

**Dr. Laurie Glimcher  
Greater Boston Chamber of Commerce  
Executive Forum  
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**[Remarks as prepared for delivery]**

Thank you, Marty [Meehan.]

I am delighted to be here.

Although this is my first chance to introduce myself to many of you, I am actually a native. I grew up here, and went through the Harvard System for my entire career, as have three generations of my family. My dad was chair of orthopedic surgery at Mass General and then Children's Hospital, and my older son is now a cardiothoracic surgeon at Mass General. Younger son City Council Newton.

I managed to stay away from Boston for four and a half years, as Dean of the Medical College at Weill Cornell Medicine in New York City. It was a great experience—but Greater Boston is the best place in the world right now to be involved in biomedicine in any capacity. The intellectual capital here is amazing. That is why GE wants to be here, why pharmaceutical and biotech firms want to be here, and why I want to be here.

And Dana-Farber is the most exciting place in the world to work on cancer—equally devoted to scientific research and to clinical care, and the quality of both is unparalleled. So I am very, very happy to be home again.

That said, I became president and CEO of Dana-Farber at an interesting moment. Now, some of what is interesting today is wonderful: We are in the midst of two revolutions in cancer care that are bringing us ever closer towards our goal: not always curing cancer—though that is something we never stop striving for—but in

cases when we cannot cure, turning cancer from a lethal disease, into a chronic but manageable disease, such as HIV-AIDS has become.

At the same time, we are in the thick of a political climate that threatens to send us backwards—both on the clinical front, with a White House determined to undermine the Affordable Care Act,— and on the research front, with the “skinny budget” proposed by President Trump, which drastically cuts federal funding for biomedical research.

It truly is the best of times and the worst of times.

But it's early in the morning. Let's start with the good news—before we consider some threats to progress, and ways that together, we can protect the remarkable biomedical ecosystem of Greater Boston.

The first great revolution, immunotherapy, or stimulating the body's own immune system to fight cancer, is particularly exciting to me, because I am an immunologist by training. It actually took us more than 100 years to get to this point. In the late 19<sup>th</sup> century, a Harvard-educated surgeon named William Coley, heartbroken after losing a 17-year-old patient to bone sarcoma, came across a number of reports of patients whose malignant tumors shrank or disappeared after they had an infection. So he began injecting his cancer patients with a bacterial concoction called Coley's Toxins. In many cases, the patients who were injected did better. But his methods were inconsistent, other physicians were alarmed by his ideas, and Coley's Toxins was eventually supplanted by chemotherapy and radiation therapy.

We now know that what Dr. Coley was doing, of course, was jolting the immune system into action. Our immune systems are supposed to fight off pathogens, but after decades of frustrating efforts to harness them against cancer, scientists discovered that

our T-cells—the white blood cells that orchestrate an immune response—have specific “checkpoint” proteins that turn off that response, so they don’t harm the body’s own healthy, normal cells. Cancer cells, diabolical by nature, can apply these brakes to their own benefit.

This discovery is allowing us to develop checkpoint-inhibiting drugs to fight cancer. Dr. Stephen Hodi of Dana-Farber led a landmark phase 3 clinical trial of the first checkpoint-inhibiting drug in patients with Stage 3 or 4 metastatic melanoma. Until then, no treatment had been found to extend survival times in patients with metastatic melanoma, which truly was a death sentence. But in the 20% of patients who respond to this drug, we see durable remissions that last as long as ten years, and counting.

In the early 2000s, Dana-Farber scientists led by Dr. Gordon Freeman discovered two related proteins on both normal and cancerous cells that activate a different checkpoint. Therapeutics that block this checkpoint have helped patients with Hodgkin lymphoma, kidney cancer, bladder cancer, and lung cancer. A clinical trial by Dr. Hodi in patients with advanced melanoma found that a combination therapy of two drugs designed to blockade both checkpoints shrank tumors in a remarkable 61 percent of patients. Combination therapies, such as those that brought HIV-AIDS to heel, are almost certainly the future for cancer treatment as well.

Clearly, we are just at the tip of the iceberg—and need to determine why some patients respond to immunotherapy and others do not, as well as to discover why some cancers seem to be resistant to immunotherapy. But the future is very promising.

The second great revolution, thanks to advances in genomics and a molecular understanding of disease, is the arrival of personalized or precision medicine, in which

characteristics of the patient or disease decide the treatment. Targeted therapy is now the standard in a number of cancers, including breast and lung cancers, in part because at Dana-Farber, we have had one of the nation's most comprehensive precision medicine initiatives since 2011, which we call Profile. We know that in a cancer cell something goes awry in the DNA, and that the resulting genetic changes drive that cancer. We also know that if we can identify those mutations, we can better predict which patients will respond to particular therapies—as well as develop new therapeutics to specifically target those mutations that the cancer needs to grow, avoiding a “one-size-fits-all,” sledgehammer approach to chemotherapy. With Profile, we offer every cancer patient coming in to Dana-Farber, Brigham and Women's Hospital, and Boston Children's Hospital the opportunity of having their tumor tissue analyzed for the presence of such genetic mutations and other cancer-related DNA alterations. We are the first cancer center in the country to do this, and that information increasingly steers treatment.

Sometimes, there are true surprises, such as in the case of a five year-old girl whose malignant brain tumors were found to have a BRAF mutation, which is mainly seen in melanoma in adults. Within two months of her enrolling in a clinical trial of a *skin cancer* drug targeting this mutation, her *brain* tumors had shrunk to the point that they were no longer visible on an MRI. Today, she is a happy, healthy third grader. From heroic patients like this, we have learned that *where* cancer appears in the body is often less important than *which* mutations it displays. Now, we are saving children we never could have saved before, and in many cases, less traumatically, with medication that can be taken orally, instead of intravenous chemotherapy.

Profile has completed 22,000 genetic profiles of patients' tumors, creating the world's largest database of the genetic abnormalities that drive tumor development. For the first time, we are able to extrapolate from "exceptional responders," such as the only patient with anaplastic thyroid cancer in a trial to respond to a drug named everolimus. Because we could pinpoint the genetic mutation that the drug was targeting in her case, we could offer a new treatment to another patient with a different cancer—advanced ovarian cancer—but who had the same type of mutation, and who also responded powerfully. This is why Profile is such a game-changing advance for cancer treatment: it allows our patients to participate in finding cures for other patients. They are truly our partners in research.

To yield further insights, we will soon be combining the tumor sequencing we do with information about our patients' immune systems. Since cancer is not just one disease, but many, the more data we have from more patients, the more likely we are to understand and manage it. So we are helping to lead an effort called Project GENIE that will combine data from eight cancer centers around the world into a single registry, and eventually make those data public for researchers anywhere to use.

While I said earlier that Dana-Farber is the best place in the world to battle cancer—and it is—no one laboratory, or hospital, or sector is going to get us to our goal. There is a big gap, for example, between figuring out which aspects of the immune system cancer is exploiting—between the discovery science—and designing new drugs to block that exploitation. While our Dana-Farber/Harvard Cancer Center collaboration has helped to introduce nearly half of the new drugs approved by the FDA for cancer treatment in the last five years, we cannot do without the industry scientists who

translate our findings into compounds that humans can tolerate, and design the clinical trials that determine that these new medicines work. We need the full Greater Boston ecosystem, including its proliferation of medical device, pharmaceutical, and biotech companies. We need fundamental university-based research and teaching, our great teaching hospitals, philanthropists who support efforts such as Profile that are not reimbursed by insurers, and partnerships with government that allow us to move forward. At the state level, the Massachusetts Life Sciences Center has been a crucial partner for Dana-Farber and the entire biomedical community.

Unfortunately, at the federal level, we have been moving *backwards*. The Affordable Care Act has been extremely important in cancer care: Before its requirement that insurers cover people with pre-existing conditions, a cancer diagnosis made it difficult to get or keep health insurance. For those fortunate patients able to maintain coverage, annual or lifetime limits still left them vulnerable to catastrophic costs. Given that there are over 20 million Americans who have at some point in their lives gotten a cancer diagnosis, these protections are essential—as are the Affordable Care Act's requirements for comprehensive benefits and preventative care, including screening tests free of cost that allow for early detection.

Clearly, we believe in universal coverage here in Massachusetts. At Dana-Farber, we use community outreach to ensure that socioeconomic and cultural barriers do not keep people from being screened, or seeking care, or achieving excellent outcomes. We send a mammography van to 16 community health centers in underserved parts of Greater Boston and embed our oncologists at the Whittier Street Health Center in Roxbury. Like most teaching hospitals, we lose money on Medicaid

patients, so we are deeply concerned about downward pressure on Medicaid reimbursements under any health care overhaul. I don't think any of us want to go back to the days when we saw large numbers of uninsured and underinsured people waiting to seek treatment for cancer until it was at an advanced stage—often, too late.

I wish this were the extent of our governmental concerns. But there is another great obstacle in our way: a pullback at the federal level on support for the basic scientific research, without which we simply do not have the breakthroughs that eventually lead to revolutionary new lifesaving treatments.

For me, personally, this has been a roller-coaster ride. I was honored to be a member of the blue ribbon panel convened by Vice President Joe Biden to shape his “Cancer Moonshot.” In December of 2016, I was present when President Obama signed into law the 21<sup>st</sup> Century Cures Act, which included \$1.8 billion in new dollars over seven years for cancer research and care. However, a few short months later, the Trump Administration released a “skinny budget” that cuts funding to the National Institutes of Health, which is the agency that distributes most federal support for biomedical research in the United States, by more than 18%. And it is unclear how the Moonshot dollars, intended to be additive, fit into the picture.

This more-than-decimation of the NIH budget has to be put into context. Over the last ten years, NIH funding had already dropped by more than 13% in constant dollars — a source of great frustration to many physician-scientists, given the incredible potential we see before us in immunotherapy, in genome editing, in more efficient sequencing, in our ability to find insights within massive amounts of disparate data. Now, to cut NIH funding almost 20% beyond that.... Since much of the NIH budget is

devoted to ongoing grants, it is possible that the NIH may not be able to fund any new work at all in 2018.

Meanwhile, other countries—particularly China and South Korea—have been increasing their investments in biomedical R&D at a scorching pace, and the resulting generation of intellectual property. President Trump says it's a bad thing that so many of the things we use are now made in China. Imagine how much worse it would be if they also were *invented* there.

As we consider moonshots, it is worth pointing out that at the height of the Space Race in the mid-1960s, the United States spent more than three times as much on R&D as a percentage of the federal budget than we do today. That spending funded discoveries that led to commercial lasers, the Internet, GPS, the cell phone, the entire biotechnology industry, and a host of medical advances, including the ones I've been talking about. Now, with the stroke of a pen, our innovation engine may grind to a halt.

Even setting aside the lives that could be saved, the foolishness of this is extreme, just in terms of cost-benefits. For example, caring for people with Alzheimer's and other dementias, costs the United States over \$200 billion per year, much of that paid for by Medicare and Medicaid. Because of the growth and aging of our population, the bill for Alzheimer's is expected to rise to more than \$1.1 trillion in 2050—and we cannot even treat these patients, because we have not yet discovered an effective treatment. If we could find a treatment that would merely delay the onset of Alzheimer's by five years, we could save \$220 billion within the first five years—seven times the \$32 billion we spent on the NIH in 2016. Cancer prevalence also rises with aging, and

cancer costs are projected to reach \$158 billion a year in 2020. Again, if we can turn this into an easily manageable disease, the nation would come out way ahead.

Before I end, I want to consider what this new political climate means for us in the Greater Boston area. With the world's greatest ecosystem in biomedicine, we have a lot to lose. Five of the ten largest private employers here are teaching hospitals—and three more are research universities. As you would expect, Greater Boston receives more NIH funding than any other city in the country. The nearly half a billion dollars in Massachusetts NIH grants likely to vanish under the Trump budget are a serious concern for our innovation-based economy.

At Dana-Farber alone, we could lose \$23 million in the first year. Here is what we really keeps us awake at night: the reality that declining federal support for biomedical research is discouraging the next generation of young scientific talent, who are not able to get funding for their projects. This loss of intellectual capital is going to hurt Boston-based businesses as well. NIH-funded research centers like Dana-Farber are an essential training ground for young physician-scientists, many of whom go on to build careers at pharmaceutical or medical device companies, or who launch new companies of their own.

These early-stage businesses also rely on NIH grants in order to research and develop promising new biotechnologies and survive the valleys of death that could keep important treatments from reaching the market. This is fuel for the vibrant life sciences startup community in Boston and Cambridge, which adds vitality to every other sector represented in this room—restaurants, hotels, real estate, financial services, software, retailing.

We face another threat as well: California. There is a cautionary tale in the way that Route 128 lost its dominance to Silicon Valley in information technology in the 1980s. Silicon Valley clearly benefitted from more powerful social networks and a more freewheeling exchange of information. And now, our friends on the West Coast are coming for our crown in biomedicine: In 2004, California voters strongly supported a ballot initiative that created the California Institute for Regenerative Medicine and provided \$3 billion for stem cell research. And the enormous wealth generated in technology means that many California universities and medical centers are awash in philanthropic support for research—including major health care initiatives, like one recently launched by Facebook CEO Mark Zuckerberg and his wife Priscilla Chan.

In Boston, we are used to being the best. But we cannot be complacent. We need to push forward on everything from digital health care to STEM education. We need to rally all sectors of our regional economy, including both philanthropy and government, to maintain our intellectual leadership. And we need to join forces, rather than to engage in cutthroat competition, given the degree to which we all gain strength from the biomedical cluster we have created here. The Boston Chamber has offered us an important vehicle for cooperation, and it has done a great deal to nurture the life sciences sector.

At Dana-Farber, we are extremely proud to be an important part of this remarkable biomedical community, and to contribute to its world-class patient care and scientific research. We want to work with all of you to make sure that the revolution in our understanding of cancer maintains its momentum—and that we strip cancer of its

power to shorten the lives of the people we love. And we want Boston to be the very heart of that revolution.

Thank you.

And now I would be delighted to answer any questions...