Remarks by MIT President Emerita Susan Hockfield
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"The University as a Driver for Innovation and Economic Development,"

Delighted to be here to speak with you. It's a great privilege to serve as a Science Envoy for the United States focused on Turkey as this country accelerates towards a knowledge-based, high-skills economy. Already I've encountered dozens of far-sighted projects and programs designed to propel Turkey toward its inspiring ambition to become a top 10 global economy by 2023. It is abundantly clear that you recognize that to reach that goal, Turkey will need to expand its innovation sector so you can compete head-to-head with the world's top economies. From all I've seen, you are on a path to do it.

Your economic goals alone represent an important and exciting ambition, but they take on particular significance at this time of world economic and political turmoil and in this place, where those economic and political forces converge with great force.

President Barack Obama visited Turkey very early in his first term in office. When he spoke to the Turkish Parliament, he described Turkey as a critical ally and asserted that, "Turkey and the United States must stand together – and work together – to overcome the challenges of our time." He pledged to "renew the alliance between our nations, and the friendship between our people."

Over the past four years, President Obama and Prime Minister Erdoğan have worked to expand our relationship by increasing trade, promoting entrepreneurship, and broadening the ties between our peoples. I believe that there is no better foundation on which to expand and deepen our ties and to tackle the challenges that face both our nations than by strengthening our cooperation on science, technology, and innovation.

In 2010, our governments signed a joint Agreement to promote science and technology to build the bridges that advance our scientific and engineering objectives. Those bridges will strengthen our economies and improve the quality of life for people here in Turkey and in America. My role is to help us build and strengthen those partnerships.

Already, programs in place have encouraged extraordinary progress. Your 16% annual increase in R&D investments and tripling of researchers since 2002 have produced an over 5-fold increase in patents and 4-fold increase in publications. New collaborative projects between Turkey and the U.S. build on your strong growth. One example of our cooperation, the U.S. Building Opportunities out of Science and Technology, or BOOST, Applied Technology Program has been working with more than 40 Turkish entrepreneurs and scientists over the last three months to turn their ideas into commercial products through the development of successful business plans.

I'm inspired by the landscape of research and higher education in Turkey. You recognize that economic growth is key to your success, here in Turkey, as in the U.S., and that entrepreneurship is the single most important driver of job creation. Achieving technological advance calls on a nation's most important natural resource: the intellect and talent of your people. A vibrant knowledge-based economy provides opportunities for our citizens to prosper and enjoy upward mobility. The remarkable tripling of Turkey's economy over the last decade has been called the "Turkish Miracle." However, what I see is not a "miracle," but an outcome of smart policies implemented by the Turkish government over the past 10 years, and smart, creative and entrepreneurial people taking advantage of those policies.

In the U.S., technological advance through scientific research has driven much of our economic and national security strength over the last 60 years. With my background in science, technology and innovation, I thought I might walk with you through four links in the innovation pipeline, the pathway that turns lab-based discoveries into marketplace products. I'll focus on the critically important role of the university

1st link: Government Investments

Here in Turkey, you've already laid in place the first link in the pipeline: government investment in basic research. A little history of U.S. research investments helps understand how the system developed.

Following World War II, the United States decided to retool the engine that had used innovation to develop war technologies into an engine of innovation for peacetime technologies. We followed a carefully designed blueprint that has proved enormously successful. Economists have shown that more than ½ of U.S. economic growth since WWII attributed to technology and innovations stemming from investments in research and development, R&D. Those investments have also been a powerful driver of job creation.

Funding by non-government sources has amplified government investments, so that our national R&D investment now constitutes about 3% of GDP. Roughly 1/3 comes from government and 2/3 comes from private (industry) sources. Together, private and public R&D investment in the U.S. sums to over $400 billion. That's a lot of money to invest, but these investments, over time, powerfully fuel economic growth. As President Obama has observed "every dollar we invested to map the human genome returned $140 to our economy," not to mention the potential in lives saved.

I'm encouraged and inspired by Turkey's commitment to increase R&D spending to 3% of GDP within 10 years, with 2% from private sector. That commitment demonstrates an understanding of the essential foundation for an innovation-based economy.

Let me mention three key principles that have guided the allocation of research funds for our research enterprise.

First, merit-based peer review: this puts the experts in the driver's seat and drives the highest possible quality of research.

Second, the government directs much of its funding to pre-competitive research, that is, basic, curiosity-driven research. This kind of research is essential, but is simply too early to justify industry investments; it may not have an economic impact for decades – or ever. Funding of the basic physics and mathematics research that underlie IT innovations, and the basic biology that leads to more effective drugs is a critically important link in the innovation pipeline.

And third, much of government research funding supports work in universities. This kind of investment has a dual benefit: it produces products and people, innovations and next-generation innovators.

2nd link: Strong Research Universities

The second link in the innovation pipeline emerges clearly from what I've just said, the central importance of strong research universities.

I'm inspired by Turkey's higher education landscape. Providing education that can support an innovation-based economy couldn't be more important for Turkey. With half of your population under 28 years of age, you have a great resource of future entrepreneurs and business leaders, as well as future scientists and engineers who will plant the research seeds for the next generation of businesses.

In the U.S., the presence of both public and private institutions has encouraged competition, enhanced by the flexibility of the private colleges and universities, and that competition makes everyone stronger. I'm pleased to see Turkey's commitment to public and private schools.

We perpetually ask ourselves the question of how do you best educate for innovation? We've found that we can't just focus on applications engineering, but must include basic mathematics and sciences, and also serious study of the humanities and liberal arts. Effective innovation requires life skills that come from a broad education.

I was once asked at a panel on entrepreneurship, "why go to college?" when some successful entrepreneurs didn't. The technology behind the kinds of companies founded by MIT alumni – the Bose Corporation, Analog Devices, BiogenIdec, and a host of new battery, biomedical and IT start-ups – require considerably more than a high school education!

Universities are an incredibly fertile environment to move theory into practice, but to do so it's important to foster connections between academy and industry. Corporate partnerships allow us to tackle real problems in the real world, and students get a chance to experience an industry perspective, on campus and in internships.

3rd link: Tech Transfer

The third link in the innovation pipeline is a robust process that protects intellectual property (IP) and fosters the transfer of technology from the lab to the marketplace. Tech transfer is how your new ideas and your new discoveries move from theories into practice.

The major research universities in the U.S. actively facilitate technology transfer through Technology Transfer Offices. These offices help university researchers navigate the path to patents, contracts, licenses and other arrangements so that private enterprise can further develop technologies conceived at the university.

A vibrant innovation-based economy requires a clear, and clearly enforced, patenting and licensing system. U.S. intellectual property laws exchange disclosure of an invention for time-limited protection in the marketplace. These laws protect inventions and reward risk. The Leahy-Smith America Invents Act, signed into law by President Obama in September, 2011, improves U.S. patent law, providing incentives for inventors to disclose their inventions sooner. The law also harmonizes U.S. patent processes with other industrialized countries. With a patent protecting intellectual property, an invention can move to a company for marketplace development.

With Turkey's patent and copyright laws currently under review in parliament, you have a once in a generation opportunity to establish state-of-the-art protection of intellectual property. Getting IP right will foster a thriving innovation-based economy.

4th link: Know-how and Funding

Tech transfer requires a great idea, but it also requires a great deal of money. This brings me to the fourth link in the innovation pipeline: know-how and funding for business startup and scale-up..

We often speak of "the Valley of Death" during the startup phase of a company. It's hard to do, especially the first time! But, knowing how to do it makes an enormous difference.

At MIT, we found that seasoned entrepreneurs and investors are more than happy to show first-time inventors the way. So, we've developed programs to encourage those relationships. The Venture Mentoring Service, the Deshpande Center for Technological Innovation, and the Martin Trust Center for MIT Entrepreneurship all have programs that introduce experienced entrepreneurs to new entrepreneurs-in-training. Many American universities have established similar programs, with great success.

Along these lines, TUBITAK's TTO grant program supports the development of tech transfer offices and activity.

Of course, startup companies require sources of private funding – venture capital, banks, angel investors. But a recent MIT study shows that the scale-up phase in a company's development presents another potential funding chasm, a "Valley of Death 2.0."

Particularly for manufactured products, scaling up for commercial production calls for vastly more investment funding. As a product moves into the commercial domain, the government plays a different, but critical role in enabling success, such as R&D tax credits to give financial incentives to investors.

In addition, part of the federal R&D budget supports programs like the Small Business Innovation Research (SBIR) program. The SBIR brings funding from thirteen U.S. government departments and agencies into competitive contracts or grants to small businesses for projects with commercialization potential.

If you visit the Boston region, you'll find several clusters of innovation-oriented businesses. Kendall Square is a beehive of activity in IT, biotech, energy and more. Michael Porter and others have described the importance in regional clusters for business success. Governments can also play a role here, to encourage the formation of business clusters.

In Kendall Square, as in other innovation clusters across the U.S., a major research university's spin-out companies decorate the school's perimeter. Venture capital companies often co-locate, as do larger companies with interests in the emerging technologies. Kendall Square, once an urban dessert, now has a magic mix of small and large companies, which draws even more investment and companies into the mix. MIT has encouraged the placement of some of our cross-institutional and cross-disciplinary programs to foster the magic mix that promotes innovation.

Conclusions

Many countries want to build an innovation-based economy. Some will succeed, but not all will succeed in the same measure. Several indicators strongly suggest that Turkey can do it; you are doing it through a wide array of visionary policies and programs. Those programs address each of the four key links in the innovation pipeline I've described:

1) government funding of basic research, supplemented by R&D investments by industry;
2) strong research universities;
3) robust policies for tech transfer and for IP protection;
4) know-how and funding for startup and scale-up of new businesses.

As I conclude, I want to underscore the critical importance of education. I know that you understand that to develop a great educational system, a society must value it. And society must value the independence required for universities to do their best work. Now, even while ensuring independence, strong connections to government and industry help in turning academic research into marketplace products.

Universities best serve their societies when they offer educational opportunity for all. Today at MIT half of the undergraduate students are women. 85% of those women (and of our men) major in science or engineering and pursue careers that strengthen our society and expand our economy. A society can't hope to prosper optimally if only ½ of the population participates.

At their best, universities breed a start up mentality – one that's innovative, creative, open-minded and ambitious -- and they can share it in academy/industry/government partnerships.

The kind of advances I've spoken about today will foster international engagements and international impact. Science and technology are spoken in the same language all over the planet. In a 2009 speech to the National Academy of Sciences, President Obama said, "We also need to work with our friends around the world. Science, technology and innovation proceed more rapidly and more cost-effectively when insights, costs and risks are shared." Science and technology cooperation is a critical part of our friendship with Turkey. The President spoke about building bridges. We do want to "build bridges," but we aspire to turn those bridges into superhighways connecting our countries.

I'm delighted to have this assignment that gives me a front row seat to see, first-hand the great progress you've made. Over the course of my work here in Turkey I hope to learn from you how, together, we can accelerate progress to the national goals you've set for the 100th anniversary of the Republic in 2023.

Thank you