producers of things, not just consumers of things. Moreover, the growth of the “Maker Movement” can help advance a number of our shared priorities, such as STEM education, innovation, entrepreneurship, and advanced manufacturing.

As the leaders of colleges and universities, we want to do our part to make the most of these opportunities. As the White House prepares to hold its first-ever Maker Faire, each of our institutions is committed to take one or more of the following steps to promote Making, including:

- Allowing students that are applying for admission to our institutions to submit their Maker portfolio;
- Investing in Makerspaces that are accessible to students across the campus, or serving as “anchor tenants” for commercially-operated Makerspaces;
- Supporting education, outreach and service-learning that is relevant to Making, such as encouraging students to serve as mentors for young Makers;
- Supporting research that advances making technologies and facilitates greater access to making experiences such as the development of new tools for desktop manufacturing;

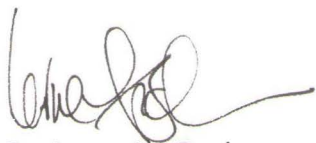
- Expanding access to university shared facilities and scientific instrumentation to Makers;
- Encouraging students to use their senior design projects to experiment with Making and Maker-preneurship;
- Providing scholarships to students based upon excellence in making and;
- Participating in regional efforts to create a vibrant Maker ecosystem that involve companies, investors, skilled volunteers, state and local officials, libraries, museums, schools, after-school programs, labor unions, and community-based organizations.

In particular, Art Center College of Design supports campus-wide maker culture by providing Makerspaces and shops at varying scales for all students to use, from traditional tools and advanced high-end 3D Printers to desktop 3D printers, laser cutters, and other tools. In many departments, student projects incorporate Making and Maker-preneurship, from undergraduate capstone projects to graduate level thesis work.

Art Center College of Design also supports research that advances making technologies. One such innovation created by Professor Philip van Allen, called the NETLab Toolkit (www.netlabtoolkit.org), allows students and other makers to quickly integrate physical computing with video, text and sound—without any programming. A new version in development will allow makers to create fully networked Internet of Things projects.

We are working together to develop a more comprehensive set of steps universities can take and each of our institutions will be developing an outline of our individual commitments to Making. Thank you for your leadership and commitment to advancing U.S. research and education. We look forward to working with you and your Administration to make this effort a huge success.

Sincerely,



Dr. Lorne M. Buchman
President
Art Center College of Design

June 13, 2014

The Honorable Barack Obama
President of the United States
The White House
1600 Pennsylvania Ave, NW
Washington, D.C. 20500

Dear President Obama:

On behalf of the **HBCU STEM Innovation, Commercialization and Entrepreneurship (or ICE) initiative**, I am writing to express our most enthusiastic support for the Maker Faire and Movement. The HBCU STEM ICE initiative represents a collaborative and partnership-driven effort led by the UNCF, the Association for Public and Land-grant Universities (APLU) and the White House Initiative on Historically Black Colleges and Universities with a vision to transform historically black colleges and universities (HBCU) into places where:

- African-American youth are STEM literate and empowered to address 21st century challenges and opportunities as innovators and entrepreneurs;
- HBCUs serve as vibrant nodes and hubs of innovation and entrepreneurship, and drivers for regional economic development.

The mission of the HBCU STEM initiative is to significantly increase the post-secondary yield of African-Americans STEM graduates pursuing careers in STEM fields; and to foster innovation and entrepreneurship across HBCU campuses that will significantly improve the profile and the R&D, commercialization and tech-entrepreneurship performance of HBCUs.

Our goals are to:

- Increase the number of HBCU STEM graduates entering into both STEM postgraduate and professional programs and STEM fields in industry by 2-3 fold over the next 10 years
- Enhance STEM educational infrastructure at UNCF member institutions to strengthen and improve teaching and R&D competitiveness (a 5-10 fold increase in the number of federal agency grants and contracts over the next 10 years).
- Launch a URM focused national advocacy and awareness campaign that will broaden and diversify the narrative around STEM opportunities and the innovation economy.
- Engage public sector stakeholders to influence policy and increase the public investment and access for African-Americans in STEM
- Facilitate economic and entrepreneurship development at HBCUs, and leverage investment capital for deal flow and research/IP commercialization and industry/Government relationships resulting in a 3-5 fold increase in the number of technology-based ventures launched from HBCU campuses over the next 10 years.



The HBCU ICE initiative achieved a major milestone last year with the inaugural HBCU Innovation Summit in Silicon Valley. Held over four days and in partnership with Stanford University, the Engineering Pathways to Innovation Center (Epicenter – NSF funded) and Andreessen Horowitz, Google and Facebook, The ICE platform galvanized commitments from over 25 HBCUs to participate and join the HBCU ICE Consortium, commit resources and time. Since the inaugural Summit, the ICE partnership has held an additional HBCU Innovation Symposium, and is poised to launch several programs including the establishment of a virtual tech-transfer and commercialization center, an HBCU-wide Hackathon competition and industry-aligned HBCU Technology Affinity Networks that will facilitate relationships between HBCU R&D, industry and federal agency research funding.

In addition, the ICE initiative will serve as a platform upon which STEM technology initiatives such as the Maker Faire and Maker Movement can be launched and implemented at scale across the HBCU landscape. As we represent the HBCU community – both public and private institutions – we have the ability to facilitate institutional engagement and implementation for initiatives such as the Maker Faire on our campuses. Since the summit, we have seen direct evidence of the ICE initiative’s impact on building capacity and infrastructure on our campuses. Several HBCU ICE member institutions have already begun building and creating Innovation Centers and Maker Spaces with the goal of providing unique experiences for students and faculty to explore innovation and entrepreneurship with 3D printing, coding/programming skills and entrepreneurial training. The ICE platform will continue to play a supportive role in the development of these Maker Spaces by identifying sources of capital and resources. The ICE platform will also serve as a hub to establish a community of practice where HBCU ICE stakeholders can share best practices and lessons learned as they develop and implement their strategic plans for their respective efforts on campus.

Finally, we are excited to support and be involved with the Maker Faire and the Maker Movement that promises to inclusively empower a new generation of tech-innovators and entrepreneurs ensuring America’s competitiveness for years to come.

Sincerely,

John Michael Lee, Jr., Ph.D.

Vice President, Office for Access and Success:

The Advancement of Public Black Universities and Hispanic Serving Institutions

Association of Public and Land-grant Universities

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June 5, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

President Obama:

STEM education is not about books, equations, and Powerpoints delivered in lecture halls. It is about experiential, hands-on doing. It is about learning how to apply experience and knowledge to create, innovate, and problem solve. Boise State University is dedicated to providing a relevant 21st century education for tomorrow's leaders, and to sharpen the technological edge that the United States must strive to maintain. As advocates for the "Maker Movement" we are excited by the demonstrated leadership of the White House in promoting these efforts with the upcoming Maker Faire. In the true spirit of the Do-It-Yourself culture, the White House is leading by example with this DIY celebration of the innovation capacity of our country.

Boise State University is proud to be a member of the Maker Movement, and we are actively expanding our capacity to provide Makerspaces to our entire campus and local community. Currently, in our College of Engineering, we aggressively seek senior design opportunities that have real impact, both for the students and the sponsors. In fact, we are currently proposing a College of Innovation & Design that will expand these efforts to all students on campus, and create a true multi-disciplinary team-based education experience. We also have many student clubs which access our fabrication facilities. These experiential opportunities are critical for engineering students. They are also important for all students.

To provide this experience, the tools of innovation and creation must be available. Boise State University is pooling resources across campus to provide access to wood shops, metal shops, computer-aided-design studios, software development systems, business incubators, and mentoring resources. A student team is being commissioned to look at various business models that may be relevant to creating, financing and managing growth and access to these Maker Spaces. Ultimately, Boise State University envisions a centralized facility that will provide mentored access, training and guidance to all students and community members.

Boise State University is excited to be a member of the Maker Community and to support our collective goals of creating an environment that encourages invention, manufacturing and production in addition to consumption.

Sincerely,

A handwritten signature in black ink that reads 'Amy J. Moll'. The signature is written in a cursive style with a large, stylized initial 'A'.

Amy J. Moll
Dean of Engineering



Bucknell
UNIVERSITY

Office of the President
Bucknell University
Lewisburg, Pennsylvania 17837

Phone: 570-577-1511
Fax: 570-577-3369

June 9, 2014

Dear President Obama:

Bucknell University is a liberal arts institution in central Pennsylvania, serving a primarily undergraduate student body. We see Making as one path to integrate students, faculty and staff from the College of Arts and Sciences, the College of Engineering, the School of Management, Student Affairs, and Library & Information Technology, as well as capitalize on our residential living environment.

To foster Making on campus, we've adopted an approach that we believe is a good model for other smaller schools that do not have the regional, space or financial resources of larger and more urban institutions. Our approach is to broaden the capabilities of and access to existing spaces on campus. This creates a variety of Makerspaces across campus, heightening the interdisciplinary nature of the space while maintaining the original stewardship and in-house expertise in those places.

Current main Makerspaces:

+ *Mooney Innovation Lab* (College of Engineering): Standard hand-tools, some power tools, 3D printing, reserveable tables and lockers, and proximity to the Project Development Lab (more traditional shop space).

+ *Art Barn Sculpture Studio* (Art and Art History): Extensive wood and metal shop tools, 3D printer, Shop-Bot.

Current smaller spaces:

+ *Digital Scholarship Center* (Library and Information Technology): 3D printer and 3D scanner, along with CAD software. This is intended as a space for those not fully comfortable with the tools or technology to learn more in a low-risk environment.

+ *Student Engineering Consulting Lab* (Small Business Development Center): 3D printer and 3D scanner, along with CAD software. Engineering student interns assist local entrepreneurs and small businesses, including student startup ventures, to prototype and develop new products.

Upcoming Makerspaces (2015):

+ *Bucknell University Makerspace* (Craft Center): Building on the current Craft Center space for student creation, we will broaden the space and capabilities to include a laser cutter, 3D printer, 3D scanner, and hand tools while maintaining the traditional craft center capabilities in painting, pottery, sewing, silk-screening and small-scale woodworking. This space is seen as the new heart for Makers at Bucknell.

+ *Electrical and Computer Fabrication Lab* (Electrical and Computer Engineering): In addition to 3D printers, this Makerspace will feature the tools and materials needed to design and fabricate integrated circuits.

All of these spaces require appropriate training and safety precautions to use the tools. Each space will also have signage designating it as a Makerspace and directing Makers to the other available spaces on campus.

These efforts are empowering Makers on campus. But simply having available space and tools is insufficient. We also want to encourage members of our community who are already Makers and also cultivate the work of those who have never engaged in Making before. We want to foster a culture where it's *cool* to be in the Makerspace soldering with your friends on Saturday night. We call this our "Outside the Classroom" initiative, and it's deliberately non-curricular because what we're seeking here is cultural. We want to cultivate Making, tinkering, and the intrinsic motivation and growth-mindset that accompanies these activities. The activities included in this cultural initiative include:

+ *Skills Workshops*: Short, free, workshops open to the campus community that center on particular Making-related skills. These happen in the Makerspaces and in the residence halls, and work on skills such as soldering and working with composites. In August 2014, a week-long pre-semester Bucknell Fabrication workshop (**B-FAB**) will provide an intensive focused introduction to these skills, culminating with a personal project.

+ *Extracurricular Project Fund* (aka "Nifty Idea Fund"): We want students to be able to create interesting projects in the Makerspaces, but we recognize not all students have the funds to buy the needed materials. This fund allows students to apply for up to \$500 in materials in order to realize their plans. One of the projects ("Prosthetic Hand") on the www.bucknell.edu/Maker website was funded through this source.

+ *Design Competitions* (funded by the Kern Family Foundation): These are one-to-three day long design jams for self-formed interdisciplinary teams of students. Students try to create and execute a design to meet a challenge in limited time with limited resources – for example, take a picture of an object that has been placed on top of the building.

We are very energized about the White House Maker Faire and the publicity it is bringing to this important idea. We at Bucknell are taking this opportunity to make it clear that when a student comes to us, they'll get a substantive and challenging education, the opportunity to apply what they learn, as well as the environment and tools to help them pursue their own projects.

Sincerely yours,



John C. Bravman
President

June 9, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

President Obama:

Having heard of the plans that The White House has to hold its first-ever Maker Faire later this year, I wanted to share some highlights of our college, Bunker Hill Community College (BHCC) and convey the continued commitment of our institution to embrace, support and promote the Makers in our college and in our community.

Beginning in 2009, Bunker Hill Community College embarked on creating an environment designed to cultivate the entrepreneurial mindset, first by creating academic degrees and cross-disciplinary certificates in entrepreneurship, and then creating supporting ancillary entities such as BHCC's Community Center for Entrepreneurship and BHCC's Entrepreneurship Club.

The Community Center for Entrepreneurship coordinates the various activities of the college related to entrepreneurship and small business services and provides one-stop shopping for our students as well as the community at large to access resources including services provided by virtue of our designation as an outreach site of the Massachusetts Small Business Development Center Network.

Our Entrepreneurship Club is a student-run organization that is committed to being the catalyst that brings together the people and ideas to foster an interactive learning environment to explore the world of entrepreneurship. Our mission is to foster the spirit of entrepreneurship and the entrepreneurial way of thinking at the Bunker Hill Community College, and to help students find the contacts, resources and real-world experiences necessary to launch or grow a successful enterprise.

Through these collective efforts, we have been able to provide the Makers on our campus and in our community the education, tools and confidence they need to pursue their dream of business ownership. While our efforts in spreading entrepreneurship are still in their infancy, our institution has spawned several entrepreneurs who have gone on to make this dream a reality.

Keo Rattana was a student at BHCC who went on to open a full-time business called KEO Ice Cream. KEO offers a premium non-dairy, gluten-free vegan alternative ice cream as a wholesaler business model. KEO Ice Cream is now in several local Boston area food stores including Whole Foods Market. When asked about her motivation to start her own business, Keo first mentioned her experience at BHCC:





“I wanted more for myself and wanted to inspire my children not to be afraid to reach for better things. The BHCC entrepreneurship program offered me a variety of supports and made it possible for me to learn with their night and weekend hours, online classes, scholarships and minimum prerequisites. If I had not gone back to school, I probably would not be running my own business. At my age and situation, community college such as BHCC was my only alternative for education.”

Keo’s plans for the future include moving into a larger production facility, expansion to additional retail outlets, adding employees, and purchasing proper equipment to scale the business. With increased production capacity, she hopes to be in more stores, cross borders to neighboring states, and one day become a national brand.



Shervin Gorgani was a student at BHCC, and while living in Boston, he noticed many small businesses were throwing away a lot of material that could easily be recycled. After making a move back to California, he saw the same. Shervin conducted more research, and he discovered that if these businesses had bins that made recycling convenient for them, they'd participate. He obtained a California Certified Recycling Business designation and opened Eco-Cycling, a small business specializing in providing FREE deposit based recycling services to commercial entities.

He is currently running the business out of his truck and is in the process of leasing property to grow his business. He still has his full-time job, but also works 30-35 hours per week on Eco-Cycling with one part-time employee. As he continues to grow his contract base, he plans on leaving his day job to operate the business full time. Additionally, he is in the process of hiring two additional employees to help with new contracts he recently secured. In regards to his time at BHCC:

“When I took Entrepreneurship classes at BHCC, I learned for the first time how to open a business instead of just learning the fundamentals of business. I learned real world applications and processes for taking the necessary steps to first open the doors and then subsequently, how to keep them open. It was a hands on process that took me through the phases of business models, business plans, pitches, routes for funding, and mentorship. Without the classes I took at BHCC and the relationships I made with the Professors in the Entrepreneurship program, I wouldn't be where I'm at.”

These are just two of the budding success stories emerging from our institution. It is our goal to continue to foster an environment supporting the future potential Makers at BHCC.

The spirit of entrepreneurship is not just transcending our campus, it is also spreading on our campus. This past semester, BHCC’s Entrepreneurship Club took the initiative to engage in social entrepreneurship by creating a fundraiser to help a local homeless shelter. The Club created a Valentine’s Day fundraiser in which they sold carnations, with all proceeds going to

President Obama, Page 3
June 9, 2014

Rosie's Place, a Boston area shelter. Their efforts raised \$1,018.20 and helped to instill not only the tenets of entrepreneurship, but of helping the less fortunate. Efforts like these are helping to develop skills in entrepreneurship, but equally, developing the life skills needed for economic and human progression.



These stories and experiences lend to the tenets set forth in the objectives of the Maker Faire. Bunker Hill Community College would be honored to participate in this event and to help further our entrepreneurial potential and share in the exciting experience of creating entrepreneurs, opportunities, and better human beings.

Sincerely,

Pam Y. Eddinger, Ph.D.
President
Bunker Hill Community College
Boston, MA

May 7, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

California State University, Northridge (CSUN) is pleased to support the Maker-Faire Initiative to help advance a number of our shared national priorities, such as STEM education, innovation, entrepreneurship, and advanced manufacturing.

By way of background, CSUN is one of 23 campuses in the California State University system. With an enrollment exceeding 38,000 students, CSUN is among the largest single campus universities in the United States. CSUN is the only four-year institution of higher education committed to responding to the multicultural community of the San Fernando Valley in the city and county of Los Angeles. The College of Engineering and Computer Science at CSUN is home to over 3,900 students and graduates approximately 500 students per year with undergraduate and graduate degrees in Engineering and Computer Science. It is renowned for its “hands-on” approach to learning that provides students with several excellent opportunities for undergraduate research, and laboratory work, as well as internships and industry experience.

CSUN has a long-standing commitment to promote advanced manufacturing as evidenced by the following:

- We offer one of the three ABET accredited Bachelor’s degree programs in Manufacturing Systems Engineering in the State of California.
- The 5000 square foot Haas Automation Lab in the College of Engineering and Computer Science features rapid prototypers, 3-D Printers and the latest CNC machines and has supported generations of students over the past two decades. The lab is divided into two halves,—one devoted to fabrication, where students make parts, and one where they work on their senior design projects, including the Human-Powered Vehicle, Unmanned Aerial Vehicle, Formula SAE car, and Intelligent Ground Vehicle.
- The College has several nationally recognized programs and is in the midst of a five year, \$ 5.5 M grant awarded by the US Department of Education in 2011, to enhance the graduation of under-represented minorities in engineering.
- We work very closely with high schools to encourage students to pursue engineering by offering our “Introduction to Engineering” course to high school students for college credit through our ACCESS program. The program is anchored by high school teachers who serve as lab instructors

in a dozen area high schools; including one of the finalists for the 2008 National Teacher of the Year- Mr. Lewie Chappelle of Monroe High School. Notably, all schools in our program compete in the FIRST Robotics and FIRST VEX competitions that inspire confidence in students through the “hands-on” experiences they provide.

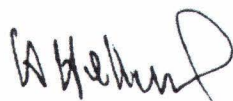
- The College has a culture of supporting innovation and celebrates the success of its students through annual events such as the Project Showcase:
<http://www.csun.edu/sites/default/files/sdps20140418.pdf>. Recent successes include first place honors by our student teams in the national AeroDef Manufacturing Challenge (2013), the SHPE National Design Competition in 2011 (Living Green) and 2009 (Assistive Technology) and the 2012 and 2011 national Intelligent Ground Vehicle Championships. Notably the winners of the SHPE design competition have received support to patent their projects and explore commercialization.
- Through the College’s Ernie Schaeffer Center for Entrepreneurship and Innovation we are developing programs to engage students in advanced manufacturing and entrepreneurship utilizing the latest technologies, and 3-D Printers, complemented with advanced material characterization capabilities.
- And finally, CSUN is taking the lead in the Los Angeles region to serve as a respected source of talent and continuing education in engineering that serves a variety of industries including Aerospace, Biotech and Clean Tech to name a few.

The Maker-Faire initiative will benefit teams of students working on innovative projects and can make a significant impact on engineering instruction in universities like ours that have a diverse student body with unique educational needs. You have our full support and commitment for this initiative. We are excited to be leading this endeavor to enhance “hands-on” experiences for students in advanced manufacturing through the Maker-Faire Initiative and look forward to working with you on this important national imperative.

Sincerely,



Dianne F. Harrison, Ph.D.
President



Harry Hellenbrand, Ph.D.
Provost and Vice President
for Academic Affairs



S. K. Ramesh, Ph.D.
Dean, College of Engineering
and Computer Science

Carnegie Mellon University

Office of the President
Carnegie Mellon University
5000 Forbes Avenue
Pittsburgh, Pennsylvania 15213
412-268-2200
president@cmu.edu

June 9, 2014

Subra Suresh
President

The Honorable President
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

Thank you for your leadership in convening the first National Maker Faire this month. This is a timely and exciting initiative that has already sparked enthusiasm and new thinking on our campus and around the nation.

Carnegie Mellon's roots as a technical trade school founded for the sons and daughters of steelworkers instills in us a deep appreciation of the power of "making things," an approach to learning that has driven CMU's educational experience for more than a century. Making at Carnegie Mellon has motivated decades of cross-disciplinary collaboration that brings together engineering, science, design, the arts, computer science, policy, and business.

We also share your vision that Making provides an opportunity to build bridges across communities. Carnegie Mellon students, union tradesmen and craftsmen, and Pittsburgh high school students have come together by tapping their inner "Maker" to discover new ways to work together. We have also witnessed the power of the Maker revolution to create new avenues for Carnegie Mellon spin-outs to secure the manufacturing of their products here in Pittsburgh.

Carnegie Mellon has historically been engaged in major initiatives in the Maker movement:

- The very cornerstone of the Maker movement was laid at Carnegie Mellon. Work by Dr. Lee Weiss of CMU'S Robotics Institute in the 1990's was among the first steps in the development of 3D printing technology.
- Carnegie Mellon was also one of the first universities to offer the option of including a Maker portfolio in its admissions process. This action was taken to recognize and tap the creativity of applicants, re-enforce the value of emerging high school Maker programs, and strengthen the Maker culture across our campus community.

- In 2003, CMU launched a Master of Integrated Innovation for Products and Services, a degree program that prepares students to work on cross-disciplinary “maker” teams, uniting engineering, design, and business.
- In 2012, Carnegie Mellon led the formation of the academic team that successfully competed for the national innovation institute for additive manufacturing, America Makes. In collaboration with our America Makes partners, we are committed to closing those critical gaps that still impede the development of these new technologies while also creating a beacon for engaging high school and college students in Maker activities. With pride, we helped establish the hub of America Makes in Youngstown, Ohio, as a statement of faith in the power this technology to shape the future of this region united by a rich industrial legacy.
- Faculty and students regularly reach beyond our campus to bring Maker experiences to many neighborhoods and communities. CMU’s Entertainment Technology Center (ETC) developed the first Maker space for a children’s museum in Pittsburgh in 2010. The ETC has also helped create digital media Maker spaces at the Harold Washington Library in Chicago and at the Carnegie Library in Pittsburgh.
- In 2012, we also joined with the Pennsylvania AFL-CIO and the regional workforce investment board in collaboration with Tech Shop to launch the “New App for Making it in America” project, with support from the U.S. Department of Labor. As noted above, this project is forging new cross-community collaborations and supporting CMU manufacturing spinouts with a well-trained work force right here in Pittsburgh. This project will also result in the creation of the first recognized national Maker credential. We believe that this credential will act as a powerful catalyst for linking Maker and Making activities to new business creation and manufacturing across the United States.

Your call to action has inspired us to celebrate the first ever National Maker Faire with new commitments. These commitments include expanding the role of Making in Carnegie Mellon’s own educational offerings, creating a strong infrastructure for Maker activities at CMU, and building new connections to encourage new Maker activities across the city, region, and nation:

We Will Expand and Develop New Maker Educational Opportunities

- In fall 2014, Carnegie Mellon will launch eight cross-CMU interdisciplinary minors designed to offer to all our undergraduates the opportunity for learning through collaborative Maker experiences that span creativity, technology, culture, and entrepreneurship. Based on 30 new interdisciplinary studio-format courses, this curriculum aims to connect the disciplinary expertise of each student to diverse Maker

contexts and spur creativity and innovation. These minors are being created through the *Integrative Design Arts and Technology* (IDEATE) initiative.

- In the fall of 2015, Carnegie Mellon will launch the Integrative Media Program (IMP) in New York City. The IMP program is the only of the four applied science initiatives that the City has launched to bridge technology, arts, and business expertise to advance Maker opportunities in emerging media and foster participatory culture. The IMP@NYC is a Master's level program focused on offering collaborative Maker learning and retraining opportunities to a diverse set of professionals, and it creates direct links that engage and foster synergy with Maker capabilities in both New York and Pittsburgh.

We Will Build New Maker Infrastructure

The introduction of the IDEATE curriculum will be accompanied by an investment of more than \$5 million in new Maker spaces on CMU's Pittsburgh, New York City, and Silicon Valley locations.

- In the fall of 2014, Carnegie Mellon will open the IDEATE@Hunt Collaborative Making Facility. The facility will occupy the first two floors of our central library, thus signaling the evolution of the library into a mediated learning commons. It will include 24/7 digital fabrication shops, a physical computing lab, an interactive media black box, a virtual computing cluster, and collaborative design studios open to all library users.
- In summer 2014, Carnegie Mellon will open the *Integrated Innovation Institute* as a setting for educating students on market-centered innovations. This Maker environment facilitates cross-training in engineering, design, and business.
- In the fall of 2015, Carnegie Mellon will open 12,600 square feet of bio- and nano-fabrication lab capabilities for next-generation nano-additive and bio-additive Making.
- Throughout 2014 and into 2015, Carnegie Mellon is developing a new Advanced Manufacturing Facility for research and development highlighted by several high-end metal and polymer additive manufacturing machines. This facility will be home to new additive manufacturing projects, particularly in conjunction with America Makes.

In addition to serving CMU students, these new facilities will create an additional focal point for our collaboration with the Pennsylvania AFL-CIO to provide organized labor with a window on innovation and make them full partners in the innovation process.

We Will Connect CMU Maker Capabilities to Help Meet Needs of the Region and Nation

- As one aspect of Carnegie Mellon's new Simon Initiative in technology-enhanced learning, the university will open a *Learning Media Design Center* in fall 2014 that will focus on K-12 education through new media and Maker experiences. The center will be

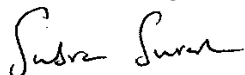
the bridge linking CMU's initiatives in Making to the region and in particular for collaboration with the Remake Learning Council in Pittsburgh. This center will focus on integrating neighborhood, school, library, Tech Shop, and museum initiatives to CMU's research and educational initiatives.

- Carnegie Mellon will partner with the Intel Corporation to advance best practices in Maker education for K-16 and lifelong learning and related Maker tool-kits. This project seeks to combine new Intel Maker-oriented processors with software applications and Maker curricula drawn from Carnegie Mellon and partner universities from across the nation. This collaboration is part of the Intel Design Network, a network of technology and arts schools brought together by Intel for advancing Maker-based learning and Physical Computing. Our collaboration with Intel will be combined with the Intel® Software Academic Program, the Stay With It program for improving the retention rate of science and engineering students at HBCUs and other underrepresented-population educational institutions supported by the Intel® Software Academic Program. This program is preparing a broader population of future educators to engage more young people in STEM and enhance the STEM pipeline. The embrace of diverse learning styles and approaches in STEM curricula in Maker-based learning can attract more people from underrepresented groups (women and minorities) to STEM education and careers.
- Finally, recognizing that your leadership in establishing the first National Maker Faire has launched a rich exchange of ideas across the higher education community, Carnegie Mellon would like to help sustain this conversation. We propose to adapt the NSF-funded, multi-university collaborative creative exchange site, XSEAD, www.xsead.cmu.edu, to support a permanent forum for ongoing dialogue across the higher education community on Maker initiatives. This readily available, multi-institutional site will support the ongoing sharing of best practices and Maker projects that this Faire has sparked.

Making is the essence of creativity and invention in both the arts and technology, which still form the heart of Carnegie Mellon's curricula. While 100 years ago, CMU students were developing stainless steel and other materials, designing roads and bridges, and writing plays, today they are also making robots, apps, games, fluorescent neurons, biosensors, and computer simulated-images of the origin of the universe. Making remains the vibrant essence of discovery and economic growth in our world.

We at Carnegie Mellon are grateful for the new energy that your vision for the National Maker Faire has sparked across the nation, and we look forward to contributing to the achievement of the important goals you have set forth.

With warm regards,



Subra Suresh

Barbara R. Snyder
President

10900 Euclid Avenue
Cleveland, Ohio 44106-7001

Visitors and Deliveries
Adelbert Hall, Room 216
p 216-368-5094
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May 8, 2014

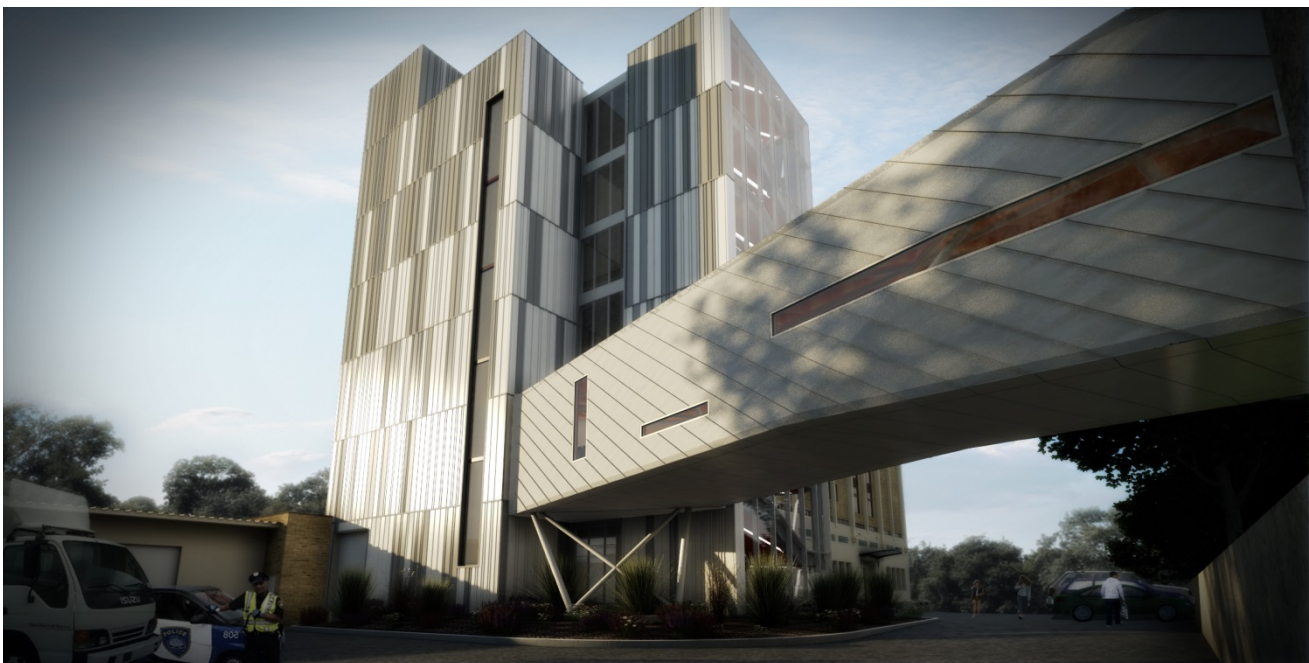
President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

President Obama:

Ten months after Joey Hudy's air cannon sent a marshmallow soaring through the State Dining Room, Case Western Reserve University opened a space that embodies the Arizona teen's Maker spirit: Think[box] 1.0, a 4,500 square-foot realm where students have created everything from fuel-cell powered bicycles to wireless water meters, test planes to even a laser-etched marriage proposal.

Open to the public as well, Think[box]1.0 includes 3D printers and printed circuit board routers, laser cutters and a 32-square foot ShopBot – a computer-controlled device that cuts, drills, carves and more. Launched in part as a proof-of-concept for a much larger effort to encourage hands-on invention and business incubation, it has so wildly exceeded expectations that construction starts **this fall** on the first phase of the full project: a 50,000 square-foot, seven-story building brimming with ideas and inspiration, initial prototypes and final products, budding entrepreneurs and seasoned executives eager to advise them.

This is an architects' rendering of the exterior:

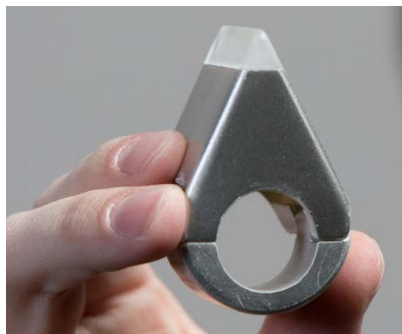


We are, after all, the university whose graduates include the inventor of the Nike Air Sole and the intermittent windshield wiper, the designer of Gmail and the Nobel Prize-winning creator of the “bubble chamber” – a development essential for a series of subsequent discoveries in subatomic physics. Little wonder, then, that one of the leading advocates for this venture is alumnus and self-proclaimed lifelong tinkerer Larry Sears, founder of Hexagram, a Northeast Ohio company that developed wireless meter-reading systems for utility companies.

Larry attributes his own success to experiences assisting faculty with real-world projects as a student. Once he sold the venture, Larry and his wife, Sally (also a graduate) decided to invest in the students who have followed them. They began with a \$5.9 million commitment to create an undergraduate design lab for electrical engineering students; inspired by its popularity, they seeded Think[box] as a second space to engage students. Larry and Sally committed \$5 million to the effort, followed by friend and alumnus Barry Romich (\$1 million). This spring the State of Ohio committed \$1 million to the project. And another alumnus, J.B. Richey – creator of the first full-body CAT scan – and his close friend and colleague, Mal Mixon - chairman of a greater Cleveland home medical product company – started off the process with a \$5 million commitment.

“We want to be a part of helping the next generation of young people with vision take some risks and generate some companies,” Mixon said, “and a new birth for Cleveland.”

Even in its initial incarnation, Think[box] already has helped stir a start-up spirit on campus. There’s EcoSpinners, a company founded by a junior chemical engineering major to develop an emission-free electrical bike. Along with them is Sprav Water, maker of a device that attaches to showers to allow users to track water and energy use; led by two senior engineering students, the company took top honors in this year’s Ohio Clean Energy Challenge – and a \$10,000 prize. And, finally, Carbon Origins, designers of reusable rockets that carry science and engineering payloads to the upper atmosphere for research, whose ultimate goal is “to make space commonplace.” The firm is one of just 16 start-up companies selected to appear at next week’s Bay Area Maker Faire.



Just as important as the future firms that may emerge from the ingenuity expressed within Think[box] are the lessons taught by the pure process of iteration and experimentation. It’s one thing to imagine an idea or even plot its form on a computer – quite another to build it yourself, test, tweak designs and then try again. With all of the tools at hand, students no longer need to wait weeks while outside vendors turn drawings into models and then ship them ack; here the only limiting factor is how quickly students can apply their modifications. In the first year of Think[box] one of our seniors used the printed circuit board router to create his capstone project. He took the device with him to employer interviews on the West Coast - and came back with a job at Apple.

These days Think[box] logs 3,000 visits a month. About 20 percent of those visits come from the public. As we prepare for the opening of Phase 1 in 2015, we’re also exploring opportunities to create programs for area middle and high school students. At the same time, we are looking at ways to revamp our introductory offerings for

students interested in STEM majors so that they experience the excitement of their own innovations early in their education – rather than enduring only foundation courses first. As faculty director Malcom Cooke explains: “Think[box] is more than a space. It’s a culture.”

And when a culture takes hold in a place, it touches more than academic life. It infuses how we think, what we imagine, and yes, even how we express undying love. Such was the case for a dental student Kyle Krause, who engaged Think[box] to help him prepare the perfect proposal. He wanted his words etched in a log that his dog, Maci, would present to his hoped-for bride-to-be. He created an image, imported it with the help of Think[box] staff and – *voila*:



Sure enough, she said yes:



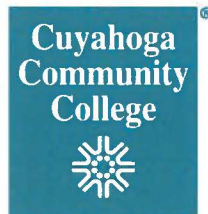
These are just some of the stories that have emerged from the makers on our campus and in our community. Case Western Reserve would be honored to tell more of them at your Maker Faire next month. We know firsthand how strong the thirst for these opportunities is; as Think[box] Operations Manager Ian Charnas shares a full third of the engineering students who enrolled last year told us they chose our university over other top programs “because we had a place where they could make things, not just draw them on the screen but actually *make* them.”

We have seen what is possible in a small space populated by state-of-the-art tools and technology, passionate teachers and inspired students. As we expand our size we also will grow our ambitions. The Maker Movement is snowballing across our country, and our campus is proud to be part of it.

We commend your emphasis on this essential part of education and the economy, and welcome any opportunity to share more about our efforts. Please let me know if I can provide any additional information as you prepare for next month’s event.

Sincerely,

Barbara R. Snyder
President



Where futures begin™

A Letter to President Obama on Fostering a Generation of Makers

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

June 12, 2014

Dear President Obama:

The Youth Technology Academy – a youth workforce program of Cuyahoga Community College (Tri-C) – is committed to increasing math competencies of high school students in Cleveland, OH and to igniting their interest in technical pursuits via STEM studies and career pathways. We believe that the Maker Movement is an effective tool in accomplishing these important goals.

According to the National Science and Math Initiative, our Country is facing a shortage of workers and students proficient in math and science. Compared to our global competitors, U.S. students recently finished 25th in math and 17th in science, well behind China, Korea, Japan, Canada, Germany and the UK, to name a few. Clearly, there is a critical need Nationwide for a defined pathway, and support structure that will enable disadvantaged, underrepresented students to have access to STEM studies and STEM career pathways and to successfully complete college with a technical degree or certificate so that they can enter the job market in the high technology fields that drive our Nation's economy.

The Youth Technology Academy (YTA) provides approximately 330 Cleveland Metropolitan School District (CMSD) high-school students with structured, after-school and weekend technology programming, which supplements their limited technology curriculum. Students participating in YTA enroll in Tri-C's pre-engineering coursework – primarily electronic engineering technology, robotics, and manufacturing – through Ohio's Post-Secondary Enrollment Options Program, which allows students to enroll in college coursework and earn college credit as well as stackable certificates, while they are still in high school.

YTA students are Makers by virtue of their participation in hands-on robotics activities and robotics competitions that reinforce project-based learning concepts taught in the pre-engineering and manufacturing classes. In addition, high-school teachers are trained to serve as Technology Ambassadors by Tri-C's Engineering Department and they act as Maker-mentors to the students assisting them with the exploration of their skills and abilities via the designing, building and programming of robots. YTA also provides its students with technical summer work experiences in addition to the technical programming that it conducts during the academic year. The Youth

Workforce and Economic Development Division

Advanced Technology Training Center | 3409 Woodland Avenue | Cleveland, Ohio 44115
216-987-3061 | Fax 216-987-3008

Technology Academy is considered one of Cleveland's best practices for student achievement in the area of technology education and this education is provided both formally through college credit classes and informally through Maker activities.


In recent years, the United States has benefitted from the democratization of the tools needed to design and make just about anything. More Americans have access to 21st century tools such as 3D printers and scanners, computer-aided design software, laser cutters, and computer-numerically controlled machine tools. While access to this technology is improving many of our inner city students are still left without the technology exposure they need to be successful. The YTA offers an exciting and innovative program through which students are exposed to cutting edge technologies that have real-world applications. Through the opportunity to 'make' things using the newest technologies and robotics platforms students get excited about STEM exploration. Their success as Makers proves to them that they have the intellectual abilities to master math skills needed to succeed in school and on the job!

YTA utilizes a variety of robotics platforms upon which the students make their robots from scratch including: VEX, FIRST and Arduino (a new open-source platform which is a fraction of the cost of traditional robotics technology allowing for the expansion of learning to more students.) The program is also one of the first in the Country to offer high school students training workshops featuring the "Raspberry Pi" – a micro-computer which costs under \$100 and was designed by an engineer in England specifically to increase access to technology for disadvantaged youth who are facing socioeconomic difficulties.

YTA's use of these various technologies and the function of allowing students to explore their abilities, and the world around them, via making activities is an effort to level the 'technology playing field' for underrepresented youth in Cleveland and help them find their competitive edge! Moreover, the growth of the "Maker Movement" can help advance a number of our shared priorities, such as STEM education, innovation, entrepreneurship, and advanced manufacturing.

Thank you for your leadership and commitment to advancing U.S. research and education. We look forward to working with you and your Administration to make this effort a huge success.

Sincerely,



George Bilokonsky, Executive Director
Youth Technology Academy
Cuyahoga Community College

June 11, 2014

President Barack Obama
The White House
1600 Pennsylvania Ave NW
Washington, DC 20500

Dear Mr. President:

Wisconsin is known for its cheese, and there is no shortage of great music in the northeast region of our state as well with the Event City USA designation in Oshkosh and the Mile of Music Festival in Appleton. There is, however, a shortage of skilled workers to fill regional workplace needs.

Regional employers partner with Fox Valley Technical College (FVTC) to generate important initiatives to meet the skills gap that is plaguing our economy. One such employer combined cheese and music to help gain some visibility about this important issue.

Strings Cheese

Sargento Cheese, headquartered in Plymouth, Wisconsin, worked with FVTC's Fab Lab to build a custom guitar. The Fab Lab at FVTC's Appleton campus is an innovation center that uses high-tech equipment to create prototypes for product development purposes.

Company officials put the guitar on display in its main lobby to help raise awareness on the value of the skills that were used to build it. Those skills relate to STEM competencies in **Science, Technology, Engineering, and Math**. Based on our region's strong manufacturing industry on national scale, STEM skills are prominent throughout the workforce.

Young students from area middle schools built the guitar for Sargento at the Fab Lab as a pilot project. In addition to learning hands-on skills in STEM, the students explored careers in manufacturing.

Several other organizations donated materials toward the effort as well. The raised awareness prompted additional guitar-building classes in FVTC's Fab Lab for other area youth.



President May presenting the Fab Lab guitar to Sargento Company officials.

Girls & Guitars

The excitement built from the cheese guitar led to more musical madness out of Fox valley Technical College's Fab Lab! In addition to partnering with the industry sector, FVTC looked next to the philanthropy arm of corporate America through a grant from the Bemis Company Foundation.

Aimed at developing STEM skills in middle school girls, the grant launched an initiative to increase awareness in non-traditional careers for females. With such a shortage of skilled workers in manufacturing, FVTC and its partners are committed to reaching as many students as possible in middle and high school to fuel excitement for rewarding careers in this sector.

We've learned that when people, regardless of any age, realize that they can "make something" with the right technology, the experience builds confidence to go along with new technical skills. FVTC is delighted to lead such an important initiative for young learners throughout the region.

To learn more, visit www.fvtc.edu/fablab.



Girls' Fab Lab guitar building project sponsored by the Bemis Company Foundation.

Thank you for taking time to learn about these innovative approaches to building awareness and skills in today's young students on behalf of Fox Valley Technical College. It is our honor to join forces with the University White House Maker Faire Initiative to make this happen across America!

Sincerely,

A handwritten signature in black ink that reads "Susan A. May". The signature is written in a cursive, flowing style.

Dr. Susan A. May
President



Georgia Institute of Technology

Office of the President

June 11, 2014

The Honorable Barack Obama
President of the United States of America
1600 Pennsylvania Avenue, NW
Washington, DC 20500

Dear President Obama:

Georgia Tech is harnessing our hallmark inventive spirit and leveraging our position as a uniquely science and engineering centric university, with the largest and one of the best engineering schools in the United States, to foster the maker and design culture on our campus.

For example, the Georgia Tech Invention Studio is a free-to-use, 3,000 square foot maker space used by more than 1,000 students every month. There, students meet and mentor each other, and create things using \$1 million of capital equipment for academic coursework as well as independent projects. The Invention Studio is centrally managed and maintained by an undergraduate student group with support from university staff. The Invention Studio's facilities, infrastructure, and cultural transformation are demonstrating the value and sustainability of hands-on, design-build education to stimulate innovation, creativity, and entrepreneurship in our undergraduates.

Another space on campus that has helped nurture the Maker Movement is Georgia Tech's Innovation and Design Collaborative (IDC), a multi-disciplinary, inclusive design studio space housed in the Georgia Tech Library. Established in August of last year, the space houses centralized design resources, teaches cross-disciplinary courses in invention and innovation, and serves as a collaborative work area for students and faculty from all majors.

Tapping into the competitive spirit on our campus, the InVenture Prize @ Georgia Tech is the largest university invention competition in the United States. Called "American Idol for Nerds" by National Public Radio, every year over 500 undergraduate inventors compete for \$30,000 in prizes and free patents in front of 1,200 members of the Atlanta community of all ages, and 50,000 viewers of a live televised broadcast of the finals through partnership with Georgia Public Broadcasting. The competition includes 80 faculty judges, 50 staff members, a three member faculty organizing committee, \$200,000 budget, nine week "InVenture Prize School" for all competitors, and direct communication with 80,000 K-12 teachers in Georgia.

Our work in this space is not limited to our campus. Georgia Tech students founded a "Mini Maker Faire" that has in three years grown to include 10,000 people. In 2014, it will become one of ten national Maker Faires, including hundreds of exhibits from students, entrepreneurs, hackers, and inventors.

Our alumni, friends and corporate partners have shown great interest in student innovation and entrepreneurship at Georgia Tech. In the past four years, alumni and friends, corporations and

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A Unit of the University System of Georgia

An Equal Education and Employment Opportunity Institution

foundations have given or committed over \$1.5 million for innovation and entrepreneurship activities for Georgia Tech students including support for the InVenture Prize. We are encouraged by the impact this is having on our innovation ecosystem in Atlanta. Numerous startup companies have sprung from these activities, such as Titan Tech, Monseur, and Rhexis Surgical Instruments. Georgia Tech's role as an engine of economic development in the southeast and the nation continues to accelerate.

We look forward to continuing to expand our capacity to allow more students to discover through making and design. We believe this will not only advance how we use technology to create solutions, but also how we address social issues and improve the world around us. It is my fundamental belief that these tenets will distinguish us as global thought leaders, and give competitive advantages to our students. Thank you for hosting the White House Maker Faire and for using the opportunity to shine a light on how this movement can help us advance our shared priorities related to STEM education, innovation, entrepreneurship, and advanced manufacturing.

Sincerely,

A handwritten signature in black ink, appearing to read 'G. P. Peterson', with a long horizontal flourish extending to the right.

G. P. "Bud" Peterson
President



June 9, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

President Obama:

Houston Community College is excited to have the opportunity to support the National Maker Faire initiative.

In Houston, HCC Northwest College is building a new campus, the West Houston Institute for the Sciences, which will focus on Science, Technology, Engineering and Mathematics – STEM. The campus design is in the final review process and the construction phase will begin within the year.

A major component within this new campus will be a Maker Space. The Maker Space Advisory Council is composed of a dynamic cross-section of engineers, representatives from secondary and higher education, entrepreneurs, and community leaders. HCC is also developing partnerships with Rice University, and several oil and gas companies to ensure this facility is as inclusive and relevant to the needs of the community as possible.

Function of the **Maker Space:**

- Provide a comprehensive workshop which encourages students and members of the community to create, invent, collaborate and build prototypes
- Promote interest in STEM careers, and specifically engineering, through programs, projects and events which target middle and high school students; i.e. Robots Teams, Engineering Clubs,
- Create greater understanding of new technology and how it can be used by interacting with the latest computer aided fabrication tools and equipment
- Enhance the academic experience for all HCC students through hands-on activities and skill development
- Partner with the HCC Center for Entrepreneurship to assist with product and small business development
- Train area teachers at all levels to create enthusiasm for and expertise in STEM projects and programs
- Host community programs and events to include Science & Engineering Fairs, Summer camps and Maker Faires.

Houston Community College recognizes the benefits of developing partnerships, and has developed a unique Engineering partnership with the University of Texas at Tyler. Through the new Associate of Science in Engineering Science (ASES) degree program at HCC, students have an opportunity to earn a Bachelor's degree in engineering - Mechanical, Electrical or Civil

President Obama, Page 2
June 9, 2014

Engineering, that is conveniently located at the HCC Alief Campus, affordable – less than \$19,000 for a 4 year degree (in-district tuition), seamlessly aligned with the UTT curriculum, and ABET accredited. The enrollment in the ASES degree program has increased by over 400% during the 2013-14 academic year.

As a current member of the Board of Directors for the Houston Technology Center, HCC also supports a great deal of community STEM programs and initiatives such as Houston Tech Street, the Houston Science and Engineering Fair, and multiple research partnerships with the University St. Thomas, the University of Houston, and Rice University.

The faculty, students and administration at Houston Community College are extremely excited to support the national initiative to promote the Maker Faire community and cultivate creativity, and the next generation of inventors.

Sincerely,

A handwritten signature in black ink, appearing to read 'Zachary R. Hodges', written in a cursive style.

Zachary R. Hodges
President, HCC Northwest

HOWARD UNIVERSITY

Office of the President

June 12, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

As the world grows increasingly diverse, yet connected through technological advances, Howard University remains committed to preparing students of high academic standing and potential to become leaders who conceptualize and design solutions to increasingly-complex local, national, and global problems. The Howard community is integrating innovation and entrepreneurship into the educational experiences of our students in order to better realize this goal. Consenting to be part of the Maker Movement being spearheaded by the Executive Office of the President's Office of Science and Technology Policy is a natural extension of our campus efforts and we are excited to share our current and future work in this area.

In 2014, Howard University became part of the inaugural cohort of the Pathways to Innovation program, a joint venture of Stanford University and the National Collegiate Inventors and Innovators Alliance (NCIIA), funded by the National Science Foundation. The Pathways program is guiding participating universities through the process of integrating innovation and entrepreneurship in undergraduate engineering curricula and building an innovation ecosystem on their respective campuses. Howard is also expanding our capacity to engage meaningfully in innovation and entrepreneurship as an institution of higher education as part of the HBCU Innovation and Entrepreneurship Collaborative, funded by the Lemelson Foundation and NCIIA.

Through the efforts of our world-class faculty and these initiatives, Howard University is creating an institutional culture of innovation through curricular enhancements, multidisciplinary partnerships, and infrastructural developments. The Department of Mechanical Engineering at Howard, in collaboration with Departments of Art, Architecture, and Computer Sciences was recognized nationally in 2013 as first place winner in the Partnership for the Advancement of Collaborative Engineering and Education (PACE) Collaboration and Innovation Challenge. The Howard team created a more effective public transportation system for Washington, DC, which incorporated innovative ideas such as a pod car system for individualized transit. A new course in the Department of Systems and Computer Science entitled, The Lean Launch Pad, also addresses innovation as students learn by proposing and immediately testing business model hypotheses in an experiential learning, flipped classroom design. In the Lean Launch Pad model,



President Barack Obama
June 12, 2014
Page Two

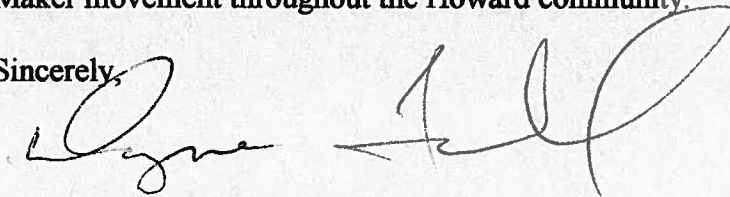
students work outside the confines of the classroom and talk to customers, partners and competitors to encounter the chaos and uncertainty of commercializing innovations and creating new ventures, in collaboration with corporate partners and both budding and experienced entrepreneurs. Beginning in the fall of 2014, our Introduction to Engineering course, which reaches all first-year engineering students, will be redesigned to include a Lean Launch Pad module and multidisciplinary, open-ended design projects that engage students in innovation in our newly-created HowU Innovate space.

Our transformative vision for the innovation ecosystem at Howard University foresees our institution as one built on creativity and driven by discovery, where interdisciplinary teams develop innovative solutions to complex problems and global challenges, and our students are energized and motivated to use innovative thinking in dedicated innovation spaces that yield more meaningful learning experiences, enabling them to be better able to recognize and capitalize on opportunities that create value and making them more adaptable in changing environments and amenable to the innovative workplace of the future. We have developed a number of strategic priorities to realize this vision, which align well with the Executive Office of the President's Maker Movement components. Specifically, Howard University is:

- Investing in Makerspaces that are accessible to students across our campus,
- Encouraging students to use required design projects to experiment with making and maker-preneurship, and
- Participating in regional efforts to create a vibrant Maker ecosystem that involve companies, government officials, and community-based organizations.

Thank you for your leadership in advancing the innovation and entrepreneurship agenda. We look forward to partnering with the White House in this initiative, as we continue to advance the Maker movement throughout the Howard community.

Sincerely,

A handwritten signature in black ink, appearing to read 'Wayne A. I. Frederick', written in a cursive style.

Wayne A. I. Frederick. M.D., MBA
Interim President

June 10, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

In summer 2012, Iowa State University was invited to participate in the Smithsonian Folklife Festival on the National Mall. The festival's focus on the sesquicentennial anniversary of the Morrill Act provided the perfect opportunity for our land-grant university to engage the public in a discourse about design, innovation, and making. Among the most popular areas of our exhibition was a station that included a 3D printer. The additive rapid-prototyping process we demonstrated captivated visitors who quickly seemed to grasp the technology's promise and limitations.

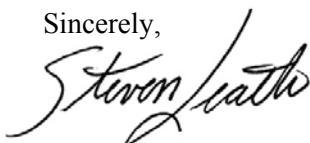
Iowa State University has a strong tradition of hands-on, practice-based learning. Our nationally ranked programs in agriculture, design, and engineering rely heavily on exploration through prototyping. Projects often are collaborative and interdisciplinary. In this setting, students learn the creative thinking and complex problem-solving skills required for academic and commercial success.

In the past five years, Iowa State has made significant investments in the academic and research infrastructure that nurtures creative activity and innovation. Our Resource Hub -- a new model for integrating existing and emerging campus facilities -- ensures that students can access appropriate equipment and supervision to execute their prototyping projects safely while optimizing resources.

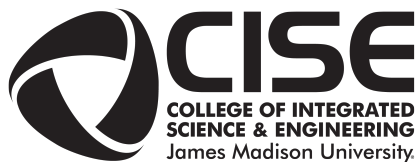
Iowa State students and faculty draw on these resources and use their making skills to address a broad range of economic, environmental, and social challenges. Current efforts involve both local and national initiatives, from the creation of concept bicycles for a campuswide bike-share system to the development and testing of a system to prevent tractor-rollover fatalities, which, despite the advent of high-tech precision agricultural equipment, remain alarmingly high nationwide.

Iowa State University maintains a deep commitment to supporting makers and making. The Maker Movement embodies the spirit of exploration and imagination that inspired the inventors who built this country's great foundation, and we would be pleased to contribute to its momentum.

Sincerely,



Steven Leath
President



James Madison University Maker Statement

At James Madison University, we have embraced the Maker Movement and have a variety of activities that span our campus. We have four separate Maker Spaces in different parts of the campus, each serving a unique audience, with a fifth space in development.

Our Engineering department has an advanced Maker Space with a variety of equipment to serve this unique undergraduate program. We offer a General Engineering degree with a focus on Sustainable Design. Designed in the 21st Century for the 21st Century, students progress through a two year design capstone sequence, heavily using this Maker Space.

Industrial Design also has a Maker Space with a variety of equipment. This program, based in the College of Visual and Performing Arts, offers students a variety of coursework in the design of model and prototypes for a variety of applications that make extensive use of their Maker equipment.

Perhaps the most unique Maker Space is housed in the Department of Mathematics and developed for General Education students. This space is furnished with basic equipment, but is open to all students regardless of the major. Students have produced everything from tangible forms of mathematical functions, such as knots, to prototypes of student inventions.

Our final Maker Space is newly opened and an interface with the Harrisonburg community. Housed in a refurbished ice factory, this space is open to the community and serves as an interface between town and gown, as well as a local economic development opportunity. We anticipate that students and members of the general public will come together and use this space to create and problem solve.

We are in the final stages of planning an additional Maker Space in our College of Education. JMU is renowned for our Teacher Education programs and this space will allow aspiring teachers to develop lessons and experience in using this cutting-edge technology.

As you can see, JMU has a broad and deep commitment to the Maker Movement and we look forward to collaborating with our peer institutions in developing new and innovative products and services using this technology, and preparing our students to move into a “Maker World”.

For more information, please contact Dr. Bob Kolvoord, Dean of the College of Integrated Science and Engineering, kolvoora@jmu.edu or 540-568-2752.



77 Massachusetts Avenue, Building 3-208
Cambridge, Massachusetts 02139-4307 U.S.A.
Phone 1-617-253-0148

June 16, 2014

The President
The White House
Washington, DC 20500

Dear Mr. President:

I write with two purposes: first, to thank you for launching and hosting the inaugural White House Maker Faire and National Day of Making, and second, to share with you a report that we have prepared highlighting the strengths of our “maker culture” here at MIT.

MIT is a hands-on place: we build, tinker, experiment, optimize, “hack,” and play. Making things is at the core of how we think, learn, solve problems, and arrive at unexpected ideas. Our passion for making stems from our founding. In the mid-19th century, America’s economy was suddenly centered on making things on an industrial scale, and MIT was launched as a bold experiment in science-centered learning-by-doing, to educate and inspire the new breed of makers that the nation required.

As our report makes clear, MIT continues to benefit in countless ways from a thriving culture of making and doing. Our students supply the energy and imagination, but we foster their maker culture in a number of practical ways, such as designing our admissions process to give makers a way to showcase their achievements, encouraging students to engage in hands-on research, building making into many of our most popular classes, creating maker spaces on campus, and celebrating maker culture. Our report explores these practices in depth, in case what we have learned may be useful to others.

In short, the people of MIT love making; in a survey of our undergraduates, 78 percent reported that MIT’s reputation for being maker-friendly made them more likely to enroll. As an institution dedicated to inventing the future, we also believe in making as a creative force: if you know how to make something new, you don’t have to settle for the status quo.

Today, the world needs bold, creative, technically adept makers as urgently as ever. Thank you for creating this occasion to celebrate the importance of making and for allowing so many individuals and institutions to share what they know.

Please let us know if we can answer any questions or be of further service.

Respectfully,

L. Rafael Reif

LRR/mes

Makers @ MIT

Lessons from and opportunities for supporting creators on campus

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Executive Summary

This report shares some lessons on supporting makers drawn from the experience and practices of the Massachusetts Institute of Technology (MIT). It is intended to support the inaugural White House Maker Faire¹ as part of a package of similar reports from several institutions which will together provide educators, policymakers, and administrators with some insight into how universities might better support maker-minded students.

In brief, MIT supports maker students by a) designing admissions policies and processes to evaluate and admit students with high “maker potential,” b) offering a comprehensive set of hands-on project/product-based classes and research opportunities, c) providing radically available student machine shops and maker spaces, and d) building a “critical mass” of makers who in turn perpetuate a deeply ingrained culture of making.

Introduction: A Brief History of “Learning By Doing” at MIT

The Massachusetts Institute of Technology (MIT) was founded in 1861 with what today we would call “makers” in mind. At the time, college reached only a tiny fraction of the population and centered on Latin and Greek learned by rote. By contrast, William Barton Rogers, MIT’s founder and first president, organized the Institute around the principle of “learning by doing.”² By

¹ Kalil & Miller, “Announcing the First White House Maker Faire,” *The White House Blog*, February 2014, <http://www.whitehouse.gov/blog/2014/02/03/announcing-first-white-house-maker-faire>

² Killian, “The Obligations and Ideals of an Institute of Technology,” April 1949, <https://libraries.mit.edu/archives/exhibits/inaugurations/killian.html>

engaging students in direct scientific experimentation and real-world problem-solving, the MIT model aimed to develop mastery of both mind and hand, theory and practice, to prepare students for careers in the “useful arts” of invention, design, manufacture, and craft.³ By 1869, MIT chemistry professor Charles Eliot, who would soon be named president of Harvard, described this “new education” as the “most ample course of instruction which has been thus far offered in this country to students who demand a liberal and practical education as well as a training specially adapted to make them ultimately good engineers, manufacturers, architects, chemists, merchants, teachers of science, or directors of mines and industrial works.”⁴

In 1919, MIT’s President Richard Maclaurin spoke of an “extraordinary demand...for [the] technically trained [because] the social unrest that characterizes our time will not pass with mere talk.”⁵ Today, almost a century later, the nation’s need for innovative, creative, technically adept “makers” remains as urgent as it is timeless. It is in this context that the White House recently announced its first Maker Faire to “inspire more people to become entrepreneurs and to pursue careers in design, advanced manufacturing, and the related fields of science, technology, engineering and mathematics (STEM).”⁶

This report contributes to this initiative by providing an overview of some ways that MIT supports makers on its campus and in its community from admission through graduation. We do not propose this as a fixed set of recommendations, or a universal “DIY” parts list for making more makers; leaders at each college and university will have to decide, based on their own constraints, priorities, and cultures, whether and how to support makers at their own institutions. This report can, however, provide policymakers, educators, and administrators with insights MIT has extracted from long experience and present practice.

Section 1: Developing a Maker Pipeline to MIT

Like any selective university, MIT can only offer admission to a small subset of its many qualified applicants. We choose this cohort through an admissions process that balances many competing institutional and public interests to appropriately allocate scarce spots and compose the best possible class.⁷ In general, the more selective the university, the more intentional it must be in *designing* an admissions process capable of identifying, evaluating, and appreciating the sorts of students it wishes to admit and enroll.

MIT Admissions recently introduced a “Maker Portfolio” to standardize the process of

³ See http://en.wikipedia.org/wiki/Useful_art; n.b.: “art” is used here in the same sense as “artisan.”

⁴ Eliot, “The New Education,” *The Atlantic Monthly*, February 1869, <http://www.theatlantic.com/magazine/archive/1869/02/the-new-education/309049/>

⁵ Account of MIT Council Meeting, *Technology Review*, November 1919, <http://goo.gl/LRWe7B>

⁶ Kalil & Miller, “Announcing the First White House Maker Faire,” *The White House Blog*, February 2014, <http://www.whitehouse.gov/blog/2014/02/03/announcing-first-white-house-maker-faire>

⁷ B. Alden Thresher, *College Admissions and the Public Interest* (New York: College Board, 1966).

identifying and evaluating students who self-identify as makers.⁸ The process is analogous to those that MIT and many other institutions already use to identify artists, musicians, academic stars, etc.

In brief: applicants may choose to submit a Maker Portfolio, following instructions on the MIT Admissions website.⁹ Portfolios are then assigned to and reviewed by members of MIT's Engineering Advisory Board (EAB) based on the relevant area of technical and/or creative expertise. Using a scale of 1-5, the EAB may rate the "Talent" and "Impact" evident in each portfolio, as well as providing an explanation of its significance, which serves as a very useful guide for the largely non-technical admissions officers who must make decisions.

Maker portfolios may not capture all aspects or forms of an applicant's creativity, technical aptitude, etc., and even a strong EAB recommendation is only one of many factors in a given application. However, Maker Portfolios do provide a powerful tool for helping admissions officers identify, understand, evaluate, and admit exceptionally skilled applicants whom a conventional selective admissions process might undervalue or overlook altogether.

In addition to its Maker Portfolio, MIT's Office of Admissions maintains strategic partnerships with many maker-minded programs, activities, and initiatives. These partnerships both a) communicate the value of these programs to and b) raise awareness about MIT among participants.

For example, MIT Admissions maintains a close relationship with FIRST Robotics,¹⁰ for which officers have attended regional and national events, presented awards, hosted participants on campus, etc. MIT Admissions officers have also spoken at Maker Faires,¹¹ judged high school hackathons,¹² and regularly visit specialized STEM high schools to speak with students, teachers, and counselors.¹³

These kinds of partnerships are often comparatively simple and inexpensive to form but yield lasting benefits to MIT's reputation, visibility, and relationship with maker communities. Indeed, 78% of MIT undergraduates surveyed reported that MIT's reputation for being a maker-friendly

⁸ Wendell, "Introducing...Maker Portfolios!", MITAdmissions.org, August 2013, <http://mitadmissions.org/blogs/entry/introducing...-maker-portfolios>. MIT had long considered an applicant's technical and creative aptitude through informal, ad-hoc processes since at least the late 1960s (and very probably well before). However, as MIT became more selective, the risks of these students being underidentified, underappreciated, and ultimately crowded out increased, prompting the development of this more formalized, standardized process.

⁹ "Portfolios and Additional Material," MITAdmissions.org, <http://mitadmissions.org/apply/freshman/supplements>

¹⁰ See <http://www.usfirst.org/aboutus/vision>

¹¹ Cochrane, "When Makers Apply To College," June 2013, <http://makezine.com/2013/06/28/when-makers-apply-to-college/>

¹² E.g., the 2014 Blueprint hackathon at Google Cambridge, <http://blueprint.hackmit.org>.

¹³ See, e.g., <http://www.ncsssmst.org>, but also local vocational schools and other hands-on institutions.

institution made them more likely to enroll.¹⁴

Section 2: Operating a Hands-On Academic Enterprise

MIT's Latin motto, *Mens et Manus* (Mind and Hand), emphasizes an ideal union of practical skill with theoretical understanding. The Institute's academic enterprise has been designed to train students both to know how to make things *and* to grasp why the things they make work.

For example, laboratory experience is required of all MIT students as part of the General Institute Requirements (GIRs).¹⁵ Through the GIRs, even students majoring in the humanities, arts, and social sciences are required to take *at least* one laboratory class to help build their technical capacity. Even classes without the "laboratory" designation will often feature significant experimental, technical components, and not only in the sciences. For example, in Spring 2014, students taking CMS.400, a core course in the Comparative Media Studies humanities major, were required to learn and use data scraping and visualization tools to better understand the social world. The prevalence of "hands-on" classes allows (in fact, requires) all MIT students to learn techniques for making, even if they arrive with no prior experience or inclination.

Indeed, many "classic" MIT courses require students to design and manufacture a project and/or product. 85% of undergraduates surveyed¹⁶ have taken or intend to take such a class while at MIT, some of which include:

- **2.00b, Toy Product Design**, for which students prototype and invent new toys¹⁷
- **2.007, Design and Manufacturing I**, which served as one of the inspirations for FIRST Robotics¹⁸
- **2.009, Product Engineering Processes**, in which students quite often translate their final projects into real-world products and/or companies¹⁹
- **6.005, Elements of Software Construction**, in which students learn the basics of software and application development²⁰
- **MAS.863/4.140, How To Make (Almost) Anything**, in which students are introduced to many methods of rapid prototyping and manufacture²¹

¹⁴ "Makers @ MIT" undergraduate survey, conducted March 2014 (n = 701).

¹⁵ See http://web.mit.edu/catalog/overv_chap3-gir.html#lr

¹⁶ "Makers @ MIT" survey, *op. cit.*

¹⁷ See <http://ocw.mit.edu/courses/mechanical-engineering/2-00b-toy-product-design-spring-2008/>

¹⁸ See <http://ocw.mit.edu/courses/mechanical-engineering/2-007-design-and-manufacturing-i-spring-2009/>

¹⁹ See <http://ocw.mit.edu/courses/special-programs/sp-724-prototypes-to-products-fall-2005/>. See, e.g., HelmetHub, a company which was started by students who "won" 2.009 by creating a vending machine for helmets to serve Boston's growing bikeshare program, <http://www.helmet-hub.com/boston-case-study>

²⁰ See <http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-005-elements-of-software-construction-fall-2011/>

²¹ See <http://fab.cba.mit.edu/classes/MAS.863/>

Beyond these full semester classes, MIT's Independent Activities Period each January features highly subscribed courses and competitions in areas like blacksmithing, web programming, and LEGO Robotics. **6.270, Autonomous Robot Design**, in which students build fully autonomous LEGO robots, is so popular that the final competition for class projects must be held in MIT's largest lecture hall and is broadcast over the web for an overflow audience.

Outside of class, students develop hands-on experience through undergraduate research. In 1969, MIT launched a then-novel program called the Undergraduate Research Opportunities Program, or UROP. What began as a small experiment is today a signature aspect of the MIT undergraduate experience; through UROP, 85% of MIT undergraduates will participate in frontline research before they graduate.²² Today, many institutions now offer undergraduates formal paths to research, but the rate of participation at MIT is, to the best of the Institute's knowledge, dramatically higher than at any peer institution.

UROP offers students a wide range of opportunities to build their technical skills by learning research methods under the supervision of a faculty member. A UROP assignment might challenge students to design, discover, or invent innovative, applicable devices or processes, such as new batteries,²³ photonic crystals,²⁴ and augmented reality interfaces.²⁵ The BeaverWorks Center, operated jointly with MIT Lincoln Labs, offers still more student opportunities for individual and/or collaborative hands-on research, working side by side with senior research mentors.²⁶

The many maker-minded members of the MIT faculty serve as mentors and role models for students. Professor Neil Gershenfeld, the Director of MIT's Center for Bits and Atoms, supports a global network of Fab Labs which provide public access to digital fabrication tools.²⁷ Professor Neri Oxman, a decorated designer and architect, develops manufacturing methods inspired by biological systems.²⁸ Professor Martin Culpepper, associate director of MIT's Lab for Manufacturing and Productivity, was recently appointed to the new position of "Maker Czar" at MIT, where he serves as the voice of the makers and builders in the Mechanical Engineering department and provides oversight of its machine shops.²⁹ These faculty, like countless others at MIT, support and inspire maker students through their teaching, direct research opportunities, and academic advocacy.

Section 3: Maintaining a Maker-Friendly Infrastructure

Makers require an infrastructure that supports their ability to make things. This infrastructure

²² "MIT History | Undergraduate Research Opportunities Program," Institute Archives / MIT Libraries, <http://libraries.mit.edu/mithistory/institute/offices/undergraduate-research-opportunities-program-urop/>

²³ See <http://techtv.mit.edu/videos/23865-urop-profile-allan-blanchard>

²⁴ See <http://techtv.mit.edu/collections/dunoyercuts/videos/23883-urop-profile-prashanth-venkataram>

²⁵ See <http://techtv.mit.edu/collections/dunoyercuts/videos/23888-lumninar-urop>

²⁶ See <http://engineering.mit.edu/programs/beaverworks>

²⁷ See <http://ng.cba.mit.edu/neil/bio.html>; see also <http://cba.mit.edu/docs/papers/12.09.FA.pdf>

²⁸ See <http://web.media.mit.edu/~neri/site/about/about.html>; <http://matter.media.mit.edu/about>

²⁹ See <http://newsoffice.mit.edu/2013/meche-announces-three-new-appointments>

includes a robust physical/technical plant and relatively open use policies.

Like most technical universities, MIT has many shops that students can use for completing projects for their coursework. For example, the Pappalardo Lab is the principal machine shop for Course 2 (Mechanical Engineering).³⁰ Students who take Course 2 classes are often assigned areas within the Pappalardo Lab, where staff then train them on the safe use of the equipment. Similarly, the Glass Lab³¹ and Forge³² operated by Course 3 (Materials Science) also offer popular undergraduate classes in glassblowing and metalwork during the Independent Activities Period in January.

However, MIT also has several student shops available for *nonacademic* use.³³ These shops serve as a vital complement to the shops owned and operated by departments because they offer students a comparatively available and unrestricted facility in which to (safely) make the things they are inspired to make, often with no connection to their coursework whatsoever. Some of the most prominent include:

- The Edgerton Center Shop supports both individual students and a dozen student-led teams with priority access to CNC machines, manufacturing equipment, insurance, funding, and training. Teams have designed and built solar cars, rockets, underwater gliders, and more for competitions and/or their own satisfaction.
- The Edgerton Student Shop, which provides free machine training and in which students spend nearly 6,000 cumulative hours annually (including nights and weekends)³⁴
- The MIT Hobby Shop, which since 1938 has offered students a place to make things, with staff and machines funded by membership dues³⁵
- The Center for Bits and Atoms, which manages a facility for making and measuring things on length scales from atoms to buildings³⁶
- MIT Electronic Research Society (MITERS), a completely student-run, self-funded, build-anything-you-want hackerspace³⁷

Some MIT dormitories and independent living groups (ILGs) have also developed their own shops and maker spaces. These dorms and ILGs often have comparatively permissive policies allowing students to (safely) build things in and around the dorms; some even maintain a substantial inventory of tools which any resident can freely borrow and use.³⁸ Students consistently credit the availability of space and tools in their living areas as factors which

³⁰ See http://mitadmissions.org/blogs/entry/machine_shops_part_1

³¹ See <http://glasslab.mit.edu>

³² See <http://dmse.mit.edu/resources/foundry-and-forge>

³³ See <http://asme.scripts.mit.edu/home/machine-shop-access-around-mit/>

³⁴ See <http://edgerton.mit.edu/node/126>.

³⁵ See <http://studentlife.mit.edu/hobbyshop/history>

³⁶ See <http://fab.cba.mit.edu/content/tools/>

³⁷ See <http://miters.mit.edu/about.php>; for a short documentary on MITERS, see <https://www.youtube.com/watch?v=jvLvdmIQkU>

³⁸ See <http://ec.mit.edu/wiki/index.php?title=ToolComm>.

substantially lower the “transaction costs” of making. Indeed, 64% of respondents reported they made things in their dorms or independent living groups: in bedrooms, lounges, and unused bike storage spaces.³⁹ The ad hoc repurposing of dormitory space, as well as student-run hackerspaces such as MITERS, has evolved into a kind of alternative infrastructure for making which threads throughout the larger institution.⁴⁰

MIT supports those who make software in part by providing a remarkably fast, radically open Internet infrastructure. The single most common mode of making at MIT is programming: of the students surveyed, more than 60% code and make things “wherever my laptop is,” and more than a quarter have participated in a hackathon. Any infrastructure intended to support such students must allow them both to make new software and to share what they have made. MIT’s fast and unusually open Internet, as well as its public support of innovative technology, helps students to work thoughtfully and creatively without being unduly encumbered.⁴¹ Indeed, one recent MIT alumnus and successful entrepreneur described MIT’s Internet infrastructure as one of the most notable “perks” which enriched his undergraduate experience.⁴²

Section 4: Creating a Strong Maker Culture

So that we could offer observations based on more than impression and anecdote, we sent a simple survey to all MIT undergraduates, asking a series of questions about how, where, why, and with whom they made what they made.⁴³

Undergraduates consistently credit a strong community and culture as one of the aspects of MIT that best supports their making. As one respondent put it, being “surrounded by people working on interesting projects makes me want to join the party. If you don’t know how to do something there’s usually someone around who can help.” In addition to the academic enterprise and physical facilities, undergraduates rely heavily on *each other* as sources of inspiration, encouragement, and training for new things they can make, both inside and outside the classroom. Put another way: there are sufficient numbers of maker-minded students here that the intrinsic value of making things is taken for granted as a foundational element of the world which MIT students experience together, i.e., their culture.

³⁹ “Makers at MIT” survey, *op. cit.* In response to this demonstrated demand, MIT has proposed transforming legacy computer labs into rapid prototyping maker spaces. See “Institute-wide Task Force on the Future of MIT Education: Preliminary Report,”

http://web.mit.edu/future-report/TaskForceOnFutureOfMITEducation_PrelimReport.pdf, at 37-39.

⁴⁰ Marisca, “The Case for Alternative Infrastructures,” *Alternative Infrastructures*, <https://medium.com/alternative-infrastructures/45809aed5687>

⁴¹ For a statement reflecting MIT’s commitment to these goals, see e.g. Reif et al, “MIT’s Letter to New Jersey’s Attorney General,” March 2014, https://www.eff.org/files/2014/03/07/mit_3.5.14_letter_re_tidbit.pdf

⁴² Mills, “Perkus Nonacademia,” October 2010, http://mitadmissions.org/blogs/entry/perkus_nonacademia; Mills’ company HelmetHub, which manufactures helmet rental vending machines to complement Boston’s bikeshare program, grew out of his final project for 2.009, one of the leading maker classes at MIT.

⁴³ “Makers @ MIT” survey, *op. cit.*

There appears to be a “critical mass”⁴⁴ of makers at MIT who collectively create and maintain a self-perpetuating culture of making on campus. Students variously characterize the maker mindset at MIT as a “general mentality,” a “pervasive idea,” and “a strong culture.” “Everybody is a maker!” one student exclaimed in her response. Some students are more accomplished makers than others, and they stand out as nodes in the social network to whom other students turn for inspiration or training. However, the critical mass is not manifest in a single, small dense core of “maker stars”; rather, it is diffused generally in a common willingness to develop technical expertise through actual practice.

MIT’s culture of making is passed down and reaffirmed by student traditions and activities that celebrate the value of creating beautiful, useful, ingenious and/or interesting things. Some of the major traditions, events, and policies mentioned by students in the survey include:

- Student “hacks,” i.e., creative, technically challenging pranks and general tomfoolery⁴⁵
- Dormitories that tolerate semi-permanent murals, construction projects, and other creative interventions within the building as long as they are completed safely⁴⁶
- Regular events, often during breaks in the academic calendar, when student communities take time to collaborate on creative projects together⁴⁷
- Popular extracurricular activities and associations for making robotics,⁴⁸ vehicles,⁴⁹ assistive technologies,⁵⁰ and almost anything else⁵¹

Our survey suggests that MIT’s maker culture may be the single strongest factor supporting makers on campus.⁵² This culture continues its vibrant development with the first MIT Maker Faire scheduled for fall 2014.⁵³ If the academic enterprise and technical infrastructure are the railroad tracks, the culture is the steam animating the engine, the motive power that drives student projects along those tracks into a more innovative future.

⁴⁴ Cf. *Grutter v. Bollinger*, 539 U.S. 306 (2003).

⁴⁵ See, e.g., “Hacks at the Massachusetts Institute of Technology,” Wikipedia, http://en.wikipedia.org/wiki/Hacks_at_the_Massachusetts_Institute_of_Technology; <http://hacks.mit.edu>

⁴⁶ See, e.g., “East Campus Culture Report 2008,” http://web.mit.edu/ec/Public/East_Campus_Culture_Report_2008.pdf; East Campus i3 videos <http://eastcamp.us/media.shtml#i3>

⁴⁷ *Ibid.* at 16-17. See also, e.g., <http://eastcamp.us/media.shtml#rex>; <http://eastcamp.us/media.shtml#cpw>; http://eastcamp.us/media.shtml#bad_ideas

⁴⁸ See <http://web.mit.edu/uav/www/>

⁴⁹ See <http://solar-cars.scripts.mit.edu/main/>

⁵⁰ See <http://assistivetech.mit.edu/assistivetech/website/index.html>

⁵¹ See <http://miters.mit.edu>

⁵² 78% of respondents reported that MIT’s culture supported their making, more than any other aspect; additionally, only 4% of respondents reported that MIT’s culture failed to support their making, less than any other aspect. “Makers @ MIT” survey, *op. cit.*

⁵³ See <http://makerfaire.mit.edu>

Conclusion: Paving Pathways to Maker-Friendly Futures

It is important to understand that the tradition of making now so fundamentally identified with MIT was not inevitable, but rather contingent, a consequence of many interlocking choices over time. MIT did not set out to invent this culture; rather, the institution and the culture emerged and evolved together. A sufficient number of students, their creative and technical inclinations reinforced by community rituals and enabled by a comparatively open academic and physical infrastructure, have, with their minds and hands, knit together a strong common culture that now both supports and drives their making moving forward. In this respect MIT intends for its future to be as bright as its past.⁵⁴

Other universities have their own cultures, their own constraints, and their own opportunities; what has worked at MIT might neither fit nor function effectively elsewhere. But if we had to distill MIT's experience into a few principles, they would center on:

- adapting the Admissions process to identify, encourage and develop a pipeline of students with maker potential
- consciously designing the academic program so that it encourages all students to engage in hands-on projects
- maintaining an open, low-barrier-to-entry physical and technical infrastructure that supports student experimentation, safe transgression, and creative play
- creating a culture that celebrates and reaffirms the intrinsic value of making things

The more maker-friendly universities become, the more makers they will make, and the more creative and innovative their shared future will be.

Appendix

Background

This white paper was prepared as part of a broad initiative supporting Making led by the White House Office of Science and Technology Policy (OSTP).⁵⁵ It is intended to help provide educational officials in government and at universities with some insight from the MIT experience on how Makers can be supported on campuses through programs, infrastructure, and culture.

Authors

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⁵⁴ See, e.g., the report by the Institute-wide Task Force on the Future of MIT Education at <http://future.mit.edu>, which suggests several ways in which MIT can support makers moving forward.

⁵⁵ See, e.g., Kalil & Miller, "Announcing the First White House Make Faire," Feb. 2014, <http://www.whitehouse.gov/blog/2014/02/03/announcing-first-white-house-maker-faire>

Media Lab. Previously, Peterson worked at the Berkman Center for Internet & Society at Harvard Law School. He earned his S.M. from MIT and his B.A. from the University of Massachusetts at Amherst.

Dawn Wendell S.B. '04, S.M. '06, Ph.D. '11 is a Senior Lecturer in MIT's Department of Mechanical Engineering, focusing on Design, Manufacturing, Fluid Mechanics, and Engineering Education. Prior to teaching at MIT, she was a postdoctoral researcher for the Centre National de la Recherche Scientifique (CNRS) in Paris and then became an Assistant Director of Admissions at MIT. She earned her S.B., S.M., and Ph.D. degrees from MIT in Mechanical Engineering.

Acknowledgment

The authors would like to acknowledge and thank the following people for contributing their support and insight in the preparation of this report:

- William Bonvillian and Philip Lippel (MIT Washington Office)
- Martha Eddison (MIT Office of the President)
- Jagruti Patel and Lydia Snover (MIT Institutional Research)
- Kim Vandiver and Camilla Brinkman (MIT Edgerton Center)
- Stuart Schmill, Matthew McGann, and Ingrid Vargas (MIT Admissions)
- Many MIT undergraduates, including the Admissions bloggers, CMS.400 students, Adam Eagle '16, and all those who completed the Makers @ MIT Survey



MISSISSIPPI STATE UNIVERSITY

Bagley College of Engineering

June 2, 2014

Dear Maker Movement:

On behalf of the Bagley College of Engineering (BCoE) at Mississippi State University (MSU), we would like to participate in the Maker Faire event being organized by the White House this summer. We are embracing the basic concepts of Maker Ed's mission to create more opportunities for students to develop confidence, creativity, and interest in STEM learning by making or creating to realize ideas.

Our students are exposed to design-build-test concepts in a number of our undergraduate engineering courses and through participation in annual national competitions such as the U.S. DOE EcoCAR, Formula SAE Series, AUVSI Student Unmanned Aircraft Systems (UAS), ASME Human Powered Vehicle Challenge, and ASCE Concrete Canoe, to just name a few. The notion of project-based learning has been adopted in many engineering disciplines within the BCoE. Although the terminology used may vary, the basic principles in concept realization through prototype development and evaluation are well established at MSU. In this letter, I would like to highlight some of the ways we are accomplishing the goals of "Maker Ed" at MSU.

Our students have been very successful in Advanced Vehicle Technology Competitions (AVTC) sponsored by the U.S. Department of Energy by finishing first place overall in 2007, 2008, 2010, and 2012 competitions. The MSU team was also selected to compete in the next round of AVTC in EcoCAR 3. In this project, students are tasked to modify a stock vehicle by redesigning its drivetrain, computer user interface, or other subsystems to improve its fuel efficiency, ride quality and other performance characteristics. Some of the parts used are actually built by the students. The multidisciplinary team of students participates in design, development and testing of numerous subsystems that extend their knowledge beyond classroom instruction, with actual road tests validating their concepts.

Another way we are accomplishing the goals of "Maker Ed" at MSU is through fabrication of composite structures by various student design teams. Our AUVSI UAS, ASME Human Powered Vehicle, and Formula SAE teams have relied on design and construction of composite structures to bring their concepts to realization while achieving significant performance gains. Fiber-reinforced composite components are typically fabricated by combining unidirectional fibers with polymeric resin to create very light but strong structures. Students use hand-layup techniques to build structural



components in construction of their vehicles. The use of composite materials has offered our students an opportunity to understand the role of laminate design in the performance of composite structural systems. In 2008, our UAS team, made up of a multidisciplinary group of undergraduate and graduate students, won the national championship at the 6th annual AUVSI competition.

We also have a long tradition in research and education in additive manufacturing. The experience of taking a design from a computer rendering to an actual hardware has provided our students considerable experiential learning opportunities. Within the BCoE, 3D printers are providing the opportunity for students in various core classes to visualize concepts from theories. Outside of conventional classes, this technology has also inspired several students to propose experiments utilizing the 3D printers that have been highlighted in the BCoE sponsored research poster competitions.

The availability of these resources on campus is also extended to interdisciplinary student teams. For the Formula SAE 2014 competition, the team tried out 3D printing for 2 parts on their car realizing a reduction in fabrication time from several weeks to less than a day with 60% reduction in weight.

As part of our outreach activities, the BCoE sponsors student projects at the nearby Mississippi School for Math and Science (MSMS) High School. These students are very bright and eager to interact with MSU and the 3D printing lab has turned out to be a tremendous recruitment tool! One of the MSMS student teams from the spring advanced to competition at the Intel International Science and Engineering Fair from May 11-16, 2014, in Los Angeles, California.

The BCoE has also teamed with the MSU Office of Entrepreneurship and Technology Transfer (OETT) to promote the University's entrepreneurial efforts. These efforts are centered on two objectives:

- 1) Provide basic prototyping needs of MSU student start-ups
- 2) Create a sustainable growth financial model through services rendered for external university customers to expand available prototyping capabilities within the BCoE.

It should be noted that students supported by the OETT office for initiating business concepts won several awards this past semester. One student was able to print a prototype of his concept which took a 3rd place award in a recent competition. Another student group was able to print a new patent-pending nebulizer enhancement. Without this prototype their efforts to begin commercializing their concept would have stopped at the conclusion of their capstone project. This team is now exploring their product as a viable business opportunity.

June 2, 2014
Page 3

I hope in reading this letter you will agree that MSU is embracing the Maker Ed Movement by incorporating new technologies on campus. Providing the ability for students in formal classes or competition teams brings together design and theory in the visualization of engineering concepts. We believe this concept will continue to grow at MSU BCoE and also into our various summer camps promoting the STEM fields.

By having the opportunity to participate in the Maker Faire, we would be able to showcase some of the student led projects to inspire greater participation in the Maker Ed Movement.

Regards,



Jason M. Keith
Interim Dean and Professor
Earnest W. and Mary Ann Deavenport, Jr. Chair



June 11, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue, NW
Washington, DC 20500

Dear Mr. President:

Morehouse College is delighted to participate with our peer institutions in this year's Maker Faire. Morehouse has long fostered academic programs and initiatives that address the increasing importance of science, technology, engineering and math as pathways for our students' success and participation in the global economy. Thus our emerging maker program is a logical extension of our longstanding commitment along these lines.

Envisioned and launched as a next wave of American innovation, the Maker Movement at Morehouse seeks to provide a venue where current and future students, faculty, and members of our immediate community can collaborate in exploring ideas and innovations that stimulate and sustain economic growth. This approach comports well with our strategy to use performance-based and interdisciplinary learning to provide more offerings for our students and improve their overall academic outcomes.

Drawing upon the tremendous intellectual and physical assets on our campus, we have begun to build an innovation infrastructure that will come on line this fall. Our faculty and students will have expanded access to cutting edge technology that ranges from 3-D printers, to electron microscopes to super computers. In essence, it is our desire to ignite a culture of creativity that will allow our students, faculty, and community stakeholders to build new technologies that have the potential to improve the quality of life for many. For example, our students are building innovative payloads for high altitude weather balloons to better understand the effects of climate change, they are testing new nano-materials that can improve the lives of those suffering from osteoarthritis and they are building and testing new "green" batteries for a wide variety of applications.

We believe the Maker Movement provides a tremendous platform for our institution to pioneer new ways to build the products of the future. Thus in the years ahead, ongoing investment in our maker program will empower innovative leaders who will contribute mightily to our national interests and to new innovations on a global scale.

Thank you, again, for raising the visibility and highlighting the importance of the Maker Movement. We look forward to working with the White House and our fellow institutions on this very important effort.

Sincerely,

Garikai Campbell



Office of the President

June 10, 2014

The Honorable Barack Obama
President of the United States
The White House
1600 Pennsylvania Avenue, NW
Washington, DC 20500

Dear President Obama:

For the past four years, Morgan State University has hosted “Morgan Innovation Day” in Annapolis where Maryland’s legislators have an opportunity to see the cutting-edge research accomplishments that flow out of our campus. Last year, I was truly amazed by an idea a group of our students had developed. They showed me a replica of a phone scanner barcode (like the one shown on this page), made on one of our 3-D printers, which in conjunction with a software application (which the students also developed), could help one locate the nearest recycling bin when they needed to dispose of their soda cans, newspapers, etc. This idea is very ingenious, and was fostered by our students having access to Morgan’s computing and shop facilities.

Our environmental facility in southern Maryland, the Morgan State University Patuxent Environmental and Aquatic Research Laboratory (the Morgan PEARL) has partnered with the local watermen to develop sustainable methods for oyster farming. With our own in-house expertise, we have fabricated novel oyster cages which allow the watermen to grow oysters in shallow waters versus the traditional dredging techniques which cause long term damage to oyster beds and upsets the delicate environmental balance for the Chesapeake Bay’s aquaculture.



3-D Printing Lab





Our Center for the Built Environment and Infrastructure Studies (CBEIS) opened under two years ago with the goal of creating an interdisciplinary research and learning environment between our School of Engineering and Institute of Architecture. Our B.E.A.R. Lab (Built Environment Applied Research) includes a major 3-D printing workshop and state-of-the-art laser cutting tools which allow students to fabricate prototypes that are used in aerodynamics to novel building structures. We at Morgan place great emphasis on coupling formal classroom learning with hands-on research to affirm our ultimate mission, which is student success in the marketplace.

Within the past eighteen months, we established a Division of Research and Economic Development, and we have started engaging the business community with the goal of not only technology transfer, but also making the University's facilities available for research collaborations with our faculty leading to economic development for our Northeast Baltimore community.

Mr. President, at Morgan State University, we want to do our part to support Maker Faire, as our institution is committed to encouraging our students and faculty to participate in Makerspacers and opening our facilities to students and our community to become Makers. This is extremely important for the population we serve, as it offers them an opportunity to participate in the new economy - an economy which is based on new ideas and the ability to translate them to the marketplace rapidly.

We support this bold initiative, and look forward to your counting Morgan State University as an exemplar for our peer institutions towards increasing opportunities for our citizens in the growing STEM-based economy.

Kind regards,

David Wilson
President



NYU

**POLYTECHNIC SCHOOL
OF ENGINEERING**

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June 13, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue, NW
Washington, DC 20500

Dear President Obama,

The NYU Polytechnic School of Engineering dates to 1854, when the NYU School of Civil Engineering and Architecture as well as the Brooklyn Collegiate and Polytechnic Institute (widely known as Brooklyn Poly) were founded. Their successor institutions merged in January 2014 to create a comprehensive school of education and research in engineering and applied sciences, rooted in a tradition of invention, innovation and entrepreneurship. In addition to programs at its main campus in downtown Brooklyn, it is closely connected to engineering programs in NYU Abu Dhabi and NYU Shanghai, and it operates business incubators in downtown Manhattan and Brooklyn. For more information, visit <http://engineering.nyu.edu>.

Our national top 10 ranking in salary potential and return on investment--coupled with the facts that 50% of our student body is made up of those from less advantaged economic resources and 40% of the students are the first in their families to attend college--demonstrate that an education from Poly is a direct pathway to the middle class and beyond.

The Panama Canal locks, the Brooklyn Bridge cables, Eugene Kleiner's first semiconductor (and much of the Silicon Valley), cordless phones, ATM machines, bar codes, radar, penicillin, polymers, elevator brakes, light beer . . . the "makers" of the New York University Polytechnic School of Engineering have been making and remaking the world long before the Maker Movement became a proper noun. Indeed, that has been Poly's motto since 1854, when Brooklyn Collegiate and Polytechnic Institute as well as the NYU School of Civil Engineering and Architecture opened (<http://engineering.nyu.edu/multimedia/photos/2011/04/i2e-invention-gallery>). Today, our students, faculty and alumni are impassioned participants in the movement to produce innovative products. In fact, when the ribbon was cut to mark the official merger of NYU and Poly we used a robotic arm created by our students to perform the task (<http://vimeo.com/86149118>).

At the NYU School of Engineering, the Maker Movement starts with a student's introduction to the vast array of student clubs, including: the Design Tinkering Club, the Entrepreneurship and Innovation Association, Patent Pending and PolyBOTS to name a few. It continues when the

students are introduced to the Greenhouse, a space on campus dedicated to the fertilization and creation of ideas. Through research experiences with professors our students get to explore and support the expansion of the limits of data transfer to create 5G wireless (<http://tech.fortune.cnn.com/2014/04/30/waiting-in-the-wings-the-next-generation-of-wireless-technology/>); study our waterways and the psychology of the creatures we share them with to help create a more sustainable environment (<http://engineering.nyu.edu/in-media/2012/03/05/researchers-use-robot-fish-lead-golden-shiner-school>).



(<http://vimeo.com/18009810>)

work to elevate gaming from pure entertainment to tools by which we can educate, rehabilitate and break down social mores (<http://www.sciencefriday.com/segment/02/07/2014/can-gaming-make-us-more-social.html>); aid in the development of sensors that detect diseases much earlier than we ever thought possible (<http://www.youtube.com/watch?v=-ODuQIk1TrY>); all of which are now a part of the field of engineering. During their time at the School of Engineering they can participate in New York City's largest K-12 STEM outreach to underserved youngsters, aiding in the creation of the next generation of STEM thinkers and professionals. Every year we cap off the semester with our annual Research Expo, a celebration of what each department has done over the past year, much of which includes the hard work of young makers (<http://vimeo.com/66744518>). Finally, it extends into our incubators, where students and faculty work alongside entrepreneurs to create resilient companies producing things of lasting import while creating jobs and enhancing the growing innovation economy.

Well before MakerBot made its home in Brooklyn as our neighbor, our school was engaging K-12 students in hands-on education through initiatives such as the National Science Foundation award-winning mechatronics program, in which our graduate students travel to underserved Brooklyn elementary, middle and high schools to engage youngsters and their teachers in STEM subjects through the use of small, inexpensive robots. The results are powerful: 70 percent of the 3,200 participating students increased their STEM grades by a half or full-letter grade.



<http://engineering.nyu.edu/multimedia/videos/2013/07/powering-cities>

When Maker Faire first came to New York City in 2011, these “Mechatronics Mania” students and faculty were front and center, luring attendees at their booth into the wonders of STEM. Over the years, our K-12 Maker initiatives have expanded significantly. Examples include Tech Kids Unlimited, a technology-based educational organization founded by one of our adjunct professors for young people between the ages of 7 and 18 with special needs. It will return to campus this summer with its popular 3D printing class. In another example, our graduate students will guide more than 50 students from underserved Brooklyn middle schools in the Science of Smart Cities summer program. Taking inexpensive materials, they will fashion engineering models of clean-energy generators to power the 3D printed houses in their cities of the future.



At the collegiate level, every freshman is introduced to the Maker mindset through the Innovation in Engineering and Technology Forum. Classes lay the foundation for innovation and invention, and break-out sessions offer students the opportunity to put what they learned into practice and compete in innovation challenges. This year, two physics majors developed a process by which oxygen and nitrogen can be harnessed in solid form. Using this “Solid Air,” the students hope to devise a replacement for the bulky, heavy, and expensive compressed-gas tanks typically used by sport divers, firefighters and sufferers of emphysema. To help them build a prototype and successfully market their patent-pending invention, the students received awards from one of several competitive funding sources institutionalized at NYU.

Inno/Vention, a student contest to prototype and pitch commercially viable solutions to real-world problems—has been providing mentorship and funding since 2007 (http://www.youtube.com/watch?feature=player_embedded&v=crWiMYcg34o). Highly popular among NYU’s engineering students, it has generated real-world businesses including one that produces a gel that instantly stops wound bleeding. Yet another institutionalized competitive

funding source is the NYU Stern \$200K Entrepreneurs Challenge, which supports disruptive ideas and helps turn them into viable companies. The NYU Prototyping Fund is yet another source: \$500 grants to build hardware or software prototypes. These awards are made by the NYU Entrepreneurial Institute and a novel student-faculty collaboration at the NYU School of Engineering called the Greenhouse. Student club members and their faculty advisor designed a space to increase collaboration, entrepreneurship and innovation through informal interactions and events like hackathons. Executed by the school, the Greenhouse is run by students and hosts hands-on workshops such as the Hacker's Kitchen, in which students learn from experts how to repurpose e-waste. Yet another piece of Maker infrastructure will launch this summer at the NYU School of Engineering, as a prototyping lab opens its doors to students and faculty.

Just as students naturally gravitate to the Maker Movement to express their technological vision, so do many of our faculty embrace its virtues. For example, our Mechatronics Lab focuses most of its research on inexpensive, open-source, intuitive robotic controls. In one project, students led development of wearable controls that cause a robot arm to imitate human motion—no need for programmers to type in code. And because it uses WiFi, humans can control the robots from a distance. In another, they developed the human-looking CAESAR (Cellularly-Accessible, Expressive, Semi-Autonomous Robot) to intuitively interact with humans who do not have a technical background, perhaps someday allowing a grandmother to read to a distant grandchild or a disabled person to manipulate CAESAR to open doors. Down the corridor in the same department, another faculty-student research initiative fashions 3D-printed biomimetic robotic fish that may someday lead real ones away from marine dangers.



<http://www.livescience.com/37253-caesar-the-robot-can-see-and-hear-you-video.html>

Finally, the Maker Movement can be seen in our new-business incubators, where an electronically controlled version of the teapot cozy fits over notoriously difficult-to-regulate building radiators to save heating costs while maintaining a comfortable temperature in each room of a high-rise. Another entrepreneurial Maker (and NYU alumnus) is developing smart heating and cooling vents for the home. Yet another company uses our faculty research to prototype quick wireless recharging stations for electric vehicles.

Whether entrepreneurs or scholars, the Maker Movement has enabled our community to visualize and commercialize their creativity. We commend your support of this important opportunity for education and the economy.

Sincerely,

K. R. Sreenivasan

Katepalli R. Sreenivasan



NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY

OFFICE OF THE CHANCELLOR
1601 EAST MARKET STREET
GREENSBORO, NC 27411

PHONE (336) 285-2430
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June 10, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

North Carolina Agricultural and Technical State University continues its quest to produce more innovative and entrepreneurial graduates by exploring new ways to turn innovative ideas into tangible products that can benefit society. N.C. A&T has moved from a culture of lectures and basic research to a place where students can take a chance on their future by participating in applied research and idea implementation. Below please find information on two programs under way at N.C. A&T to advance student leadership and the Maker Movement.

The university's Colors of Innovation competition provides an opportunity for students to work with industry partners, mentors and other students to bring their ideas for innovative products to life. The program allows high school and STEM students to participate and interact with innovative students and researchers from campus.

In addition, all senior engineering students participate in the Senior Design Program, in which they develop innovative solutions and build working prototypes to solve real industry problems. The College of Engineering Senior Design Program has been expanded to include a community Senior Design Expo and a new Senior Design Intellectual Property Policy, which allows the university and student to share the rights to their creations.

EXPLORE
DISCOVER
BECOME



Department of Industrial and Systems Engineering and Department of Civil, Architectural and Environmental Engineering joined forces to assist in the effort to prevent fatalities and injuries caused by falls from roofs in residential construction.

Future university initiatives that foster a welcoming environment for the Makers community and to help North Carolina Agricultural and Technical State University become an economic driver in the region are:

Aggie P.R.I.D.E Incubator

N.C. A&T is in the process of establishing a student technology innovation and entrepreneurship incubator called the Aggie **P.R.I.D.E** Incubator: **P**artnership in **R**esearch, **I**nnovation, **D**iscovery and **E**ntrepreneurship. This incubator will be equipped with state-of-the-art audio-visual capabilities, top-of-the-line 3-D printers, manufacturing/prototyping equipment, brainstorming and proof-of-concept space, fitness equipment, and ten living and business office suites. The Aggie P.R.I.D.E Incubator is designed to place like minded makers in an environment that takes learning beyond the classroom and places them into a 24/7 learning community, allowing students with different backgrounds an opportunity to combine their knowledge, experiences and passion to create and grow businesses.



Entrepreneurship Faculty Fellows Program

Faculty interested in entrepreneurship will be provided financial incentives and academic support to develop seminars, new courses, and/or integrate

entrepreneurship activities into current courses. Faculty members receiving this fellowship will be recognized as N.C. A&T Entrepreneurship Faculty Fellows.

Student Entrepreneurship Startup Fund

A fund to encourage entrepreneurial students to translate their innovative business ideas into viable business ventures. Opportunities include micro startup grants, orientation sessions, mentoring, and advance entrepreneurship training.

Aggie Entrepreneurs Success Conference

We host an annual e-Entrepreneurship conference for students, faculty, and alumni to showcase and celebrate the entrepreneurial spirit on the campus. The conference includes presentations, seminars, a business idea competition, awards and exhibitions.

Innovation Scholars 10-Week Summer Training Program

A program to educate/train selected graduate students from the STEM disciplines in entrepreneurship, innovation, and the technology commercialization process. Upon the completion of summer training, graduate students will be matched with promising faculty innovators for business planning, market research and analysis, spin-off company formation, executive summary execution, etc. Program content will include coursework, projects, seminars, and industry collaboration. The goal is to help students gain the knowledge and skills necessary to translate ideas into commercially viable inventions and business ventures. Students completing the summer program in addition to completing a faculty project will receive a Certificate in Innovation.

Business Plan Competition

This STEM-discipline program will increase entrepreneurship awareness and student participation. In addition to cash prizes, winners who launch their businesses will have the opportunity to be selected to receive additional assistance, mentoring, funding, and incubator space. Future goals of the competition include opening it up to other HBCU's and predominantly white colleges across the state of North Carolina.



Collaborative teams from N.C. A&T and Iowa State University participate in the Boeing Innovative Design Competition

Innovation, Invention and Discovery (I2D) Think Tank

The Office of Outreach and Technology Transfer will establish an Innovation, Invention and Discovery Think Tank. Participants will include students, faculty, alumni, government and industry officials, business owners and community leaders. The think tank will introduce participants to the technology commercialization process and use brain-storming meetings to help develop the skills and steps necessary to translate an idea into a viable invention or business venture. Invited guest presenters will come from successful start-ups, government and industry agencies, and the community.

For an increasing number of our students, entrepreneurship is not a goal but an accomplishment. We have begun highlighting businesses created and operated by students with a page on our website, <http://www.ncat.edu/research/students/aggie-entrepreneurs.html>.

We commend your emphasis on this essential part of education and the economy. Please let me know if I can provide any additional information.

Sincerely,

Harold L. Martin, Sr.
Chancellor

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

June 12, 2014

RE: Fostering a Generation of Makers

Dear President Obama:

In recent years, the United States has benefitted from the democratization of the tools needed to design and make just about anything. More Americans have access to 21st century tools such as 3D printers and scanners, computer-aided design software, laser cutters, and computer-numerically controlled machine tools.

Hundreds of thousands of families are participating in Maker Faires, and communities across the country are investing in Makerspaces, FabLabs, and TechShops. Expert Makers are “passing it on” by serving as mentors for young Makers. This is empowering Americans to become producers of things, not just consumers of things. Moreover, the growth of the “Maker Movement” can help advance a number of our shared priorities, such as STEM education, innovation, entrepreneurship, and advanced manufacturing.

As the leaders of colleges and universities, we want to do our part to make the most of these opportunities. As the White House prepares to hold its first-ever Maker Faire, each of our institutions is committed to take one or more of the following steps to promote Making, including:

- Allowing students that are applying for admission to our institutions to submit their Maker portfolio;
- Investing in Makerspaces that are accessible to students across the campus, or serving as “anchor tenants” for commercially-operated Makerspaces;
- Supporting education, outreach and service-learning that is relevant to Making, such as encouraging students to serve as mentors for young Makers;

- Supporting research that advances making technologies and facilitates greater access to making experiences such as the development of new tools for desktop manufacturing;
- Expanding access to university shared facilities and scientific instrumentation to Makers;
- Encouraging students to use their senior design projects to experiment with Making and Maker-preneurship;
- Providing scholarships to students based upon excellence in making and;
- Participating in regional efforts to create a vibrant Maker ecosystem that involve companies, investors, skilled volunteers, state and local officials, libraries, museums, schools, after-school programs, labor unions, and community-based organizations.

We are working together to develop a more comprehensive set of steps universities can take and each of our institutions will be developing an outline of our individual commitments to Making. Thank you for your leadership and commitment to advancing U.S. research and education. We look forward to working with you and your Administration to make this effort a huge success.

Sincerely,



Dr. H. Jeffrey Rafii
President



Oregon Institute of Technology

OFFICE OF THE DEAN

COLLEGE OF ENGINEERING, TECHNOLOGY, AND MANAGEMENT

June 9, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

President Obama:

The Oregon Institute of Technology (Oregon Tech), the Pacific Northwest's only public institute of technology, is an institution founded on the principles of excellence through hands-on knowledge. We believe in giving students a rigorous, practical education while applying cutting-edge concepts for real-world solutions. We continually partner with industry leaders to ensure that our programs and classes are at the top of the line in adapting to new technology and preparing students for workforce demands.

Our individualized and applied approach to teaching, which blends theory and practice, is the main reason our alumni are so avidly recruited. Oregon Tech maintains a mission of excellence through hands-on experience in maker spaces in the labs at both our Klamath Falls and Wilsonville campuses. All of our engineering and technology students are required to do capstone projects as a culminating experience in each student's program of study. It represents one's ability to formulate a project and implement it from start to finish using a combination of conceptual, technical, and applied knowledge. This is a significant learning experience stressing teamwork, organization, and communication - important elements in a career.

Along with their capstone projects, students are encouraged to participate in a variety of clubs outside of the classroom such as our Formula and Baja SAE racing clubs. These teams are a student design competition organized by SAE International (formerly Society of Automotive Engineers). The concept behind Formula and Baja SAE is that a fictional manufacturing company has contracted a design team to develop a small Formula or Baja-style race car. The prototype car is to be evaluated for its potential as a production item. The target marketing group for the race car is the non-professional weekend racer. Each student team designs, builds and tests a prototype based on a series of rules whose purpose is both to ensure onsite event operations and promote clever problem solving. SAE promotes careers and excellence in engineering as it encompasses all aspects of the automotive industry including research, design, manufacturing, testing, developing, marketing, management and finances. SAE takes students out of the classroom and allows them to apply textbook theories to real work experiences.

To help promote our Makerspaces, Oregon Tech has plans to build a new engineering building in Klamath Falls that will include open spaces for students to engage in student projects, inventions and entrepreneurial activities. Oregon Tech will also continue our operations to pursue energy independence projects. The campus has been entirely heated by geothermal water for several decades, and now the geothermal resource is being utilized in a 1.75-megawatt combined heat and power plant

Hands-on education for real-world achievement.

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President Barack Obama
June 9, 2014
Page 2

to provide electricity. Additionally, a 2.0-megawatt solar array was installed on 9 acres of campus land and commissioned at the end of last year, allowing Oregon Tech to generate all of its own electricity and heat needed to run the campus. Students from Oregon Tech's renewable energy program are able to use these facilities to learn the engineering principles to develop, promote, and implement sustainable energy technologies. Oregon Tech's Bachelor of Science in Renewable Energy Engineering degree program is the only ABET-accredited renewable energy engineering program in North America.

Oregon Tech is proud to promote an environment to create more opportunities for all young people to develop confidence, creativity, and interest in science, technology, engineering, math (STEM), and learning as a whole through making.

Sincerely,



Charlie Jones, PhD
Dean, College of Engineering, Technology and Management

RHODE ISLAND SCHOOL OF DESIGN

TWO COLLEGE STREET PROVIDENCE, RHODE ISLAND 02903-2784 TELEPHONE 401-454-6764 FAX 401-427-6995

June 9, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

As an institution well-known for educating generations of artists and designers, Rhode Island School of Design is pleased to write in support of the Administration's initiative to promote innovation through hands on discovery and invention at the upcoming Whitehouse MakerFaire.

At Rhode Island School of Design "making" is fundamental to how our students learn and develop creatively and intellectually. We call this "Critical Making" to express the integration of complex forms of knowledge, inquiry, and exchange that we believe are essential to educating the next generation of innovators and creative leaders.

This is also why RISD initiated the call to add the "A" to STEM to make STEAM, acknowledging the important role of art and design in educating creative "do-ers" who can imagine, develop, and activate new solutions to our most intractable economic, social, and ecological problems.

Building on our historical links to local industry and manufacturing, RISD is also investing in the development of new kinds of making spaces on campus that will situate traditional making technologies alongside digital and advanced technologies. Associated programs in advanced manufacturing will prepare our students to lead in rebuilding our economy and communities, and will serve as a vital academic research and creative resource for a variety of community, economic development, and business partners in RI and beyond.

Sincerely,



Rosanne Somerson
President, interim





SADDLEBACK COLLEGE

28000 Marguerite Parkway • Mission Viejo, CA 92692
949.582.4500 • www.saddleback.edu

June 11, 2014

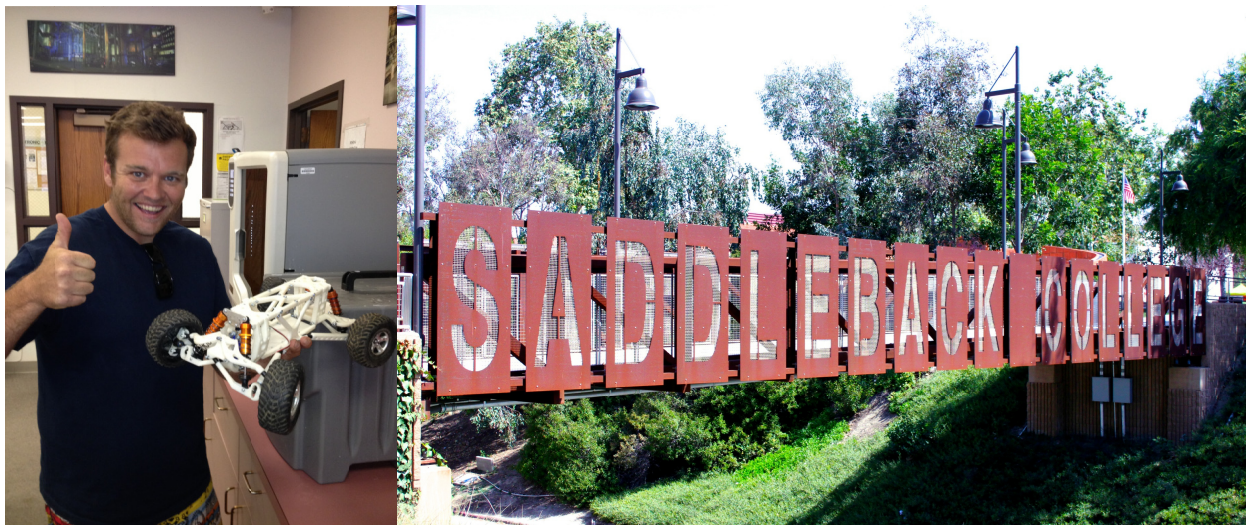
President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

In the past, advanced manufacturing involved large factories that required substantial capital investment. The prior state of this industry was a barrier for small to medium sized businesses (SMEs) throughout the country. According to the US Census Bureau, small and medium sized businesses make up 99.7 percent of businesses in the United States. These business leaders could not provide state of the art manufacturing due to the required investment in technology.

Today, technology has brought advanced manufacturing to SMEs and this phenomenon has been highlighted by the Maker Movement. Communities across the country have embraced the idea that advanced manufacturing can be accomplished with affordable technology including 3D printers, laser cutters, and other related technology, stacked upon entrepreneurial concepts.

Community colleges and universities have taken the lead in promoting STEM education, entrepreneurship, and advanced manufacturing as part of the Maker Movement. Saddleback College is integrating its science, business, technology, and manufacturing programs to demonstrate our commitment to advanced manufacturing for the SME. Our current students have learned the core elements of the Maker Movement and have competed in various local competitions.



SOUTH ORANGE COUNTY COMMUNITY COLLEGE DISTRICT BOARD OF TRUSTEES

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SADDLEBACK COLLEGE: Dr. T. A. Burnett, President

An Equal Opportunity Employer

As the White House prepares to hold the inaugural Maker Faire, Saddleback College is committed to the following steps to promoting the Maker Movement:

1. Promote the development of braided and stacked curriculum that will infuse the Maker concept where SMEs can take a product from concept to design to market in an entrepreneurial spirit,
2. Improve the college's existing advanced manufacturing facilities in alignment to the concepts defined by the Maker Movement,
3. Encourage our students and the community to apply to our college in order for them to develop their Maker portfolio,
4. Invest in Maker spaces that can be accessible across campus, or serve as a key partner for community-based Maker spaces,
5. Partner with our academic and community partners to highlight the advances in technology and business which promote the Maker Movement,
6. Support research and development of technologies that will make desktop advanced manufacturing accessible to SMEs,
7. Encourage students to embrace Makers and "Makerpreneurship" in their design projects,
8. Establish scholarships for students based upon the concepts defined in Makers, and
9. Participate in regional efforts to promote Makers and desktop advanced manufacturing in STEM and career technical education.

We are excited that your administration is encouraging the Maker Movement through the Maker Faire and we look forward to working with you in making this effort a resounding success.

Sincerely,

A handwritten signature in black ink, appearing to read "Tod A. Burnett". The signature is fluid and cursive, with a large initial "T" and "B".

Tod A. Burnett, Ed.D.
President, Saddleback College



June 6, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

As the *Jesuit University in Silicon Valley*, Santa Clara University has embraced the maker movement as a motivating and enabling element of our academic program in innovation and entrepreneurship. We created our own Maker Lab two years ago as a means to gauge student interest in such a resource. We are happy to report that use of this Lab has exceeded all expectations, with more than 300 students, staff and faculty from across the University making use of the Lab during this past year for a variety of courses, capstone projects, and personal endeavors. The success of this Lab has motivated us to explore new opportunities to expand this facility, to increase its incorporation in academic programs, and to create new community programs with local industry and K-12 and community college programs.

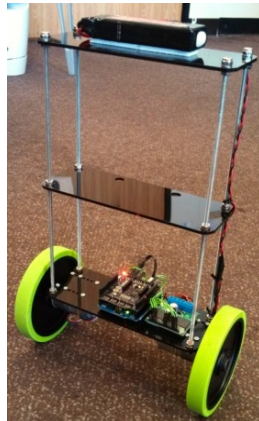
Our Maker Lab originated from a desire to foster a hands-on culture of engineering creativity, allowing interdisciplinary student teams to rapidly develop and test new ideas and contributing to the development of an “entrepreneurial mindset” among our students. This Lab complements our existing and more sophisticated laboratories, which often require more involved training and supervision and which are often fully subscribed in support of formal course exercises. In its current state, the Lab includes several 3D printers, a laser cutter, two table routing machines, vacuum forming and injection molding equipment, a 3-D scanning system, as well as an array of common hand and power tools. It also includes equipment for electronic and embedded systems development, such as a circuit board router and test equipment. We are also beginning to add equipment to explore “Do-It-Yourself” bio-engineering projects such as bio-printing.



The Lab has been integrated into numerous educational courses and research activities ongoing across campus. Courses include engineering-focused classes on manufacturing methods and device design, design courses on developing cost-effective products to meet customer needs, and courses with a broader focus on how technology such as 3D printing can be a disruptive force in society, the economy, and the developing world. A great example of this work is posted on the School’s 3D printing blog, 3DPrintCraft, which can be found at blogs.scu.edu/3dprintcraft/.

School of Engineering, Office of the Dean
500 El Camino Real, Santa Clara, California 95053-0590
408-554-4600 FAX 408-554-5474 <http://www.scu.edu/engineering>

Access to our Maker Lab has unleashed a wave of impressive innovation among our students and faculty. Projects in the Lab have ranged from prototyping deep-sea robots and satellites, to making low cost medical delivery cases and water quality instruments for the developing world, to creating new teaching aids and works of art.



One particularly exciting extracurricular activity has been an annual “Entrepreneurship Maker Challenge” in which student teams have 3 weeks to conceive simple “school spirit” products, to fabricate two dozen units, to conduct a campus-wide marketing campaign, and to sell the units in the campus bookstore. Conducted as part of our participation in the Kern Entrepreneurship Education Network, this activity has been a wonderful venue for exposing students to issues relating to product development, such as understanding and serving a customer need, fabricating more than a simple prototype, and understanding the challenges of marketing and sales. Some of the products produced through this program are shown in the photos and include products like an artistic cell phone case, a precision ruler, and a set of interlocking coasters commemorating engineering highlights for the SCU School of Engineering’s Centennial celebration.



Moving forward, our Maker Lab and associated programs in innovation and entrepreneurship will be a pillar of our new University Strategic Plan and central to our plans for a new engineering and science STEM complex on campus. As part of these discussions, we are exploring closer ties between the Lab and local businesses, K-12 programs and community colleges; we also hope to expand our Lab within the next year to include more equipment and space to support classes, creative brainstorming, and product start-up initiatives.

School of Engineering, Office of the Dean
500 El Camino Real, Santa Clara, California 95053-0590
408-554-4600 FAX 408-554-5474 <http://www.scu.edu/engineering>

We are very pleased with the White House's support of this important movement and to be involved with the new University Maker consortium. We agree that the Maker Movement can improve education, spark innovation, and bolster economic development. We look forward to taking advantage of new Maker-related opportunities offered through government agencies and to contributing to the spirit of making throughout the country.

Sincerely,



Godfrey Mungal
Dean of Engineering
mgmungal@scu.edu

Dear President Obama,

As a leading school of art and design, the School of the Art Institute of Chicago (SAIC) has an important role to play in the “maker movement,” which attracts practitioners from a wide array of backgrounds. Makers are artists and designers, but they are also technologists, engineers, scientists, and even businesspeople—anyone interested in creative invention, learning-by-doing, and exploring new modes of production and consumption.

Because it is so open-ended, maker culture produces many fascinating collaborative projects between people with different areas of expertise. Moreover, the D.I.Y. ethos of the maker movement helps drive the entrepreneurial activity on which large segments of our economy rely. These are both areas in which SAIC excels. Our interdisciplinary curriculum, for example, teaches our student artists and designers to think of their practices as part of a larger conversation spanning the fine arts, academic scholarship and research of all kinds, and the business, social, and civic worlds. After graduating from SAIC, many of them go on to collaborate with engineers, environmental scientists, product designers, and community organizers, among others. Likewise, our emphasis on “critique,” in which students provide feedback on one another’s work, demands that our students learn how to think on their feet, to articulate a creative vision, and to examine their work from many different perspectives. These are critical skills to have when starting a business, and many of our graduates do eventually become entrepreneurs.

SAIC was founded in 1866 to focus on the following areas: Drawing, Painting, Sculpture, Architecture, Engraving, and Design. These disciplines remain a key part of our curriculum, but as our culture’s understanding of the arts has expanded over the past 150 years, we have also added programs in areas like Art and Technology Studies, Fiber and Material Studies, Designed Objects, and Design for Emerging Technologies, to name a few. At the same time as we excel in the classical arts, therefore, we are also at the vanguard of exploring new ways of making that are highly collaborative and help incubate the future of artistic production. You see this in the availability of courses such as:

- *Data Viz. Collaborative:* This course is a first of its kind collaboration between SAIC and Northwestern University, bringing together students and faculty from both institutions to rethink data representation. During last summer’s inaugural course, the student artists, designers, and engineers produced final projects that combined big data, the studio arts, and visual communication design. One of these projects, “Chicago Desk: Big Data and School Choice,” used a large data set (test scores, school locations, socio-economic levels) to reveal how parents might move their children to a better school.
- *Whatnot:* For the past four years, SAIC faculty members have taught a yearlong design studio to develop a collection of designed objects called “whatnot.” Each spring, we show these products at the Salone Internazionale del Mobile in Milan,

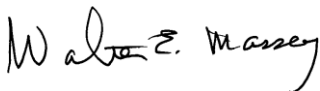
where whatnot came to the attention of CB2. Beginning last fall, we developed a collaborative course in which our students designed products exclusively for the retailer, acquiring critical experience in manufacturing, identifying consumer trends, negotiating tight price points, and working with a rigid brand identity. Ultimately, several of the products were selected for production and sale in CB2 stores, and the course will be offered again this fall.

- *Algorithms, Information, and AI*: In 2014, SAIC welcomed its first-ever Scientist-in-Residence, David Gondek, formerly an Artificial Intelligence expert at IBM. During the spring semester, David offered a course called “Algorithms, Information, and AI” in which students examined issues like information retrieval, data collection, sentiment detection, and the challenges of teaching a machine to translate human language. Beyond acquiring new technical expertise, students learned how to incorporate the basic building blocks of AI into their practices, one example being a student who analyzed the sentiment of tweets local to the Chicago area, creating a striking “weather map” of mood around the city.

Paired with our state of the art facilities, which include 3D printers, laser cutters, advanced jacquard looms, CNC machines, and vacuum formers, courses such as these prepare our community of artists, designers, and scholars to enter the working world as committed and collaborative makers. Recently, for example, three recent alumni of our Art and Technology Studies Department have joined up with an MIT alumnus to found MB Labs, a start-up in Chicago’s West Loop. MB Labs operates as a cooperative workspace in which the founders design commercial products that rely on electronics, mechanics, or programming. Similarly, alumni Caroline Linder and Lisa Smith have founded ODLCO, a company that works with designers and manufacturers to produce innovative home products. Finally, members of our community have been critical in the growth of 3D printing in Chicago, with both alumni and faculty members playing foundational roles in the launch of organizations such as *The 3D Printer Experience*, the Midwest’s first public access 3D printing facility.

These examples and others convey the impact that schools of art and design such as SAIC can have on the maker movement, and the many opportunities that exist for our students, faculty members, and staff to work with practitioners and experts in other fields. Cultivating opportunities for interdisciplinary collaboration will be key to the future of our economy as well as of our students, and so we are very proud to support this movement and are thrilled to see it garner the national attention it warrants.

Best regards,



Walter E. Massey



June 11, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

President Obama:

The School of the Museum of Fine Arts, Boston (SMFA) is a proud participant in the Maker Movement, and a strong supporter of upcoming Maker Faire at the White House. The School's community of artists has pursued creative artmaking since our founding in 1876, when SMFA was established by the Museum of Fine Arts, Boston as the crucial second part of a mission to educate through the arts. SMFA has always been more than a technical school—it is a place of rigorous ideas and concepts. Since its founding, the School's faculty, administration, and curriculum have been dynamically engaged in questions of art education, creative expression, and innovation.

The entrepreneurial spirit of the Maker Movement—learning by doing, designing, creating, and exploring—is fundamental to the success of our nation's students. SMFA's interdisciplinary approach to education encourages the pursuit of knowledge, skills, and techniques that combine student interests with career aspirations, ultimately defining what our students will make of themselves. The School firmly believes that students must have the opportunity to develop a broad cultural competence, an ability to think critically in order to assess and understand the changing global cultures, and learn to represent ideas effectively and persuasively (no matter what medium).

We are thrilled to stand alongside the other Maker Community members in support of the vision to “support a generation of Americans who are [“makers of things, not just consumers of things”](http://www.whitehouse.gov/blog/2014/06/04/first-ever-white-house-maker-faire-celebrating-nation-makers).” (<http://www.whitehouse.gov/blog/2014/06/04/first-ever-white-house-maker-faire-celebrating-nation-makers>), and are committed to providing our current and future students the most advanced resources to inspire innovation and creativity.

Sincerely,

A handwritten signature in black ink, appearing to read "Chris Bratton". The signature is fluid and cursive, with a long horizontal stroke at the end.

Chris Bratton
President, School of the Museum of Fine Arts, Boston



OFFICE OF THE PRESIDENT
Phone: 404-270-5001
Fax: 404-270-5011

BEVERLY DANIEL TATUM, Ph.D.
President

June 11, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

We at Spelman College want to commend you on your efforts to encourage innovation and entrepreneurship among the nation's colleges and universities. In particular, we are very excited about your support of the Maker Movement and we hope to join with other institutions and the Office of Science and Technology Policy in the first-ever Maker Faire on June 18th.

As the global leader in the education of women of African descent and the leading producer of Black women who go on to earn PhDs in the STEM disciplines, we know that we must also be on the forefront of this kind of innovation. This summer we will be creating our first Maker-space on campus. We have already acquired key pieces of equipment to be installed in workshop space in our Science Center: a uPrint SE Plus 3-D printer, a Universal Laser VLs3.60-50 system, and a Denford Router Compact 1000 Pro CNC. Two key faculty members in Computer and Information Sciences and in our Dual Degree Engineering Program are working to develop curricular enhancements to incorporate Maker projects into the curriculum for Fall 2014, and we already have students doing research on space optimization as part of the planning effort.

We are grateful for the technical assistance we have received from colleagues at Virginia Tech and at Georgia Tech. As a small liberal arts college for women and a HBCU, we occupy a unique position in higher education and are eager to bring our perspective to the dialogue on the Maker Movement that will be taking place in Washington, DC on June 18th. We know that we have much to learn as we develop our Maker-space and create dynamic learning opportunities for our students. We are eager to connect with others who may be further along in this journey, and we expect to share what we learn with others, particularly within the wider HBCU community.

Thank you again for your leadership.

Best wishes,

A handwritten signature in black ink, reading 'Beverly Daniel Tatum'.

Beverly Daniel Tatum, Ph.D.
President



Office of the President

June 13, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

As the White House prepares to hold its first-ever Maker Faire, Suffolk County Community College is pleased to share the following examples of our college's commitments to the concept of Making, including:

- Expanding access to shared facilities and scientific instrumentation to Makers via a new two-story, 33,792 square foot Renewable Energy and Science, Technology, Engineering and Math STEM Center that has received approval for design and will be the first of its kind in the New York State community college system. The new facility will house laboratories and classrooms to teach installation, maintenance and repair of solar, photovoltaic, wind, geothermal and other green power technologies. The second floor of the facility will serve as an incubator in conjunction with regional universities, as well as the cyber security educational and development opportunities.
- Supporting research, education, and service-learning that is relevant to Making; our STEM scholars' innovative achievements span both local and international borders. Our STEM scholars have designed solar powered solutions for our college's emergency phone communications stands. Internationally, our STEM scholar alumni are creating a consortium of student engineers to address sustainability solutions for their native country of Haiti.
- Since 2007, SCCC has provided over 160 scholarships to students to increase their opportunities to explore Making through our NSF S-STEM and CSTEP grants.
- Supporting research that advances Making technologies and facilitates greater access to Making experiences; during the past seven years, more than 100 Suffolk STEM scholar have been awarded paid research internships:

<http://www.sunysuffolk.edu/About/SCCCVideos.asp?id=3cWCpW8ZZ94&ti=Building>

As our examples above illustrate, the growth of the "Maker Movement" can help advance a number of our shared priorities, such as STEM education, innovation, entrepreneurship, and advanced manufacturing.

We look forward to working with you and your Administration to make this effort a huge success.

Sincerely,

Dr. Shaun L. McKay, President

Suffolk County Community College promotes intellectual discovery, physical development, social and ethical awareness, and economic opportunities for all through an education that transforms lives, builds communities, and improves society.

Central Admissions
533 College Road
Selden, NY 11784-2899
(631) 451-4000

Ammerman Campus
533 College Road
Selden, NY 11784-2899
(631) 451-4022

Michael J. Grant Campus
Crooked Hill Road
Brentwood, NY 11717-1092
(631) 851-6718

Eastern Campus
121 Speonk-Riverhead Road
Riverhead, NY 11901-3499
(631) 548-2512



Office of the President

Box 5007 • Cookeville, TN 38505-0001 • (931) 372-3241 • Fax (931) 372-6332

June 5, 2014

The President of the United States
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

Tennessee Technological University (TTU) is committed to student success, preparing our students for a competitive economy and producing engineers and technical professionals equipped to create jobs. Our strategic plan is focused on student success. Our College of Engineering currently has the largest number of undergraduate engineering students in the State of Tennessee. The college’s strategic vision of producing 21st Century Renaissance Engineers has the goal to “revolutionize engineering to solve societal problems.” A Renaissance Engineer is an adaptive professional, is inquisitive and creative, and makes significant contributions for the betterment of humanity. Our strategic plans over the past two years have resulted in a number of initiatives at TTU that are going to prepare our students for an innovation-centered education and a job-maker mentality.

TTU has had a tradition of hands-on engineering, and our students have been considered by the industry as ready for the workforce. Many of our faculty have industry experience and are engaged and eager to work with the corporations on science and technology research projects. They are developing new courses and introducing new techniques and technology, such as 3D printers, into the classroom. TTU is also one of a cohort of 12 universities selected to participate in the NSF funded Pathways for Innovation Program managed by the Epicenter at Stanford University. In support of these activities, the university is launching the Innovation Discovery Learning Institute (IDLI) that will be modeled similar to the Stanford d-School and other innovation studios with the distinction that it will be co-located with our Business Media Center and Virtual Reality facilities in the University Library. Thereby, the students can visualize their creations in addition to making prototypes while being aided by marketing and business planning collaborators.

Our existing State supported Centers of Excellence — Center for Manufacturing Research, Center for Energy Systems Research and Center for the Management, Utilization and Protection of Water Resources — along with other university centers, particularly the Millard Oakley STEM Center, will play an important role in disseminating the results of the work of our students and faculty related to these initiatives.

We are excited to be part of this “Makers Movement” taking shape across the U.S. universities and communities. We are ready to do our part for this region, State of Tennessee and the country, and we appreciate your leadership in promoting the fundamental role universities play in our economy. Through this writing, Tennessee Technological University is formally a signatory to the letter being submitted to you on behalf of the university group and we are committed to meeting the goals set forth in that letter.

Sincerely,

Philip B. Oldham
President

TEXAS  STATE
UNIVERSITY®

The rising STAR of Texas

June 9, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

President Obama:

The Ingram School of Engineering at Texas State University is proud to support the Maker Movement and the White House Maker Faire. In the Ingram School, we are training young engineers to engage with a society where innovation, experimentation, and informal prototyping are valued in context with professional pursuits which stress formalized design, development, and advanced manufacturing.

Founded in 2007, the Ingram School of Engineering is a relatively new academic component of Texas State University. We offer degrees in Manufacturing Engineering, Electrical/Computer Engineering, and Industrial Engineering. Situated in Central Texas between two of the fastest-growing cities in the U.S., our enrollment continues to increase by over 10% per year. Many of our students are the first in their families to attend college and don't have professional role models. Many are the children of immigrants and face difficult economic and cultural challenges. However, empowered by a hands-on and practical education emphasizing important aspects of "Maker Culture", graduates of the Ingram School are finding skilled employment, enjoying professional success, and achieving personal goals.

Students in the Ingram School participate in a wide range of projects which are directly motivated by industrial partners, and which stress innovative and collaborative activities. These activities reinforce the Maker culture in nano-scale, micro-scale, and macro-scale engineering projects, including:

- Creation of semiconductors for harvesting solar power, and development of nano-scale devices using "wonder material" graphene for applications from biosensors to robotic skin;
- Fashioning of compound micro-systems for biomedical fluid analysis, and development of embedded computing systems and communications technologies for the Internet of Things;
- Production of wind turbine blades using polymer nano-composites, and optimization of macro-scale systems for energy delivery and conservation.

Additionally, through the efforts of our faculty in collaboration with IEEE, a local school district and an industry maker space, we are embarking on a multi-year effort to build a pipeline of future engineers and entrepreneurs, a program that will be sustainable and can be replicated throughout the country.

From tiny devices and materials to huge systems and processes, the Ingram School of Engineering at Texas State University fully supports the ideals and philosophies of the burgeoning Maker culture. From experimentation & prototyping to development & production, we are training graduates to engage in all aspects of engineering design & innovation. The Ingram School is proud to support the Maker Movement, and the White House Maker Faire initiative.

Sincerely,



Stan McClellan, Ph.D.
Director

INGRAM SCHOOL OF ENGINEERING

601 UNIVERSITY DRIVE | SAN MARCOS, TEXAS 78666-4684 | phone 512.245.1826 | fax 512.245.7771 | WWW.TXSTATE.EDU

Texas State University ⁸⁷ was founded in 1899.

MEMBER THE TEXAS STATE UNIVERSITY SYSTEM™



The Maker Studio At Tufts

6 years ago, Will Langford, then a freshman mechanical engineer, started the Mechanical Engineering BotLab - the first modern maker space on Tufts campus. The BotLab started as a small room for soldering and laser cutting for a few mechanical engineers and rapidly grew into a multi-disciplinary group of students working together to solve problems. Will returned from an internship at MakerBot (he was the first intern there) and 3D printers entered the mix. By Will's senior year (2012), the BotLab was reaching out to arts and science majors, running robots across campus and 3D printing frosting on cookies in front of the dorms. Will passed the torch on to Quinn Wongkew, who started the BotSchool, with students offering classes to their peers, once again working on attracting non-engineers to the space.

The following spring, Ben Shapiro joined the faculty and has been working ever since to make these learning spaces an integral part of every Tufts undergraduate's learning experience. He led the first Tufts Starting Up Conference, a chance for students, faculty and staff to learn about entrepreneurship and how to productize an idea. He is currently working to integrate the longstanding Tufts traditions like the student-run Craft Center with the new Maker culture on campus. Ben is also bringing the research side to our spaces - looking at how these spaces promote learning (through their physical layout, social interactions, and connections to students' everyday lives and interests) that crosses disciplines that include computer science, engineering, and the arts.

This summer, we are running our first pilot maker studio in the Tufts library. We have been working with the library for a few years in an effort to place a maker space in the center of student activity and using the foot traffic of the library to get more non-STEM students involved. If successful, this pilot could help redefine the role of the Tufts library in student learning. What we learn from this pilot will help us design and build a full Maker Studio in the fall.

At the same time, a number of faculty have been experimenting with small fabrication facilities and multi-disciplinary students in the classroom as well. Paul Lehrman runs a very popular course on design and fabrication of electronic musical instruments, with engineers, computer scientists, and musicians all working together to design the instruments of the future. Chris Rogers (Mechanical Engineering) and Marina Bers (Child Development) often have their students from their respective classes (robotics and teaching with technology) team up to develop new robotic educational toys. In both cases, the faculty have built small fabrication spaces specifically for their classes, but see a bigger university-wide maker space as an integral part of these classes.

From a global perspective, we are currently in a partnership with the New York Hall of Science (Queens, NY) and Universitas Siswa Bangsa Internasional (Jakarta, Indonesia), creating and supporting a maker space on a university campus and in four high schools in Indonesia. Our goal is to use these spaces to transform hands-on education in Indonesia and to use what we are learning about learning to improve the design of these environments for creativity, collaboration, and innovation in students. We have a second partnership with a new fabrication space in Tokyo, Japan that works with the after-school informal education market.

Over the next few years, we will grow the number of places on (and off) campus devoted to engineering and making, including increasing international partnerships. At the same time, we will locally grow JumboSchool, with more students teaching each other the skills necessary for making. Finally, we will grow the research effort to better understand how students are learning.



LINDA P.B. KATEHI
Chancellor at Davis

OFFICE OF THE CHANCELLOR
ONE SHIELDS AVENUE
DAVIS, CALIFORNIA 95616-8558
TELEPHONE: (530) 752-2065
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June 6, 2014

Dear President Obama:

I am writing to applaud your efforts to convene the first-ever Maker Faire on June 18th. UC Davis shares your commitment to giving students an opportunity to invent and create. In fall 2013, UC Davis became one of the first universities in the nation to create a dedicated on-campus space for all students to prototype their ideas and collaborate on technology ventures.

The new Engineering Student Startup Center (ESSC) was launched in collaboration with BetaVersity, a company that specializes in creating spaces for technology design and entrepreneurship within universities and startup incubators. The 543 square foot ESSC facility has been designed to feature several resources to empower students at the early stages of their technology ventures. These features include:

- CubeX Trio color 3D printer for generating physical prototypes;
- Next Engine 3D scanner for digitizing 3D physical models;
- ShopBop CNC device for milling and machining of plastics, wood, and aluminum; and
- Other materials and software for the creation of prototypes.

The ESSC has had a tremendous response from the participating students. It is our hope that some of these prototypes will lead to startups, which can be incubated at UC Davis Engineering Translational Technology Center.

Additionally, this spring quarter we created a new undergraduate engineering course entitled, "Starting and Prototyping a Technology Venture." This course was full in less than two hours and a second section was added to accommodate the demand. The course was envisioned by Dr. Lucas Arzola, a recent UC Davis Ph.D. graduate in Chemical Engineering who developed and launched a startup while in graduate school. Typically, first and second year engineering class work is theoretical, with little to no hands on application. This course is designed to give students a better understanding of entrepreneurship while helping them develop techniques to think creatively. Arzola guides the students through the creation and presentation of a viable product and how to write a business model that incorporates technical feasibility and marketing opportunities.

These are just two examples of how UC Davis is helping students explore new ideas and think creatively. I look forward to continuing to work with you to ensure that more young people are inspired and empowered to excel in all STEM fields. Thank you for all you have done to highlight this critical issue.

Sincerely,

A handwritten signature in black ink that reads "Katehi".

Linda P.B. Katehi
Chancellor

/am



OFFICE OF THE DEAN
THE HENRY SAMUELI SCHOOL OF ENGINEERING
UNIVERSITY OF CALIFORNIA, IRVINE
5200 ENGINEERING HALL
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GREGORY WASHINGTON, PH.D.
DEAN
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E-MAIL: GREGORY.WASHINGTON@UCI.EDU

May 29, 2014

Tom Kalil
Deputy Director for Technology and Innovation
Office of Science and Technology Policy
1650 Pennsylvania Ave NW, Washington, DC
Washington, DC 20502

Dear Mr. Kalil,

We, at the University of California, Irvine, would like to express our strong support for the efforts of our national government to re-invigorate the "maker" culture of our society and to foster creativity and entrepreneurship of our citizens by providing the access and training to rapid prototyping and advanced manufacturing tools for wide social, economic, and generation spectra of our population.

Here, at UC Irvine we are implementing re-engineering of our engineering education and we include "design and build" projects as part of our advanced manufacturing curriculum that includes undergraduate and graduate classes. During the White House Makers Faire in June, we look forward to presenting some of the devices manufactured by our undergraduates during their advanced manufacturing classes as well as examples of UCI's community outreach and support to small businesses, community colleges and K-12 students. Some examples include:

- Gourmet Puree, a small business whose goal is to bring a sense of normalcy to eating for those who are limited by their dietary and physical constraints. UC Irvine was able to assist this small business in making food molds that represent our daily diet.
- Collaborative project with Cerritos Community College which created a 3D printed scaled model of a wheelchair with the ability to traverse variety of terrains.
- A three-dimensional replica of a blinded Marines's skull that has helped surgeons at Naval Medical Center in San Diego to restore soldier's sight.

- Floating Tripod – a student-designed hovering tripod (with Arduino controlled stabilization and vibration dampening system) suitable for professional photography and video shoots.
- Snowboard Waxing system, an automated snowboard waxing system designed by students at UC Irvine
- The Music Glove – a music based hand rehabilitation device from “Flint Rehabilitation Devices”, a company started by a recent UC Irvine graduate.

Our students have access to a wide variety of the advanced manufacturing equipment through the RapidTech, National Center for Rapid Technologies, located on our campus. RapidTech serves as a core facility for student education in advanced manufacturing and hub for fostering research and project collaborations between graduate, undergraduate and community college students, providing training to over 200 community colleges, university and industry partners across the nation and consulting over 650 companies on advanced manufacturing processes.

We are delighted to share our unique experience on the advantages of co-locating of the advanced manufacturing facility in the university setting.

I will be looking forward to your reply.

Sincerely,

A handwritten signature in black ink, appearing to read 'Gregory Washington', with a long, sweeping horizontal line extending to the right.

Gregory Washington, Ph.D.
Professor and Dean

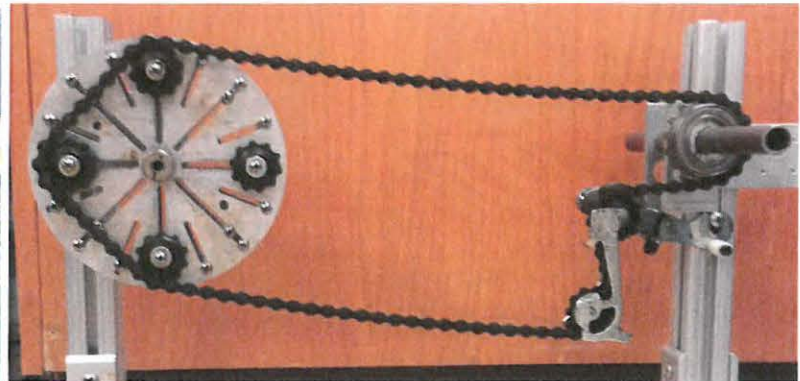
June 9, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

President Obama:

Here at the University of Delaware (UD), we fully understand and embrace the importance of "Making." For the past 150 years, we have provided training for the business and engineering workforce that enables manufacturing and innovation up and down the I-95 corridor and beyond. UD graduates are leaders in business and product development at companies like DuPont, WL Gore, Siemens, Astra Zeneca and others, where they are known for being innovative, hands-on, creative, and persistent workforce contributors. It all starts with their training here at UD, where our Campus brand is, "Dare to be first" and our unofficial UD Engineering motto is, "Let's Go Change the World Together."

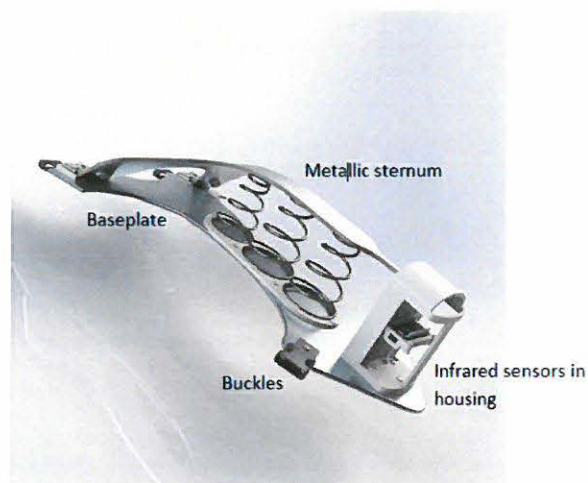
UD pioneered Problem Based Learning. In our mechanical engineering program, our students design and build each and every semester as part of their curriculum. Our freshmen build structures from "industrial erector sets" – this year, chariots from PVC – and learn that true innovation involves failing fast and frequently on the path to creating a successful design. Sophomore and Junior students focus on commercial product design in collaboration with local industry. This year's sophomore class, inspired by WL Gore's line of high performance cycling products, developed novel hydration systems, safety gear, and even automatic gear shifting systems for the cycling industry.



President Obama, Page 2,

June 9, 2014

The undergraduate engineering experience culminates with an Interdisciplinary Design Program, which brings together students from engineering, business, and the arts to solve real-world problems from industry, non-profit, and academic partners. Annually, the program partners with over 30 companies and generates nearly one dozen new patents. Examples from this past year include: (1) QuadCrew (3 patents pending), an adaptive rowing system for the severely disabled that was recognized at the Clinton Global Initiative; (2) PlaySkin Lift (1 patent pending), a garment-based exoskeleton to enhance movement in children with palsy that involved collaboration between students and faculty in engineering, fashion, and physical therapy; and (3) wearable simulation systems (2 patents pending) to improve the training of young clinicians by allowing them to safely perform invasive procedures on standardized patient actors. The latter technology, developed in partnership with our school of nursing and theater department, is currently being transitioned to an industry partner who will mass manufacture and distribute these systems, thereby improving the safety of patient care nationwide.



It is clear from these examples, that building is part of our DNA, but we believe that it's not enough to "make stuff" – students need to know why and how to create. That's why our institution has invested heavily in curriculum and infrastructure that allows our students to create products that are not only commercially successful but also impact society in a meaningful way. From the moment they step on campus as freshmen, our engineering students are focused on addressing the grand challenges and great debates that define our time, namely, healthcare, environment, security, joy of living, etc., which are used as a framework for introductory courses and the criteria for project selection by our faculty in

President Obama, Page 3

June 9, 2014

our capstone design. The design activity on our campus concentrates in one of several open-access "maker spaces," including our new 5,500 square foot Design Studio, which is located in our mechanical engineering building. The Design Studio includes workspaces for rapid manufacturing (3D printing, computer-controlled manufacturing), electronics, healthcare focused design (wet lab for tissue work and physiology stations), and design validation and testing. As a result, UD is a leader among universities in this country for the most "maker space" available per student; where our students put these resources to good use. The Design Studio was designed and built by our students, with financial contributions from our alumni, college, and university.

The University of Delaware and its College of Engineering wholeheartedly supports the Maker Faire movement and the White House's efforts to inspire the next generation of entrepreneurs and inventors. We are excited to join this coalition of universities nationwide to grow the "maker" movement, and we are happy to lend our expertise to this effort in terms of developing inspiring curriculum and infrastructure.

Sincerely,



Babatunde A. Ogunnaike

William L. Friend Chaired Professor

Dean



June 8th, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

We are proud to be a part of the Maker Movement for the Hawaiian Islands and commend the effort to showcase the creative work of academics, students of all ages, and community members at the first national Maker Faire in Washington, D.C. on June 18, 2014. This movement brings to people the power to precisely create their own physical devices, practical inventions, and tangible artistic expressions much like the personal computer movement brought computational power to every person; and mobile technology and the internet brought the power to ubiquitously communicate to the masses. This power enables people who witness a challenging problem to engineer and actually build a solution on their own -- thus greatly expanding their capacity to innovate. Moreover, it gives the opportunity to bring in a wildly diverse set of people to the discipline of engineering and cast STEM-related concepts in a real light to minds that may have otherwise missed them.

At the University of Hawai'i (UH), we have worked to enable students and the community to take advantage of this technology after seeing first-hand the excitement that it has generated. Since 2012, we have been equipping the UH Fabrication Lab (3000 sq. ft.) with 3D printing (Replicator 2X), printed circuit board fabrication, and other prototyping tools largely driven by engineering students as well as collaborating faculty, researchers, and students from the sciences. We have introduced courses at the graduate level that embrace the principles of rapid prototyping (Making) which has seen popularity from both mechanical and electrical engineers, and has led to real prototypes and teams winning in the annual UH Business Plan Competition (BPC). At the undergraduate level, there has been a tripling in the number of capstone design projects that involve the use of the Fabrication Lab and rapid prototyping. This year a team of two undergraduates made it to the semifinals in the BPC with their prototyped smart power strip. This summer, we are involving local high school students in learning these tools through the Native Hawaiian Science and Engineering Mentorship Program (NHSEMP). Generally, the senior students help in mentoring and training the younger students, which amplifies the utility of this laboratory and our educational mission. Richard Ordonez, a PhD student in electrical engineering and a 2014 ARCS Scholar remarked, "As a student mentoring undergraduates and high school students, some of the best and most enjoyable experiences I have had pursuing my degree is when I teach them how to use the various rapid prototyping equipment to make their designs into reality."

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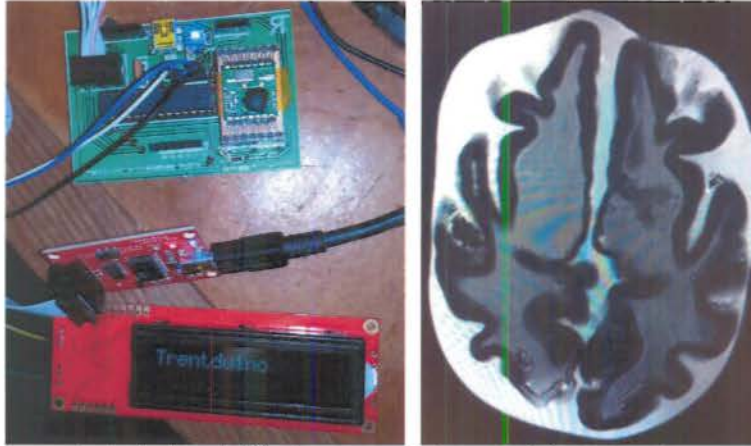
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The UH Fabrication Lab (left) houses numerous Making tools. In one project for the Navy (right), a temperature controlled platform was 3D printed by graduate student, Trent Robertson, to fit a micromanipulator stage that feeds into a semiconductor parameter analyzer for testing chips.

Some examples of the Making projects we have worked on include:

- Wireless module prototyping for wireless sensor networks
- 3D anemometers for architectural wind sensing
- Calibration units for MRI
- 3D printed robotics
- Mars rover (NASA Competition)
- Anti-theft devices
- Special-purpose quadcopters
- RF detector modules
- Wireless moisture sensors
- Web accessible sensor arrays
- IR waveguide sensors
- Autonomous road safety devices
- High accuracy thermal regulators
- Interactive lighting systems
- GPS skateboard speedometer
- Adaptive optics
- Solar monitoring systems



Some Maked examples including (left) a low-cost wireless module for interior sensor networks under the Renewable Energy and Island Sustainability (REIS) program by graduate student Trent Robertson and (right) a 3D-printed fluid fillable brain for MRI research by graduate students, Kyoko Fujimoto and Trent Robertson.

On April 3rd, 2014, we presented at the Honolulu Mini Maker Faire which brought together numerous Making efforts from across the Hawaiian Islands with a much larger local turnout than expected. This event enabled us to see the impact that this movement has had locally; and catalyzed an effort to collaborate with local high schools, industry, and other island efforts like the Maui Making community.

We intend to support the Maker Movement in several ways. We will continue building research programs that advance and make use of Making technologies. We will support accessibility of Making laboratories (such as the UH Fabrication Lab) to students across campus having already involved the medical school (JABSOM), the School of Architecture, the College of Tropical Agriculture and Human Resources, the School of Ocean and Earth Science and Technology (SOEST), and the Institute for Astronomy (IfA). We will continue growing support in education and outreach, and encourage mentorship and apprenticeship efforts. Additionally, we plan to expand our participation in regional efforts to grow a vibrant Maker ecosystem reaching out to community colleges, high schools, and middle schools across Hawaii. Several graduating students have shown interest in pursuing entrepreneurial activity in this space and we hope to continue to fuel this excitement.

Please feel free to contact me with any further questions you may have.

Yours Sincerely,

A handwritten signature in black ink that reads 'P. Crouch'.

Peter E. Crouch
Dean of Engineering
University of Hawaii at Manoa



COLLEGE OF ENGINEERING

Office of the Dean

3100 Seamans Center for the
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June 9, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

On behalf of the students, faculty, and staff of the College of Engineering at the University of Iowa, we applaud The White House for initiating the first-ever Maker Faire June 18. The event will draw very welcomed attention to the many students and their mentors who are involved in building a “Nation of Builders.”

The College of Engineering already has a proud heritage of creating and participating in programs and projects that encourage bright, adventurous student Makers. For years, we have encouraged our students to become “the engineer...and something more” – not only concentrating on the rigorous studies of engineering and technology, but stretching themselves into teamwork, entrepreneurship, global awareness, technical communication, leadership, and even becoming the creative engineer with ties to the Arts.

As the White House prepares to hold the first Maker Faire, please be assured that we at the University of Iowa are committed to take several steps to promote Making, including:

- Allowing students who are applying for admission to our College of Engineering to submit a Maker plan at that time. We are asking future students to include these plans in their scholarship application process. We have a high percentage of our students who both apply for and receive scholarships, so this is an excellent approach to capture the Maker plan as they begin their collegiate venture.
- Supporting education, outreach, and service learning that is relevant to Making, including encouraging students to serve as mentors for young Makers. For example, many of our current students are deeply involved in two major STEM programs. The College of Engineering is an Affiliate Partner in the national FIRST Tech Challenge program and co-leads the Project Lead the Way efforts for the state of Iowa. Both programs have been recognized for their STEM efforts from grade school through high school.
- Encouraging students to use their senior design projects to experiment with Making and Maker-preneurship. For years, every department at the College of Engineering has conducted senior capstone design projects as a requirement for graduation. About 20 years ago, this was expanded to include the Program for Enhanced Design Experience, involving senior engineering students who work with engineers from industry on a design project for an entire year. The goal is for students to gain experience in the design process from conceptualization, to prototyping, testing and evaluation, and finally production. Students gain first hand experience in solid modeling, finite element analysis, dynamic

simulation, and cost analysis. Emphasis is placed on communication skills, including written reports and oral presentations.

- Providing scholarships to students based upon excellence in making. Better than one out of five students in the College of Engineering receives a scholarship. In addition, the College often awards scholarships at local and state STEM events involving grade school and high school students.

The College of Engineering is working to develop even more steps that will support our commitment to Making. We appreciate your leadership to advancing U.S. research and education, and we look forward to working with you and your administration to provide long-term success to the Making effort.

Sincerely,

A handwritten signature in black ink that reads "Alec Scranton". The signature is written in a cursive, flowing style.

Alec B. Scranton

University of Iowa Foundation Distinguished Professor of
Chemical and Biochemical Engineering and Dean



**UNIVERSITY of MASSACHUSETTS
AMHERST**

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OFFICE OF THE CHANCELLOR

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www.umass.edu

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

June 9, 2014

President Obama:

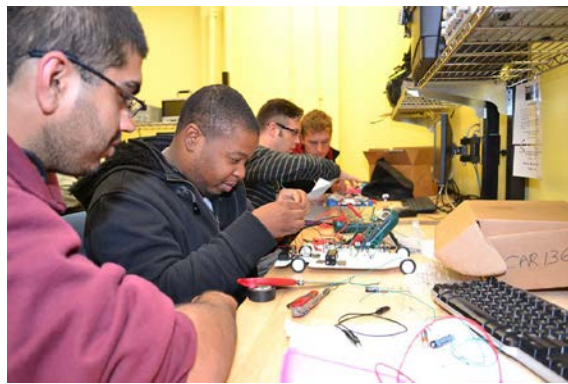
On behalf of the University of Massachusetts at Amherst, I extend my appreciation for your support of the Maker Movement through the White House Maker Faire and the nationwide Day of Making on June 18. The spirit of this movement comes from a combination of technology and community that is truly reflected in the Making efforts on our campus. Let me share three examples.



M5, a 5,000 sq. ft. academic Makerspace in the Department of Electrical & Computer Engineering, was created in 2008. **M5** integrates laboratories, large presentation spaces, small meeting rooms, a recording studio, a machine shop, a 3D printing zone, and a comprehensive free parts zone (electronic and mechanical) to support a broad range of individual and collaborative activities, formal and informal instruction and mentoring. In April 2014 our student chapter of the Institute of Electrical and Electronics Engineers (IEEE) used **M5** to host HackUMass, a 24-hour hackathon in which undergraduate students from across the Northeast created everything from automated parking meter payment systems to portable health monitoring systems inspired by Star Trek tricorders. **M5** is supported by

enthusiastic alumni who are leaders in their field, such as Dr. Roberto Padovani, a National Academy of Engineering member and Executive Vice President and former Chief Technology Officer at Qualcomm, who says, “We recognized early-on in 2009 that an academic makerspace such as UMass Amherst’s **M5** could have a significant impact on engineering education. Witnessing **M5**’s activities since confirms the value that such makerspaces have in preparing students to be our nation’s future innovators.”

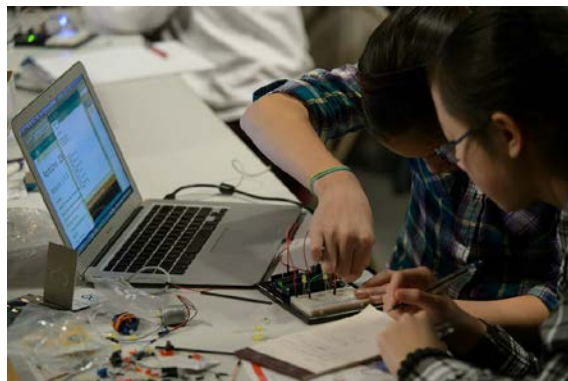
The **Innovation Shop**, housed in our Department of Mechanical & Industrial Engineering, was recently established with a gift from Altra Industrial Motion Inc. and contains sophisticated manufacturing equipment like 3D printers, a water-jet cutter, and a computer-controlled four-axis mill. The mechanical tools and electrical components, together with hardworking and curious students, provide a unique environment for discovery and learning. Our students use the **Innovation Shop** extensively for course-based and extra-curricular projects, many of which provide a service to members of the local community.



The story of Ryan Wade is a case-in-point. Ryan, a five-year-old from nearby Northampton MA, is unable to perform many activities of daily life without assistance from caregivers, because he has a rare condition known as radiohumeral fusion that doesn't allow him to flex his elbow. A team of students from our Mechanical & Industrial Engineering Department and College of Nursing worked with Ryan and his family to assess his needs, and then design and build a body-powered mechanical arm that allows him to independently perform tasks like adjusting his glasses,

wiping his mouth with a napkin, and feeding himself. The resources of the **Innovation Shop** were important in giving the students the ability to iterate through many versions of the design, from cardboard, to wood, to the final version made out of lightweight plastic using cutting-edge 3D printing technology.

Our new joint effort among the College of Natural Sciences, College of Engineering, College of Social and Behavioral Sciences, and the Town of Amherst (MA) is establishing a “**town-gown Makerspace**” that will host community and youth STEAM (Science, Technology, Engineering, Art, and Math) programs that combine creativity and technology. A kickoff weekend event in January 2014 at Amherst Media, a local non-profit communication and technology center, filled to capacity and demonstrated the extent of interest across the community. Participants were introduced to Arduino microcontroller technology and explored a variety of environmental sensors that work with Arduinos. The second phase of the initiative begins this summer with funding from the university. A team of faculty, in partnership with staff at Amherst Media, will run a series of Maker workshops paired with weekly free-form open Makerspace hours at the Amherst Media facility. This blended format will allow students of all levels to envision and start new projects, complete activities at their own pace, and have the freedom and support to explore those ideas. Our long-term goal is to build a permanent Makerspace as part of the new Amherst Media facility to be constructed within easy walking distance of both Amherst middle and high schools. We aim to encourage Amherst youth in positive, self-guided out-of-school STEAM



experiences, to learn how to make these programs self-sustaining, and to eventually help establish similar Makerspace programs in the nearby cities of Holyoke and Springfield, both of which have a high percentage of multicultural students.

As you can see, we at UMass Amherst are excited about our ongoing contributions to the Maker Movement, which are based on our strong tradition of engaged scholarship. We look forward to expanding our activities in this area and welcome partnerships with broader efforts like the White House Maker Faire.

Sincerely,



Kumble R. Subbaswamy
Chancellor



Southwick 250
One University Avenue
Lowell, Massachusetts 01854
tel 978.934.2576
fax 978.934.3007

FRANCIS COLLEGE OF ENGINEERING
Joseph C. Hartman, Dean

June 9, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

The Francis College of Engineering at the University of Massachusetts Lowell is proud to be a part of the “Maker Movement” that is fostering a generation of “Makers.” Our College has engaged in a number of “Maker” activities, including:

- Conversion of 6000 ft.² into a Makerspace, with 3D printers, laser cutters, and other tooling for use in design courses from freshman to senior year.
- Redesign of our freshman design experience such that all freshman must make something their first year.
- Redesign of our senior design experience such that engineers from multiple disciplines work with business students to infuse innovation and entrepreneurship into the critical capstone course.
- Combining courses with engineers, designers, and artists to enhance the design experience, with topics ranging from urban development and digital design to sculpture and knitting.

In all, we view the Maker Movement as a key step in our strategy to educate, and excite, students about manufacturing and innovation. This is necessary to keep America at the leading edge of the advanced manufacturing economy.

Sincerely,

A handwritten signature in black ink, appearing to read 'J.C. Hartman'.

Joseph C. Hartman, Ph.D., P.E.
Dean, Francis College of Engineering



Office of the President

Steven H. Kaplan, Ph.D.
President

June 9, 2014

The President
The White House
1600 Pennsylvania Avenue, N.W.
Washington, D.C. 20500

Dear Mr. President,

It is with great enthusiasm and excitement that we write to support the Maker Movement. As home to one of the nation's finest engineering programs and as a national leader in experiential education, the University of New Haven believes wholeheartedly in empowering Americans "to become producers of things, not just consumers of things."

To this end, the University of New Haven has partnered with a group of innovators and technology leaders to found the New Engineering University (NEU), which was announced at the 2013 Maker Faire in New York City. The goal of NEU is to re-engineer engineering education, and our first program will be a Master of Engineering in Big Data, a one-year graduate degree program to be offered in Palo Alto, California.

Supporters of the program include *MAKE:*, the magazine and driver behind the Maker Movement; Dale Dougherty, creator of *MAKE:* and founder of the Maker Faire; the Geena Davis Institute for Gender in Media; the Codecademy online coding platform; and GoldieBlox, the female-targeted engineering toy company. All are working to identify candidates for our inaugural class, which is scheduled to begin this fall. An advisory council of industry and academic leaders is also helping to design the program and curriculum.

NEU will provide an outstanding opportunity to explore innovative curricula, while ensuring the highest-quality education through experiential, collaborative and discovery-based learning in partnership with industry leaders. The Master in Big Data will be hands-on, project-based and team-oriented. It will include a corporate internship and seek to develop professional skills such as leadership, entrepreneurship and communication. All of these are hallmarks of the degree programs at the University of New Haven's Tagliatela College of Engineering.

The Big Data program will target recent engineering graduates and underemployed engineers. Most importantly, the program will enroll a diverse student body with a significant percentage of women. Currently, just 11 percent of practicing engineers are female.



In addition, the University is planning to launch a Maker program during the 2015 or 2016 academic year. The details are yet to be worked out, but our intent is to support research, education and service-learning initiatives that are relevant to Making. We will create a Maker “ecosystem” that involves companies, investors, volunteers, state and local officials, libraries, museums, schools and community-based organizations.

We also would note that we have partnered with the Engineering and Science University Magnet School (ESUMS) of New Haven, and construction of its new building adjacent to our campus will begin soon. We look forward to working with these young students, their parents and teachers.

As you can tell, we are very invested in STEM and the Maker Movement, and we are committed to doing all that we can as an institution, and as educators, to prepare the next generation of scientists, technologists, engineers and others who will change our world.

UNH, in fact, is the only university in Connecticut that is an affiliate of Project Lead the Way, the highly regarded national program that develops STEM curriculum for middle and high school students.

We wholeheartedly support your efforts on behalf of STEM and the Maker Movement, and we look forward to the opportunity to work with you in creating a generation of makers.

Sincerely,

A handwritten signature in black ink, appearing to read 'Steven H. Kaplan', is written over a large, light-colored oval shape that serves as a background for the signature.

Steven H. Kaplan
President

June 10, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear Mr. President,

I write to express my gratitude that the White House will shortly be holding its first “Maker Faire” on June 18, 2014, to celebrate students and entrepreneurs who are using modern tools to develop innovative solutions for problems old and new. We welcome this renewed national commitment and wish to let you know that the University of Notre Dame’s College of Engineering is firmly committed to the same goals and will be delighted to join in continued national efforts to these ends.

Since Engineering was first offered at Notre Dame in 1873, we have sustained pioneering work through the decades in fields ranging from aeronautical wind tunnels to wireless communication. Many of our undergraduates have a zeal for building things themselves, and enter their craft in national and international competitions. Pictured below are students fabricating entries for the Society of Automotive Engineers’ 2014 Baja Competition, the 2014 Cessna/Raytheon Student Design/Build/Fly Competition, and the 2013-14 NASA Student Launch.





While in one sense these students are doing simply what engineers have always done, i.e. build things that work, they are in fact at the forefront of today's so-called "Maker Movement" in that they are using state-of-the-art design tools to craft their devices. Those tools include software for engineering drawings, stress and force analyses, software-driven fabrication tools including 3D printers and computer-controlled mills and lathes, modern sensors and actuators, and wireless communication of real-time diagnostics. At present, facilities available to these talented undergraduates are likely as cramped as the 1852 blacksmith shop of early South Bend innovators Henry and Clement Studebaker, but we have plans in the works to bring significant resources to bear to fully enable the promise of the 21st century.

Our vision is for a 20,000 square foot facility fully equipped with trained personnel and equipment to enable a larger number of our students to participate in the modern Maker Movement. This space will allow students across the College of Engineering to interact on projects ranging from those fully integrated within their curriculum, e.g. senior design projects, to creative endeavors entirely of their own making. We are also committed to outreach efforts to educate high school and middle school students and teachers. Currently, Notre Dame has active RET (research experiences for teachers) programs as well as other activities such as [ndWAVES](#) that teach 5th graders how engineering, music, and art work together. Using percussion instruments that the Notre Dame students design and build, the students receive hands-on lessons on music, sound, engineering and design.

We see this effort for our undergraduate students integrating well with our participation in two of the recently announced Midwest Manufacturing Hubs in both Chicago and Detroit for lightweight metal manufacturing and digital manufacturing and design. In summary, we see a bright future here at Notre Dame for modern manufacturing and design and are delighted that the White House is fully participating in this transformative initiative. We look forward to working with you and your Administration to make this a success.

Sincerely yours,

Peter Kilpatrick
Matthew H. McCloskey Dean of Engineering



UNIVERSITY OF OREGON

June 13, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue
Washington, D.C. 20500

Dear President Obama,

The University of Oregon (UO) shares your vision of fostering vibrant communities of producers and designers and we applaud your leadership in hosting next week's White House Maker Faire. We greatly appreciate this opportunity to highlight some of the innovative ways that the University of Oregon is contributing to the "Maker Movement".

UO offers a unique combination of culture, infrastructure, and tools that enables making across the State of Oregon. We have maker spaces for product design in Portland and Eugene with even more spaces planned in the groundbreaking Allan Price Science Commons and Research Library, which is currently being developed on campus. We provide access to instrumentation and equipment for established companies, academics, innovators, and students through a variety of means including CAMCOR, Oregon's high tech extension service. We have also collaborated with Oregon State University and the cities of Eugene, Springfield, Albany, and Corvallis to establish the Regional Accelerator & Innovation Network (Oregon RAIN) that helps connect innovators with expertise. Collectively, these tools enable a collaborative innovation culture that is contributing to Oregon's economy and our nation's prosperity.

UO positions its students to see their studies through to completion by offering a combination of robust hands-on experiential learning coupled with a rigorous theoretical and creative base. Some students find success with the Product Design program while still enrolled, such as Zander Eckblad, a Materials and Product Design major, who invented green insulation – non-toxic, plant-based cellulose nano fiber insulation that may be three times as effective at one-eighth the cost. Oregon BEST, a local nonprofit that promotes green economic practices, recognized Mr. Eckblad's work with a \$5,000 design award and touted the invention as a way to repurpose Oregon's paper mills. For more about UO Senior Zander Eckblad, see <http://champions.uoregon.edu/product-design-project-uo-undergrad-oregon-winner>.

OFFICE OF THE PRESIDENT

1226 University of Oregon, Eugene OR 97403-1226 T 541-346-3036 F 541-346-3017 www.uoregon.edu

An equal-opportunity, affirmative-action institution committed to cultural diversity and compliance with the Americans with Disabilities Act

The critical research and design work produced by students and faculty members has an impact on both the local and international design communities. Through the Product Design program, students learn to develop projects from a personal, local, and global perspective. They gain in-depth knowledge about materials, idea generation, prototyping, and manufacturing. Manual skills are taught alongside high tech 3D rendering and printing. Our students finish the program with the confidence and skills needed to thrive in the 21st Century global economy. The Product Design Program is a major partner in UO's [Green Product Design Network](#). The work of UO students was also featured at the 2014 Internazionale del Mobile di Milano, also known as "Milan Design Week", the global benchmark of the home furnishing industry. Some of the pieces built by the students were selected for production.

Again, UO greatly appreciates this opportunity to highlight some of the ways we are contributing to the innovation culture. Efforts like the White House Maker Faire help create enthusiasm among entrepreneurs and innovators and we thank you for your commitment to this meaningful cause.

Sincerely,



Michael R. Gottfredson
President



Frances Bronet
Dean, Architecture & Allied Arts

June 9, 2014

Dear President Obama:

The University of St. Thomas strongly supports the involvement of universities in the Maker Movement. We strive to show all of our students, and our community at large, that everyone is capable of **making change in the world around them to advance the common good.**

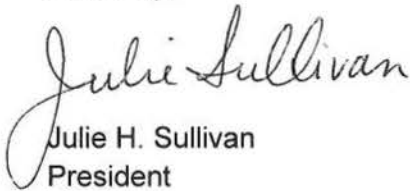
Examples of how we put this in action include:

- The summer of 2014 marks our **15th year** of offering STEPS, a free **STEAM camp for middle school girls**. The program has served more than 3,000 girls from the Minneapolis-St. Paul metro area in a 5 day, overnight, college campus STEAM educational experience. This year, the 280+ participants in our STEPS camp will be creating Artbots, designing and constructing e-textile wearables, sewing, and soldering.
- Undergraduate students and a faculty member developed **Squishy Circuits**, an open source method for using conductive and non-conductive play dough to sculpt working electrical circuits. This project is now used in schools, homes, and youth programs around the world. We have taught Squishy Circuits to thousands of makers young and old in settings as varied as libraries, elementary schools, Maker Fairs, and universities.
- Our students and faculty, through our **Center for Engineering Education** and our **Playful Learning Lab**, regularly lead Maker workshops for youth and educators around our community. Recently this included a group of four engineering students who led **Creative Circuitry workshops for Deaf children**, combining our students' skill in languages (including American Sign Language) and a playful approach to learning engineering.
- Every undergraduate in our School of Engineering has access to, and instruction in, using a wide **variety of physical and digital tools** that allow them to bring their **ideas to reality**.
- The Engineering Senior Design Clinic engages all of our engineering students with regional industry partners in the design, build, and testing of new products and improved manufacturing processes. The interdisciplinary engineering teams are required to produce working prototypes for validation. In the past 6 years, the Clinic has developed over 100 prototypes with industry sponsors including Mayo Clinic, 3M, Medtronic, Anderson Corp., Stratasys, Polaris, and St. Jude Medical.

- Last year, we celebrated the 10th Anniversary of our Peace Engineering program. The program has engaged many faculty and nearly 100 students in the design, build, and testing of equipment to assist with the post-harvest processing and preservation of food in the developing world.
- Our faculty member Dr. AnnMarie Thomas took a leave of absence from the university to serve as the **founding Executive Director of the Maker Education Initiative** from 2012-2013. She regularly travels to help school systems, libraries, museums, and other youth organizations incorporate Making into their programs.
- Our faculty and students are helping the nonprofit organization “Magic Arms for the World” design **3D printable custom devices for young children** with Arthrogyrosis Multiplex Congenita (AMC).

We applaud your work supporting the Maker Movement and especially its role in education. As the sampling of projects and programs I have highlighted here attests, the University of St. Thomas is committed to helping further this cause.

Sincerely,



Julie H. Sullivan
President

Dean of Engineering

124 Perkins Hall
Knoxville, Tennessee 37996-2000
Phone: (865) 974-5321
Fax: (865) 974-8890

June 10, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

The University of Tennessee, Knoxville, has been pursuing development and promotion of a young Maker spirit at the local, state, and regional level. Whether it is community outreach relevant to Making, development and expansion of Makerspaces, supporting research that advances making technologies, or faculty involvement in outreach and mentoring young Makers in national competitions, the University of Tennessee, Knoxville has been promoting and encouraging a series of diverse efforts to support Making and young Makers.

The University has been actively pursuing a summer outreach residential program in STEM areas for 7-8th, 9-10th, and 11-12th graders from middle and high schools throughout Tennessee and surrounding states. These all-day, week-long, free classes involve student teams which are engaged in design, making, testing and presentations of engineering and science-related projects with the active participation and mentoring of students by faculty in various engineering and science disciplines. These programs which are free to Middle School, Sophomores and Junior high school students are sponsored by many corporate and industrial friends including Alcoa, Boeing, Eastman, TVA, Verizon Wireless and the University of Tennessee, Knoxville, College of Engineering.

The University has embarked in planning a multi-use facility, named the Engineering Innovation Lab and Senior Design Space, which provides a cohesive design and fabrication space to support necessary tools and implements for development and education of young Makers. Preliminary plans for this state-of-art facility are already drawn and fund-raising has begun. This space shall be used to support outreach activities, recruitment of STEM students, and engineering undergraduate student activities. This Makerspace will foster collaboration between disciplines, build a more cohesive community within the University and the College of Engineering, and create a highly visible showcase as a recruitment tool as well as a means of exciting underclassmen about Making. In order to accommodate design activity related to Making, this space will require open bench work areas, bookable alcoves for longer-term projects, storage, collaboration/meeting areas, and a range of specialty shops. These specialty shops will include wood shop, metal shop, welding area, electronic shop, paint/spray room and an advanced visualization space. The Design Space will also have access to the Rapid Prototyping and Media Output shops located within Engineering Innovation Lab.

The College of Engineering departments, faculty, and student have played a central role in providing knowledge and access to University facilities to high school students engaged in various activities including making and entering robots in national competitions and high school students research and scholarly activities through participation in faculty research projects and laboratories. The faculty has been actively engaged in various research projects that advance making technologies. Examples of numerous such activities include Industrial and System Engineering department faculty who are engaged in making better robots for human-robot collaboration, making automated vision systems for better information management in manufacturing, and design of manufacturing systems for Advanced Manufacturing (AM) in our Mechanical, Aerospace, and Biomedical Engineering and our Industrial and Systems Engineering departmental laboratories and facilities. The Nuclear Engineering Department faculty is engaged in testing of detectors made in the College of Arts and Sciences Chemistry Department, and College of Engineering Civil Engineering and Materials Science and Engineering departments. Another example in combining advanced research activity in support of innovative making technologies is the college's Nuclear Engineering department in development of custom detector architectures using the microelectronic fabrication facility at the University of Tennessee. This high-tech multi-institutional collaboration (Fisk University, Vanderbilt University, Y-12 National Security Complex) involves supporting advanced graduate education relevant to Making.

We are committed to introducing the Maker spirit to the K-12 and undergraduate and graduate students of the university.

Sincerely,

A handwritten signature in black ink that reads "Wayne T. Davis". The signature is written in a cursive style with a prominent initial "W".

Wayne T. Davis



EXECUTIVE VICE PRESIDENT AND PROVOST

THE UNIVERSITY OF TEXAS AT AUSTIN

110 Inner Campus Drive, Suite 201 • G1000 • Austin, Texas • 78712-0538 • 512-471-4363 • FAX 512-475-7385

June 10, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

The University of Texas at Austin has championed a “Maker culture” for more than three decades. UT Austin is recognized nationally for its commitment to the STEM fields and to educating innovators and problem solvers. Together, UT Austin’s Cockrell School of Engineering, School of Architecture and College of Fine Arts have made a significant investment in creating new Maker spaces and developing 21st century tools that empower student entrepreneurs and propel the Maker Movement.

In the mid-1980s, UT Austin faculty invented one of the first 3D manufacturing processes (see Appendix 1-A), called Selective Laser Sintering (SLS), which has transformed manufacturing in the United States. UT Austin continues to be a leader in developing advanced manufacturing processes and equipment that are driving the next generation of Makers.

The Cockrell School of Engineering will soon open a new Maker space, called Alec’s Maker Space, which will be dedicated solely to creating, inventing and building. The facility will include a 1,500-square-foot laboratory containing 3D printers, a 3D scanner, a laser cutter and electronics, and hand-tool stations. Alec’s Maker Space will:

- **Inspire creative students**, including traditionally under-represented students, to encourage them to pursue STEM careers by introducing Maker competitions for K-12 and undergraduate students;
- **Expand an already extensive inventory of courses** built around hands-on student projects, and provide a dynamic space for collaborative group projects, such as the team-based solar car project (see Appendix 1-B);
- **Expand activities** such as the Longhorn Startup Program (see Appendix 2-A), taught by Ethernet inventor and UT Austin Professor of Innovation Bob Metcalfe, by exploring consumer-driven, high-impact entrepreneurial activities.

Additionally, the Cockrell School of Engineering will soon break ground on a 430,000-square-foot building called the Engineering Education and Research Center, known as the EERC (see Appendix 2-B). The EERC has been designed specifically to provide students with open and flexible space for multidisciplinary learning, research and hands-on projects — all essential elements of the Maker Movement. When completed, the EERC will completely transform how UT Austin engineering students learn and create. The building will enable:

- **A focus on active, project-based learning** that brings engineering and science fundamentals to life for every student;
- **Entrepreneurship woven into the student experience** to ignite innovation and prepare well-rounded engineers and Makers;
- **A new Center for Innovation** that will challenge our students and move revolutionary ideas and technologies into the market for lasting economic impact.

The College of Fine Arts, in cooperation with the Fine Arts Library and Division of Student Affairs, is constructing an open-source software facility that will be available to all UT Austin students, instructors and faculty. This new facility will provide 3D modeling and printing resources; an audio/video production and editing studio; a 3D graphics and interactive game and applications studio; a Maker space for microelectronics, especially for projects in animatronics; and a high-tech music recording and production studio. This facility will be rolled out in conjunction with a campus-wide student initiative called The Creative 40 Acres that will also include additional teaching and learning resources in the liberal arts and sciences.

UT Austin’s School of Architecture considers Making an integral part of design and planning education. This updated version of the Beaux-Arts tradition was spearheaded by the School beginning in the early 1970s with the establishment of the first student-focused “open-access shop” — what now would be known as a Maker space.

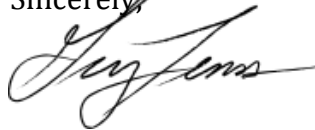
Since that time, the School of Architecture has continued to deeply integrate Making into its curriculum and ensure that all students have access to Maker spaces and tools. Recently, this has shifted to include materials research and digital fabrication tools like CNC routers, 3D scanners and printers, and laser cutting machines. The School has been on the forefront of advancing modeling for building energy efficiency and for urban growth through technologies like computer-aided design, geographic information systems, and geodesign. These tools enable students to envision more healthy and safe buildings, landscapes and communities.

The School of Architecture is currently engaged in a major facilities remodeling and expansion effort that will significantly expand its Maker spaces. The continuing

evolution of the Maker Movement promises better access, better materials and better technologies for direct student engagement in Making, and the School of Architecture is poised to advance these goals.

Across UT Austin, students have become passionate participants in the Maker Movement, and faculty, researchers and industry partners have established Texas as a destination for innovation and entrepreneurship. We look forward to continuing to play an integral part in the manufacturing economy by inspiring and educating the next generation of Makers.

Sincerely,

A handwritten signature in black ink, appearing to read "Greg Fenves", written in a cursive style.

Gregory L. Fenves
Executive Vice President and Provost

cc: President William Powers, Jr., The University of Texas at Austin

Appendix A

1-A Selective Laser Sintering



Selective Laser Sintering (examples above) is an advanced manufacturing technique that was invented at UT Austin's Department of Mechanical Engineering in the 1980s.

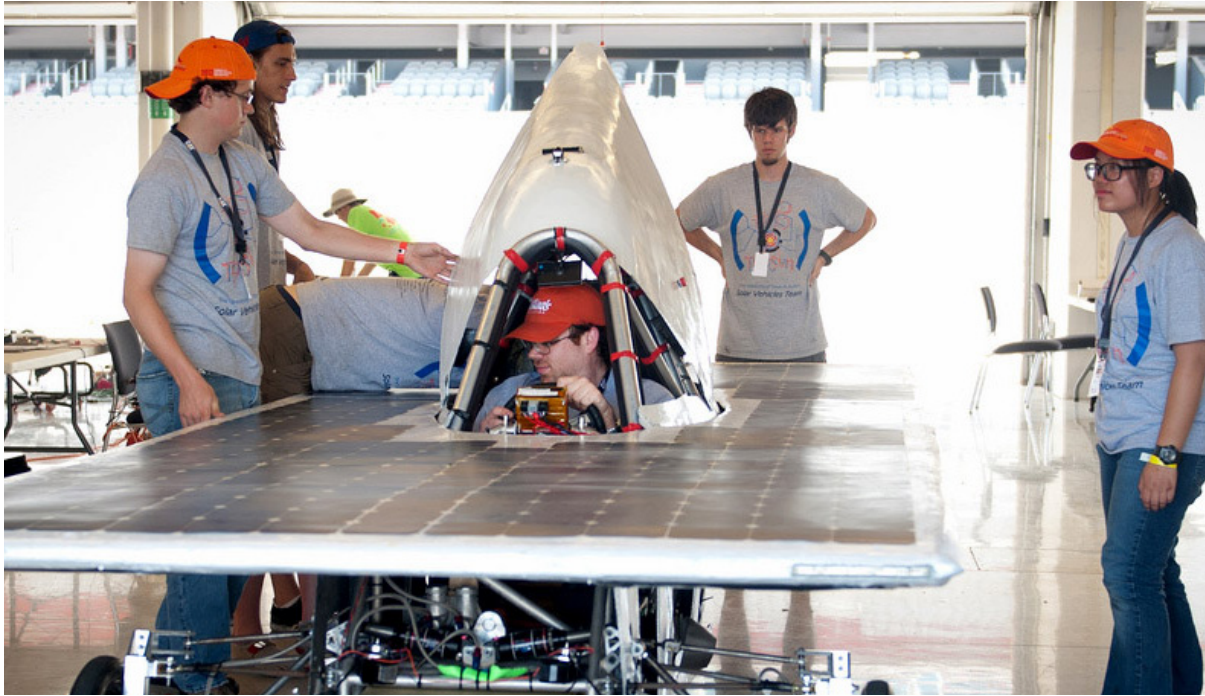
2-A Longhorn Startup Program



The Longhorn Startup Program trains student entrepreneurs to launch successful businesses with the help of faculty and industry mentors from a variety of backgrounds.

Appendix B

1-B UT Solar Vehicles Team



The Solar Vehicles Team is a multidisciplinary group of students that designs, builds, tests and races solar vehicles. This summer, the team will host the annual Formula Sun Grand Prix and American Solar Challenge in Austin.

2-B Engineering Education and Research Center



With 430,000 square feet of teaching and research labs, and open and flexible space, the Engineering Education and Research Center will fuel collaboration among thought leaders across campus.



Entrepreneurship Development College of Engineering, The University of Toledo

A collaborative learning environment that assures a seamless continuum of education to research to commercialization with life-transforming outcomes



June 10, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Nagi G. Naganathan, Ph.D., ASME Fellow

Professor & Dean
College of Engineering
The University of Toledo
Nitschke Hall 5012 MS 310
Toledo, OH 43606

Phone: (419)530-8000
nagi.naganathan@utoledo.edu

President Obama:

Greetings from the Office of the Dean of Engineering at the University of Toledo (UT). Thank you for this opportunity to share some of the fine work our students, faculty, and staff have been doing to promote a 'Maker Culture' at the University of Toledo.

Technological and cultural advancements from rapid prototyping to Crowdsourcing are accelerating engineers and entrepreneurs in making their visions become reality. The University of Toledo's College of Engineering (COE) believes that a hands-on approach to learning the process of entrepreneurship, increasingly in multidisciplinary teams, teaches students invaluable lessons, and heightens awareness of the real world challenges that budding innovators and student start-ups were previously likely to face only after graduation. Providing our students both a comprehensive infrastructure and relevant mentoring enables them to explore potential career paths while still in school -- a driving force behind our continuing efforts to extend the spirit and unparalleled success of COE's mandatory, one-year cooperative experience program¹ into the self-directed spaces for our Makers of tomorrow.

¹Every engineering science student is required to work for one year in a professional setting before they are certified as graduates. During the last 15 years, our students have benefited from more than 14,000 such paid work-placements.

There has always been a 'Maker Culture' tradition in our college. For example, under Associate Dean Hefzy's direction, during the last 25 years we have designed and built more than 150 assistive devices for the physically disabled persons in the community. Most of these projects have been done as part of our students' capstone design experiences. We have also had a successful Senior Design Clinic since 1998, where students worked with industry and business partners on their capstone projects. Supporting cross-campus collaboration, bioengineering senior students regularly work with faculty in the College of Business and Innovation on their capstone design projects, and College of Engineering and College of Business and Innovation students take courses together toward a shared Entrepreneurship minor. Our doctoral program in biomedical engineering (jointly offered with the College of Medicine) has a well-defined entrepreneurial component. In this letter we would like to focus on a relatively new initiative in our college, where we have begun to actively seed the culture of entrepreneurship during the very first semester of a student's academic experience.

Toward this goal, in the summer of 2013, several UT College of Engineering faculty members and I traveled to Dartmouth, Georgia Tech, Northwestern, University of Maryland, and the University of Michigan to learn best practices and implementation strategies from leading engineering colleges with strong design programs. While several of our first year classes have had design experiences for many years, these visits reenergized the COE faculty in creating a relevant and improved design experience for our freshman engineering students.

In fall 2013, each engineering department implemented an initial framework to incorporate freshman design and entrepreneurship into the first year orientation courses. These initial efforts focused on team design projects that involved designing a device or process. For example, under the leadership of Dr. Matthew Franchetti, the Mechanical, Industrial, and Manufacturing Engineering (MIME) Department implemented freshman design projects in MIME 1000: Introduction to Mechanical Engineering, with an enrollment of 183 students. In total, 42 freshman design teams were created, consisting of four to five freshman students and a senior mechanical engineering student mentor. Each of the teams worked on a novel device concept and created a mini-business plan. The teams were provided with a dedicated design space in COE's North Engineering complex that included hand tools, work desks, and storage space. Teams were also provided access to a 3D printer and weekly in-class presentations related to the design process, market identification, business plan development, and teamwork. The students presented their concepts and business plans at the end of the fall 2013 semester for credit in the MIME 1000 course.

Concurrently in fall 2013, Dr. Patricia Relue launched the Department of Bioengineering's BIOE Freshmen Design Club. Participation in the club was voluntary, with over half of all the entering freshmen participating. Students met weekly to learn the process of engineering design, first by identifying functionally underperforming medical devices that are used regularly. Groups then worked on analyzing need, brainstorming, and iterating designs and solutions to the self-identified problems. Midway through the semester, students met with two physicians on the UT Health Science Campus to discuss problems in medicine and patient care. The students then self-selected into teams to work on problems related to patient/doctor communication, hospital-acquired infection, redesign of medical instruments and rehabilitation devices.

During the 2014 spring term, thanks to the generous support of COE benefactors, Thomas and Elizabeth Brady, I was able to invite Mr. Scott McIntyre to serve as a mentor for several of the teams. Mr. McIntyre is a former Manager of Business Incubation at UT and is a passionate

entrepreneur. Mr. McIntyre led teams through an iterative process resulting in numerous projects transforming dramatically from their original designs.

Mr. McIntyre quickly established the Freshman Engineering Entrepreneurship Development club (FEED) for freshmen to share their new knowledge with each other and learn from upper-class members of sister organization, Young Entrepreneurship Society (YES), an entrepreneurship club founded by McIntyre intern and graduating masters candidate, Michael Koludrovich.

“Building an entrepreneurial culture starts with educating both students and the community that the benefits for each are interconnected. Our events have sparked remarkable initiative and tangible results.”

-Scott E. McIntyre



The semester ended with eight teams presenting their business plans at the inaugural “Angel Pitch” competition held at UT on April 16, 2014. Teams showcased their detailed plans in a structured presentation highlighting their process of discovery, research, customer interaction and prototypes to an expert panel for direct feedback and awards. Angel Pitch was won by freshman MIME student Joe Strobbe who had fabricated a novel apparatus designed to help extract military casualties from challenging terrain. To much applause, Joe demonstrated the physical integrity of his invention by “wearing” a classmate on his back using a prototype of the apparatus during his presentation (pictured at far left in photo on Page 1). Joe Strobbe went on to be elected to a leadership position at YES for the coming year and will be the first student “Ambassador” to help FEED and YES members actualize the comprehensive services and benefits available to all students.

UT operates Northwest Ohio's premier business start-up and entrepreneurial assistance facilities, University of Toledo Innovation Enterprises (UTIE) and UT Launch Pad, the latter of which is operated out of the Nitschke Technology Commercialization Complex (NTCC), a new, sprawling 40,000 square-foot building adjacent to the COE's education and research facilities and is home for a growing and diverse incubation clientele. NTCC (photo at top-right page 1) also features COspace, a state of the art co-working environment home to early stage ventures, FEED/YES meetings and future student start-ups.

The entire year-long Freshman Design and Entrepreneurship Development process proved to be a rewarding and educational opportunity for both students and faculty. We now plan to extrapolate these successes for initiatives campus-wide, including development of “COcampus”, a web-based platform designed to seamlessly connect anyone interested in collaborating on meaningful, relevant projects that could range anywhere from assisting staff at UT Medical College to raising funds for university programs to aligning teammates for independent student start-ups. The University of Toledo Jesup Scott Honors College will be featuring presentations from McIntyre and colleagues from business incubation at incoming freshmen orientation exercises this summer. Also sharing the mission are several student members of the University of Toledo Engineering Leadership Institute (ELI), which was launched in our college in 2009 and was catalyzed more recently by a \$1million endowment from Roy and Marcia Armes. ELI is a student program focused on team-building, professional ethics, and entrepreneurship. Mr. Armes is a 1975 graduate of the UT College of Engineering, and presently serves as CEO of Cooper Tire & Rubber Company.

Incorporation of design and entrepreneurship into the freshmen year experience with access to dedicated project design space has uncapped a store of unimaginable initiative and creativity from our students. These students worked energetically and resiliently with faculty, mentors and community supporters to tackle their projects without fear of failure. We look forward to rounding out our technopreneurship facilities with the addition of a larger dedicated Maker Studio where students campus-wide can work on their own projects or assist incubation clients as vendors.

We look forward to greater outcomes in the near future. Again, thank you, for your personal encouragement of this initiative in our nation.

Sincerely,



Nagi G. Naganathan, Ph.D., ASME Fellow
Professor & Dean



**We recruit a *graduating* class...
not a freshman classSM**

Dear Colleagues,

Virginia Commonwealth University
School of the Arts, Office of the Dean
Research and Entrepreneurship Office

Monroe Park Campus, Pollak Building
325 N Harrison St. Rm 201
PO Box 842519
Richmond, VA 23284-2519

804 VCU ARTS (828 2787)
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arts.vcu.edu

VCU and VCU School of the Arts is excited to participate in collaborative efforts to support making on university campuses. VCU has made concerted efforts to support makers and develop new making opportunities across campus. Examples of VCU's commitment include the following:

- Establishment of the School of the Arts **Research and Entrepreneurship Office** to generate new projects, build productive infrastructure, and design programs to increase impact within and beyond the university.
- Development of an innovative multidisciplinary facility, called **The Depot**, opened in May 2014. This space allows for collaborations across the university. This "making space" has the potential to serve as a core laboratory with open collaboration spaces, including green screen and movement studios.
- In 2012, the School of the Arts launched an innovative curriculum in **Creative Entrepreneurship** to incorporate entrepreneurial skills development into the arts and design education as part of a larger university-level program in venture creation. The curriculum supports student to generate ideas that spur the creation of new business.
- Development of "healthcare makers", with the Spring 2014 launch of the **Arts and Health Fellows Program** to develop new collaborations across arts, design and healthcare. Funded by a university start-up grant, this program supports students, alumni and faculty to produce new solutions to healthcare challenges.
- In 2014, VCU School of the Arts will launch an interdisciplinary program in **Advanced Media Production Technology**, working with a local recording studio, which will focus on the craft of creating multiplatform content.
- With support from a grant from the National Endowment for the Arts, **The CurrentLab** was launched in June 2014 to instruct art teachers across the state of Virginia in game design skills. These teachers will be supported through the year, to teach digital game design to their students. **Currentlab** plans for a next stage of development to provide educators with skills in 3D printing, mobile application development, and haptic interfaces.

Thank you for your efforts to advocate for makers in higher education,

Dr. Sarah Bainter Cunningham
Executive Director for Research



Washington University in St. Louis

Mark S. Wrighton
Chancellor

June 13, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

Washington University in St. Louis is proud to be a part of the White House Maker Faire Initiative. The leadership of our students, faculty and staff in the Maker Movement is inspiring. As we have seen on campus, groundbreaking medical devices and novel designs to help address pressing global issues are just two of the possibilities when our community has ready access to the latest in technology and tools.

The enclosed white paper outlines our commitment to supporting and growing the Maker Movement on our campus. The Maker Movement is key to furthering Washington University's culture of innovation and entrepreneurship.

Sincerely yours,

Mark S. Wrighton

MSW:js

Enclosure



Building a Maker Movement Foundation at Washington University

From roving around Mars to major medical advances, Washington University in St. Louis has a rich history of exploration, ingenuity and problem solving. This can-do spirit is part and parcel of our nation's fabric, and, here in the heartland, innovation is taking place every day in garages and basement workshops.

The imagination-defying ideas taking root in our community will have a chance to flourish when people have ready access to a workspace that offers the flexibility and freedom of a garage or basement, combined with tools and technology not often available in one space. This is Washington University's *and* St. Louis' Maker Movement opportunity – getting people back to the “shop.”

It is an exciting time for Washington University. As an institution, we're building and strengthening our Maker foundation with **space, support and spirit.**

Space

The hive is abuzz

A Maker Zone is growing on campus thanks in large part to the leadership of our students.

We have a cluster of spaces on our Danforth Campus dedicated to fabrication and collaboration, including a new central Maker space in our School of Engineering & Applied Science.

Dedric Carter, PhD, our new associate vice chancellor for Innovation and Entrepreneurship, describes this area as a busy hive. “The energy is amazing,” he says. “You can grab a burger, connect with friends and then head off to work on a race car, create a prototype, or talk through a problem with fellow innovators and designers.”



Nothing is off the table in Washington University’s Maker Zone, whether it’s designing for the racetrack, constructing a dance floor for a fundraiser, or tackling a global cookstoves issue.

This Maker Zone offers a glimpse into how Maker space will be designed and incorporated into future academic areas.

Our Sam Fox School of Design & Visual Arts' digital fabrication labs, FAB LAB I and FAB LAB II, support studio and course work assignments, as well as independent research projects conducted by students and faculty. The labs feature fully equipped facilities for building models and fabricating prototypes. Students work with a wide variety of materials, including wood, plastic and paper. Beyond the fabricating equipment and tools typically found in wood and metal shops, the school's equipment includes laser cutters, three-axis CNC mills and a plastic 3D printer.



More than two-dozen Washington University architecture students used the cutting-edge digital fabrication technology in the FAB LABs (top left) at the Sam Fox School to bring their avian observatory to life near the confluence of the Mississippi and Missouri Rivers. Students and faculty collaborated with the Audubon Center at Riverlands and the U.S. Army Corps of Engineers' Rivers Project Office.

The Sam Fox School also is a founding member of the Alliance for the Arts in Research Universities (a2ru), a partnership of nearly 30 institutions dedicated to generating knowledge, advocacy and resources that enable universities to integrate arts and design practices, and foster highly adaptive creators and thinkers.

Support

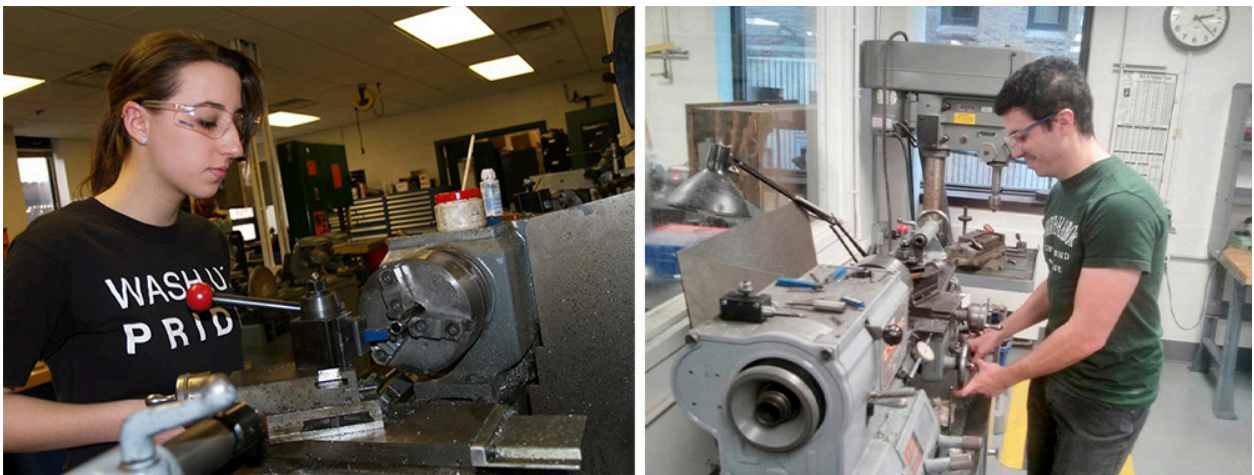
The people and programs behind the place

Washington University Makers have crucial support before they matriculate.

Later this year, the School of Engineering & Applied Science will begin a process to evaluate the feasibility of including Maker Portfolios in student admissions considerations in coming years.

In addition, Washington University's new College Prep Program, which brings 26 high school students from the local St. Louis region to campus for boundary-expanding academic opportunities, includes hands-on activities designed to help students learn the joys of engineering and manufacturing components. Projects include building a generator, fabricating blades for small wind turbines and building kites to investigate wind smoothness and speed. This program begins freshman year and continues through graduation, including three summer opportunities to live on campus with our undergrads.

Once on campus, Washington University students work with and learn from leading researchers and innovators. Of note, over 60 percent of Washington University's engineering undergraduates participate in an independent design project or are engaged in research with faculty.



Washington University students, under the guidance of long-time staff member Pat Harkins, learn the fabrication process in the university's machine shop. Harkins dedicates much of his time to helping students with design projects during their years at the university.

Spirit

The heart, hometown and history

The backbone of Washington University’s Maker movement is a strong spirit inspired by our students, faculty and staff, and by our hometown and history.

Washington University students from around the world are leading the Maker charge on campus and beyond. One example is BetaVersity (betaversity.com), a company co-founded by Washington University senior Blake Marggraff that creates collaborative prototyping spaces where students learn by doing.



BetaVersity, co-founded by senior Blake Marggraff (left), is a technology startup that creates and supports active learning facilities for educational organizations. Two of BetaVersity’s products are the BetaBox (right), a mobile active learning space available for rent and lease, and BetaSpace, a package for educators interested in installing a permanent facility.

Our hometown is a booming innovation and entrepreneurship hub, and the burgeoning local Maker movement will be part of St. Louis’ expansion in this area. In a recent Brookings Institution report, St. Louis is highlighted as one of the premier “Innovation Districts” in the U.S.

The concept of Making has, and continues to be, part of WUSTL's history, from the development of the first PET scanner in the 1970s to today, as Washington University students and researchers create life-changing devices on 3D printers.



Using a 3D printer, a team of researchers led by Igor Efimov, PhD (far left), Washington University biomedical engineering professor, is developing a custom-fitted, implantable device that can deliver treatment or predict an impending heart attack before a patient shows any physical symptoms. Also using a 3D printer, a team of Washington University seniors (right) designed and built a robotic prosthetic arm for 13-year-old Sydney Kendall. Sydney requested that her new arm be pink.

Space, support and spirit add up to Washington University's incredible momentum in the Maker movement – an important opportunity for our campus community, St. Louis and beyond.



WESTMORELAND COUNTY COMMUNITY COLLEGE

June 12, 2014

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

To meet the growing workforce needs of Western Pennsylvania's manufacturing and natural gas sectors, Westmoreland County Community College will be opening a state-of-the-art Advanced Technology Center (ATC) on August 21, 2014.

The \$16 million ATC will occupy **73,500-square-feet** at RIDC-Westmoreland (the former SONY plant) in Mount Pleasant to house workforce development programs currently located at the WCCC Youngwood Campus. The ATC will nearly triple the space for the college's advanced technology programs, which experienced a 63 percent enrollment increase over six years.

The ATC will offer programs with an industry-aligned curriculum in areas such as **advanced and additive manufacturing, energy, mechatronics, machining and fabrication, and materials joining/welding. An occupational advisory committee comprising representatives from regional employers such as Kennametal, Elliott Company and Carpenter Technology Corporation along with the National Center for Defense Manufacturing and Machining review and provide input into the ATC programs' curricula.**

The ATC will house classrooms, labs outfitted with specialized equipment for hands-on training and open, flexible instructional space to allow for collaborative learning on projects.

The curriculum will include short-term, stackable certificates that lead to an associate degree at WCCC and a bachelor's degree at four-year universities. These certificates will give students and incumbent workers multiple entry points to education and employment.

Funding for the ATC has been secured through public and private sources, including the Westmoreland County Commissioners, Pennsylvania Redevelopment Assistance Capital Program, U.S. Department of Labor, the college's capital budget and the WCCC Educational Foundation campaign, *Investing in Our Community*.

When it opens, the Advanced Technology Center will be a community, workforce and economic development asset and will help grow the manufacturing and natural gas industry in the region.

Nationally recognized ShaleNET expands energy industry training

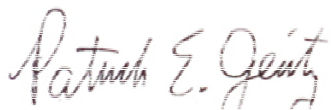
WCCC's ShaleNET program, which trains students for entry-level positions in the natural gas and oil industry, was selected from nine finalists to receive the **2013 Exemplary Program Award** from the National Council for Workforce Education, an affiliate of the American Association of Community Colleges.

ShaleNET started in 2010 with a \$4.96 million U.S. Department of Labor Education and Training Administration grant awarded to WCCC in collaboration the Pennsylvania College of Technology, Allegheny Conference for Community Development and Pennsylvania Independent Oil & Gas Association. The grant's focus was to build a comprehensive recruitment, training, placement and retention program for high priority occupations in the natural gas drilling and production industry.

Since its inception, ShaleNET has grown to over 20 certified training providers throughout Pennsylvania, Ohio, West Virginia and New York and certified 978 graduates for positions with 125 employers in the natural gas industry throughout the United States. The ShaleNET Talent Matching System (ShaleNET.org) educated 12,619 individuals on the benefits of entry-level jobs in the Natural Gas Industry and over 3,000 of these individuals found employment from July 1, 2010 through June 2013.

ShaleNET received in September of 2012 a TAACCCT Grant for \$14.96 million for advanced natural gas training which was awarded to the Pennsylvania College of Technology (PA) as the lead institute, and the partnering community colleges are Stark State College (OH), Navarro College (TX), and Westmoreland County Community College (PA).

The program has evolved from noncredit training to advanced "stackable" credit certificate and associate degree programs that will prepare graduates for good paying jobs with companies involved in gas processing, treatment and transmission. Current WCCC credit programs include Mechatronics, Petroleum and Industrial Process Operations Technology, Occupational Health and Safety and Natural Gas and Oil.



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May 31, 2014

A Letter to President Obama on Supporting Students in the Art of Making

President Barack Obama
The White House
1600 Pennsylvania Avenue NW
Washington, DC 20500

Dear President Obama:

I am pleased to be able to share with you how Youngstown State University (YSU) has embraced the maker concept in its educational and outreach activities, and how excited we are to be part of the conversation about your first ever White House Maker Faire. We have found these programs to be tremendously compelling for our students and faculty, and for prospective students from throughout the Youngstown metropolitan region.

Launch Lab is a new YSU initiative to provide students from all disciplines a place to create innovative solutions and gain hands-on experiences. Launch Lab will have an open ideation space and digital manufacturing equipment allowing YSU students to conceive ideas, design and bring them into reality. YSU students can take advantage of Launch Lab as part of coursework within STEM disciplines, coursework within creative arts disciplines, personal use, and/or newly created cross-disciplinary STEAM courses such as The Science of Design. Working with our colleagues in the College of Creative Arts and Communications, we are seeking to make this new course one of the first in the nation that would be available to all University students as a general education offering, providing an opportunity for all of our YSU students to gain an understanding of the importance of making.

Launch Lab's equipment will include 3D printers, 3D scanners, CNC routers, and 2D laser cutters. The facility will also leverage existing YSU capabilities such as the new **Center for Innovation in Additive Manufacturing (CIAM)**, the Center of Excellence in Materials Science and Engineering (CEMSE), the Arts and Engineering Metal Casting Foundry, the STEM machine shop, the Arts Ceramics Lab, and the Graphic and Interactive Design Lab. This enables access to a wide range of materials from sand, ceramics, plastics to metals and also, an array of varying manufacturing techniques.

Launch Lab sponsorship includes support from the Ohio Board of Regents, the Appalachian Regional Commission, the College of STEM, and the College of Creative Arts and Communication.

Launch Lab is the most recent in a series of initiatives surrounding advanced manufacturing. YSU was a **founding member of America Makes**: the National Additive Manufacturing Innovation Institute. New faculty members have arrived on campus to lead additive manufacturing teaching and research. In

January 2014, YSU launched the Center for Innovation in Additive Manufacturing (CIAM) and installed two industrial grade ExOne 3D printers capable of printing metals and ceramics.

A rapidly growing student maker community is taking advantage of these initiatives. A team of YSU Industrial Engineering students created a 3D printing kiosk for open access. This kiosk contains two MakerGear M2 printers and opened in April 2014 with support of the Bakos family. Another team of YSU Choose Ohio First Scholarship students won a regional research competition by developed metrics of product complexity and customization to help businesses decide whether or not to use 3D printing. This summer, YSU students are on 3D printing internships at places like NASA Glenn Research Center, MakerBot, America Makes, and Youngstown Business Incubator through PICAM and OH-Penn grants.

YSU has also been involved in K-12 STEM outreach programs and workforce development. Outreach programs include the Biz3D high school focused entrepreneur program in collaboration with the Youngstown Business Incubator. Using our College in High School initiative that offers dual college and high school credit, we have expanded our Science of Design course to be available to high school students, providing them with the opportunity to experience the art of making.

YSU is a proud partner with OH Wow! The Roger and Gloria Jones Children's Center for Science and Technology, to introduce the art of making to students in the primary and middle school grades. Together, we are coordinating Youngstown's first-ever maker faire to be held in September as part of our Seven Days of STEM Festival. OH Wow will be adding a new 300 square foot area specifically designed as a maker space, and is working with faculty and students from YSU to develop activities that can take advantage of this expanded space.

As an historical center of manufacturing within the United States and the home of the National Additive Manufacturing Innovation Institute, I am especially pleased that YSU is able to work with many partners throughout the Youngstown area in bringing the art of making to students of all ages. Thank you for all of your efforts to reinvigorate STEM education, and your leadership in bringing the excitement of making to the public.

Sincerely



Martin A. Abraham
Founding Dean, College of Science, Technology, Engineering, and Mathematics