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"Make It in America: What's Next?" District Field Hearing
PANEL ONE: Maryland Research and Innovation

Good morning to the chair, Congressman Steny Hoyer, Maryland Senators and Delegates, fellow witnesses, and to all who share an interest in the "Make it in America Plan" to ensure both Maryland and America's competitiveness in the world. My name is Darryll Pines and I am Nariman Farvardin Professor and Dean of the A. James Clark School of Engineering at the University of Maryland, College Park.

In my testimony today, I hope to highlight how universities, through state and federal investments in creative policies and programs, can spur innovation, economic development, and job creation in Maryland and in the country, and significantly contribute to the "Make it in America Plan." I would like to begin my testimony with a quote from the great engineer, Henry Ford who said:

> *I am looking for a lot of people who have an infinite capacity to not know what can't be done.*

The A. James Clark School of Engineering is one of the largest undergraduate and graduate engineering programs in the nation and represents the flagship engineering program for the D.C., Maryland, and Northern Virginia area. When compared with our public peer institutions, U.S. News and World Report ranks our undergraduate and graduate programs 11th and 12th, respectively, in the nation. The Clark School has eight academic departments, four institutes and centers, and manages an Unmanned Aircraft Systems test site in Southern Maryland at the St. Mary's County Regional Airport.

The Clark School enrolls over 6,000 students. Of these, more than 4,000 are undergraduates. Annually, the Clark School confers degrees to approximately 1,500 B.S., M.S., M.Eng., and Ph.D. candidates. Each year our faculty members conduct research activities that amount to more than $130 million in research expenditures. This work is spread across a number of strategic areas of interest to the state of Maryland, including:

- Bioengineering and biomedical devices
- Advanced battery and energy storage devices
- Robotics and autonomy
- Advanced materials
- Nanoscience and nanotechnology
- Quantum sciences
- Photonics, communication and computing

Our undergraduate and graduate students are in very high demand by industry, government, and academia. Our alumni include technical, business, and entrepreneurial leaders who have made significant contributions to the state of Maryland, the nation, and society. They include pioneers such as:

- The late A. James Clark,'50, CEO and President of Clark Enterprises, 8th largest construction firm in the nation with 4,000 employees in the United States and $4.4B in revenue

• Tim Regan,'77, CEO/President of Whiting-Turner, 11th largest construction firm in the United States (MGM Casino project), 2,000 employees, $5B in revenue
• George Laurer, '51, former IBM employee, Inventor of the Universal Product Code
• Rob Briskman, '61, founder of Sirius Satellite Digital Radio
• Brian Hinman, '85, serial entrepreneur and inventor, Polycom Teleconference Systems
• Brendan Iribe, founder and CEO of Oculus VR, which produced the first consumer-targeted virtual reality headset (purchased by Facebook for $400M in April of 2014)

These are the types of innovators we want to continue to grow, cultivate, and inspire to make our state great. My point in highlighting these notable alumni is that universities, due to the research they conduct and the talent they produce, are key elements in the innovation ecosystem that spur economic development and job creation in the state and nation.

As a member of the Maryland Economic Development and Business Climate Commission, one of our principal findings was that Maryland has not nearly reached its potential in creating jobs and growing businesses. Although Maryland ranks first in the nation in the monetary value of research conducted within its borders, our state ranks thirty-seventh in percentage of job growth and twenty-sixth in the growth rate of creating university-based startups in the past decade. Various organizations that assess "business friendliness" place Maryland at sixteenth, thirty-fifth, and forty-first among the 50 states.

At the same time, our state's citizens enjoy the highest median income. A significant positive contributor to Maryland's economy has been federal spending within the state, however, such spending will almost certainly continue to diminish in the foreseeable future. A major challenge will therefore be to diversify our state's economy and, in addition, provide the opportunities needed to overcome the economic and educational inequities that continue to exist across the populace. To improve the business climate and economic vitality of the state of Maryland, the commission proposed 32 recommendations, of which eight were related to education and entrepreneurial support to bolster research, innovation, economic development and job creation in the state.

• Prioritize higher education funding, including capital funding, to a degree that reflects its extraordinary importance.
• Establish a university executive in residence at the Maryland Department of Business & Economic Development.
• Establish a one-semester elective course in engineering in high schools in the state.
• Reassess state allocation of pre-K-12 funds to assist in closing the education gap and to assure equity in education.
• Require all research universities receiving state funds to consider establishing mechanisms of technology transfer, including incubators and innovation hubs, and provide additional state funding to support these efforts. One example is UM Ventures, which represents a partnership between UMB and UMD that fosters technology commercialization and collaboration across the two institutions in the biosciences, biomedical engineering and biomedical devices, virtual reality, and computing.
• Increase the availability of venture capital through matching investment, publicity, and other programs.
• Encourage higher education institutions to implement higher education professional development standards.
• Establish a task force to examine the appropriateness of existing conflict of interest laws, procurement rules, and intellectual property policies that inhibit technology transfer.

At the University of Maryland in the Clark School of Engineering, we are fortunate to have founded the Maryland Technology Enterprise Institute (Mtech) which has built a comprehensive entrepreneurship and innovation ecosystem at the University of Maryland. Its programs arm top faculty and students from around the

world with the knowledge of how to successfully launch companies and guide aspiring and existing entrepreneurs through the entire lifecycle of launching and maintaining technology-based ventures.

One such successful program is the Maryland Industrial Partnerships Program, which promotes the development and commercialization of products and processes through industry/university research partnerships. MIPS is a state sponsored program that provides matching funds to help Maryland companies pay for the university research at a University System of Maryland member campus. Projects are initiated by the companies to meet their own research and development goals. MIPS companies have created over 15,000 jobs with approximately $30.3 billion dollars in product revenues. Past success stories from the MIPS program include:

- HughesNet, North America's largest consumer satellite Internet network, $13.7 billion in impact
- Synagis, which prevents a severe respiratory disease in infants, $13.6 billion
- Martek Biosciences Corporation, which produces DHA fatty acids, found in more than 90 percent of infant formulas in the U.S., $2.9 billion

The college also boasts recent notable success stories that involve university based research from faculty, staff, and students that have lead to innovative startups including:

- FlexEl is a UMD spinout developing thin film batteries, battery solutions and power applications. FlexEl recently received a $6 million investment from a Fortune 500 company, as well as $3 million in grants and third party investment funding. They now have 60 employees in College Park.
- OmniSpeech is developing groundbreaking speech extraction technology. Its signature product, OmniClear, provides the highest quality background noise reduction and speech enhancement, delivering superior voice quality and intelligibility in a software-only solution.
- Remedium Technologies, a medical device company advancing the standard of care for treating uncontrolled hemorrhage. It recently won FDA approval to market their lead product, the Hemogrip™ Patch. The patch is indicated for use at vascular access sites, where it rapidly controls bleeding that occurs when accessing veins or arteries for various medical treatments and applications.
- Startup Shell is the first ever on a university campus student-run co-working space and incubator that fosters entrepreneurship thru collaboration. In two years it has generated 52 student lead startups.

So, how do we continue to link research to innovation and entrepreneurship and have impact? We continue to leverage our universities to spur economic development and job creation by supporting infrastructure, programs, partnerships and processes that enable innovation and technology commercialization.

One example is the creation of a University of Maryland Unmanned Aircraft Systems Test Site in Southern Maryland in partnership with NAVAIR/NAWCAD and St. Mary's County Regional Airport. The goal of the UAS Test Site is to conduct research to ensure safe and efficient integration of UAS into the national airspace. Products that are commercialized from this research will help boost and grow the state's UAS commercial market with applications to search and rescue, precision agriculture, aquaculture, package delivery, entertainment, real estate, and many, many others. In just one-year, the test site has secured agreements and partnerships with private firms such as Aurora, and UAV Solutions that have agreed to collocate offices near the test site.

In conclusion, the state of Maryland is poised to become a national model for translating research into innovation and technology commercialization. In partnership, the state and its research universities have changed the culture around innovation, creating a moment where policymakers can—and should—capitalize on the opportunity to improve Maryland's business climate by investing in innovation districts, investing in

university based startup ecosystems, retaining entrepreneurial scientists, investing in minority and women entrepreneurs, and ensuring existing state programs achieve their intended goals.

A notable inventor and entrepreneur, Dr. Robert Fischell said it best:

> *A terrapin can only move forward if she or he is willing to stick its neck out*