Arturo Casadevall, M.D., Ph.D.
Professor and Chair, Department of Microbiology & Immunology
Leo and Julia Forchheimer Chair in Microbiology and Immunology
Albert Einstein College of Medicine

Thank you, Dr. Spiegel, for your very kind and generous introduction.

It is a great honor to be your commencement speaker. I have never given a commencement address before and I will admit that I thought for weeks about what to say. I read other speeches and wondered about what message to convey on this most important day.

Well, after considerable reflection I decided to focus on the importance of lifelong learning and generating new knowledge. As graduates, today is a landmark day in your life. It is a day that may seem to mark the end of formal training, but actually, it is the beginning of what will hopefully be a life of lifelong learning.

However, before going on, I would like to pose a question: how many of you went to school to become a vermin exterminator? Any hands out there? Well, I did. But I did not become an exterminator, at least not yet. Instead, I ended up in medical school, where I enrolled in an M.D.-Ph.D. program and graduated in this same auditorium 29 years ago, on a day pretty much like today. In fact, if you could travel back in time this place would look the same. Our commencement speaker was Mayor Ed Koch. Although there were some differences in clothing styles you could have gotten by with your current clothes without attracting too much attention, and I would argue that the greatest difference was that no one had a cell phone. We’ll return to cell phones later.

When I climbed to this stage to get my degree, medicine was a far cry from what it is today. I will give you some examples from that day. AIDS was four years old, HIV had just been described and the life expectancy of anyone with a diagnosis of AIDS was a matter of months. There was no diagnostic test for HIV infection. There was hepatitis A and hepatitis B, and something called non-A non-B hepatitis, which was suspected to be caused by a virus but no one knew what it was. The cause of cervical cancer was unknown. Chronic myelogenous leukemia was treated with a noxious combination of anticancer drugs that caused serious side effects and very rarely delivered a cure. Organ transplantation was a very specialized therapy that was carried out in only a few medical centers in the country, and each operation carried huge risks of organ rejection and complications from immunosuppression. Ulcers were
attributed to acid secretion and type A personality. I could give you more examples but these suffice to make the point.

Today, 29 years later, HIV is a treatable disease for which there are almost 30 different antiviral agents, and most infected individuals can expect to have lives with a normal life span. In fact, within a few years of my graduation, an HIV test became available, and shortly afterwards, the first effective drugs against HIV arrived. In a very short time AIDS went from being a lethal disease to being a manageable condition. Witness the fact that Magic Johnson was diagnosed with HIV infection 22 years ago and is healthy today. Non-A non-B hepatitis became hepatitis C, and within a decade there were early therapies that have matured to the point that hepatitis C is now considered a treatable disease. Today there is a vaccine to prevent cervical cancer and we can envision a day when this disease can be eradicated. As for leukemia, new drugs such as tyrosine kinase inhibitors have produced such spectacular results that it is conceivable that this cancer could be curable. Organ transplantation is now a relatively routine procedure with excellent outcomes. Finally, as for ulcers, they were found to be caused by bacteria and can now be cured with antibiotics.

How did we get here? Was it because politicians passed laws to make these diseases curable? Was it because the physicians of 1985 used 1985 technology and knowledge to make this progress possible? I think you know that the answer to these questions is a resounding “NO!” This progress was made possible because of new knowledge. You needed observant physicians and basic scientists working on these problems to make such progress. You needed basic science combined with clinical research to make the discoveries that translated into new therapies. You needed new knowledge, and that required approaching problems with the tools of science.

To put this experience in perspective, we have lived a very unusual life by the standards of human history. I have seen tremendous progress and so have you. Until relatively recently in human history, most people died in the same world that they were born in. For example, the economy of Europe grew very little, perhaps by a percentage point, in the many centuries between the end of the Roman Empire and the High Middle Ages. Today we expect quarterly growth rates of several percent, and hope for a better life in the future. How is this possible? It is possible because of the scientific revolution, which began three centuries ago and is still continuing.

In fact, I would argue that the greatest problems that humanity is facing all require scientific solutions. Think about the things that could take out our species. Can you think of some? I will give you five problems that could pose existential problems for humanity: (1) a rock from outer space; (2) a new pandemic with an organism that causes high mortality; (3) the faltering green revolution, which continues to provide most of the calories that humanity consumes; (4) energy shortages; (5) climate change. None of these problems can be legislated or litigated away, but each can be addressed with new knowledge and technology. The point that I am making is that the future of humanity depends on a vibrant scientific enterprise, if we are going to make it as a species on this increasingly damaged, overcrowded and resource-exhausted planet.

That is good news because humanity has evolved to approach big problems with new knowledge that leads to creative solutions. Besides being lifelong learners, humans are remarkably curious. If one of those cataclysms that I mentioned earlier was to befall us and cause us to disappear, I like to think that if another intelligent species discovered our remains, and they would conclude that we were curious and
that we strived to solve problems with new knowledge. Somewhere on the moon and on Mars there would be probes that will last for eons as powerful testaments to our curiosity. The curiosity of humanity resides in each of you, and each of you can nourish it and keep it healthy. Each of you has the potential to generate new knowledge. Whether your next destination is a career in surgery, administration, bench research, statistical analysis, psychiatry, delivering babies or any of the multitude of fields that medicine encompasses, you will have an opportunity to make observations that can translate into new knowledge. If each one of you goes forward and works to make your field better through the acquisition of new knowledge you will leave a great legacy. Knowledge is a powerful way to make things better.

Unfortunately, today’s science is ailing from multiple maladies that include inadequate funding, high administrative burdens, workforce imbalances, winner-take-all economics and a variety of systematic challenges. Our society, with its focus on short-term rewards, is moving away from funding basic science because its usefulness cannot always be articulated. Nonetheless, there is overwhelming historical evidence that transformative discoveries generally follow a passion for unraveling the mechanism of a curious observation or phenomenon. Now, hold this thought for a moment while I get back to your cell phone. In 1916 Einstein proposed his theory of general relativity, which envisioned a fundamentally new vision of reality. The theory stemmed from Einstein’s unfettered curiosity about the world around him. For decades the theory of relativity provided no immediate benefit to anyone. In fact, Einstein would have been extremely hard pressed to make a case for the usefulness of his theory in the world of 1916. Had he written a grant that would be awarded based on its significance, as grants are today, it might have failed to be funded. However, if you dial forward to the 1990s you will see that relativity is essential to make your phone work, because it relies on GPS, which in turn relies on atomic clocks that run at different rates on the earth and in orbit. There are innumerable other examples where inquiry into basic processes resulted in transformative technologies and a better world. If on the day that I received my degree we had focused only on the knowledge and tools that were available at the time, we would still have 1985 technology, and that would mean no cell phone, no HIV drugs, no vaccines against cervical cancer, continued antacids for ulcers and none of the progress that you and I have seen.

So, as newly minted medical professionals and scientists, I urge you to support science, the scientific process and research in any way that you can. That means making the case to your families, to your friends and, for physicians, to your patients. Physicians as they talk to their patients are in an excellent position to communicate how advances in medicine are dependent on research. While this is critical if the patient is a politician who can influence funding for research, it is important to do so with everyone, for every patient has a vote. If we are going to continue to make progress against disease and suffering, we need a healthy scientific enterprise, and that requires the support of everyone in this room.

So let’s go back to the business of exterminating bugs that I told you about at the beginning of this speech. When I was 19 years old my father did not think that I was going anywhere in life and he insisted that I go to school and get a pest-control operator license. He told me that with $500 I could buy the tanks and some pesticides and start a business and I would always make a living in NYC since there would always be roaches to kill. I did go to pest-control school. The classes were held at night in a community college in Brooklyn and some of my other classmates were inmates from Rikers Island, who usually arrived chained to one another. They were there undergoing some sort of correction by learning how to kill roaches. I got my pest-control diploma and if you visit me in my office you will see that I
proudly display it on my wall. Why am I telling you this? Because I want to make the point that life has many branch points and that the road to this podium was by no means straight or assured. In fact, I feel very lucky to have gotten as far as I have. In medicine I specialize in infectious disease and my research is focused on killing microbes. Hence, I am indeed in the business of killing bugs, so you could argue that I did take my father’s advice but just kept going.

So I end this address by urging and encouraging you to embrace a life of learning and committing yourselves to generating knowledge. If you embrace lifelong learning and generate knowledge, I believe that a day will come when one of you will give a commencement address, possibly in this same hall, and you will tell the graduates that you remember a terrible time when many cancers were incurable, elderly individuals developed dementia and there were only a few therapies for psychiatric diseases. When that day comes I hope that you will deliver the message that the way forward is to embrace lifelong learning and generate new knowledge to ensure that an even better world will be built with the tools of science, ethics and investigation on the wings of curiosity and the human spirit. Congratulations again on your great achievement and thank you for your attention.