Sylvester James Gates, Jr. of the University of Maryland was awarded a 2025 Barry Prize for Distinguished Intellectual Achievement. In this video, Academy Executive Director Greg Forster interviews Dr. Gates about the inherent tension between employment preparation and the life of the mind, the value of rediscovering ancient ideas about the purpose of education, and how the development of scientific theory drives technological innovation.

Greg Forster, American Academy of Sciences and Letters

Hello, everybody. I'm Greg Forster with the American Academy of Sciences and Letters. Here with me today is Sylvester James Gates of the University of Maryland, who won the Barry Prize for Distinguished Intellectual Achievement in 2025. Jim, thank you so much for being with us.

Sylvester James Gates, University of Maryland

Well, first of all, Greg, thank you and the Academy for the recognition. It came totally out of the blue. I was totally shocked. It's the sort of thing that I never expected to happen in my life. So thank you and the Academy.

Forster

We are honored to honor you, as our board chair always likes to say.

Let me ask you my first question. What are some underappreciated ways in which the work in your field contributes to human understanding and well-being?

Gates

I'd like to tell a story that's related to this. It's a story that actually starts in the 1800s. There was a Scottish physicist by the name of James Clark Maxwell. In the 1860s, he wrote some equations that describe everything about how electricity and magnets work. It was 20 years before he actually published these results in one of the great canon books of physics. It's a treatise on electromagnetism. The books explain how four equations relate to what you observe in the world. But these equations go beyond that. They also make a prediction that if you do a certain thing with electrical batteries and magnets, you can generate invisible forms of electricity that travel through space without any wires. Today, we call these invisible traveling waves radio waves and television waves and Wi-Fi.

This story encapsulates what fundamental physics, the kind of physics I've dedicated my life to, does for our species. It opens up unforeseen and unthought-of ways to make human life more bountiful. We have the computer revolution, we have modern IT, we have radio, we have Wi-Fi, and all of those owe their existence to these four equations. So, you can see it's about a 200-year gap, but boy, when we get it right does it mean a lot for humanity!

There's a codicil story that is often told about this. Back in the 1800s, a representative of the queen of England was visiting the laboratory of one of the scientists who allowed this development to happen. It was a little bit like the original Frankenstein movies with sparks flying and all sorts of strange things going on. But at the end of the tour, the minister asked the scientists, this is all very impressive, but what good is it? Supposedly, the answer was, I don't know, but one day you folks will tax it. So that's what we do.

Forster

That's delightful. Your story about someone having predicted radio and television and Wi-Fi waves 200 years before we mastered them made me think of Leonardo da Vinci and his attempt to invent the helicopter. He made this diagram of a corkscrew on top of an apparatus. He said, if you can just turn that thing fast enough, you can pull yourself up into the air. It suggests to me, regarding the relationship between theory and practice, that people are dazzled and overwhelmed by the applications of science, but they often don't understand very well the process of thinking that has to go into understanding fundamental forces and the way the world works in a theoretical way that is the necessary prelude to those applications.

Gates

That's been illustrated over and over again since essentially Newton. I like to tell people Newton is really the father of modern science, although he owes a great debt to Galileo and the ancient Greek philosophers. What Newton did was basically take observations about the world and distill them into one or two equations. Out of that basically came the scientific revolution that swept across Europe after his great work the *Principia* and sparked advances in mathematics. Because of that kind of work, as a species we came to understand time in a more precise way than anyone had ever understood it before Newton. Curiously enough, his tool for doing this was the invention of calculus.

It's a story that is little told and little understood about how it took hundreds and in some cases thousands of years to make the advances that we now take for granted. Names like Newton, of course, get remembered, but there are hundreds of other scientists who made a contribution to the effort that went into making something like a smartphone. The public generally thinks corporations do that stuff, because you buy these things from corporations, some of the big IT firms or in previous generations, General Electric and General Motors. So people think corporations do this, but corporations represent the endpoint of this process. It's the process that at the end of the day allows us to live more bountiful lives.

Forster

In the public imagination, people like Steve Jobs or Bill Gates have replaced people like Newton or more recently Einstein. And yet the theoretical mind is still at the back of all these advances.

Gates

Or Edison, who was also one of those bridge makers between the theory and the application that then leads to good services and products that then impact society.

Forster

That's right.

Let me ask you my next question. How would you describe the mission of the university and why is that important?

Gates

Let me vary your question slightly and say what I think the *public* thinks is the mission of the university and then come back to your actual question. I'm 75 years old, and I've watched my society especially for a couple of decades now. I've been a faculty member since 1984 when I became an assistant professor of applied mathematics at MIT. I've watched the interaction of the university and the popular society and media. From my perspective, it looks as follows. Most of the public thinks of universities as the places where skills are acquired to benefit one's economic existence through their lifetime. In this expectation, you want universities to produce people who will contribute to the economic vitality of our society.

That's the main belief in society about what universities ought to be. We try to do this, but I'm going to borrow a thought of Einstein's that's related to this. He said that it is not the role of education to teach people how to remember. It's the role of education to teach people how to think. This is a very, very different endpoint because this acquisition of skills, which of course we all want to have because we want society to advance, is very different from the uplifting of the human mind to take disparate facts and observations, to weld them together into a coherent whole cloth and then from that cloth to extract something that has never existed before. Even the word "education," if I remember my Latin correctly, *educare*, means "to free the mind." It doesn't mean to load the mind up with facts and dates, but to free the mind, to be able to exercise this amazing gift that humans have about imagining things that have never existed before.

Forster

Even the word "liberal" in front of "education" redoubles that emphasis, a word that in its historical usage was associated with freedom and also with generosity, setting a wide rather than a narrow target. I'm also thinking about how you mentioned the aspiration we have in the academy through the life of the mind to seek coherence, to see how things fit together, to understand how it makes sense when we put pieces together. But an emphasis on job training really moves in the other direction. It pulls away from coherence. It pulls us in a thousand more short-term directions. Not that we don't want the university to prepare people for life, but there's a tension between the thousand demands of the worker marketplace and the desire of the mind to make pieces fit together.

Gates

This is an inherent tension. How shall I say this? This is the fundamental challenge to modern universities. If we think about the Western tradition of higher education, we can trace this back to ancient Greece and the Greek philosophers, Plato and Aristotle and a host of others. Certainly, in its instantiation in those times, it appears that these leaders were upholding the liberation of the mind and the expansion of the mind and the ability to put tiny pieces together into these coherent wholes. As I have understood the history of these institutions, at the beginning, that was the initial message. It was far removed from the necessary economic realities of creating an environment where people can thrive generally.

This secondary mission of what you phrased as "job training" is a later add-on to the mission of the university. It comes out of the medieval period. You mentioned Leonardo. You can see these masters of thought who also begin to show evidence of mastery of the use of ideas to create things that have never

been created or existed, and that will make a difference in society. This later comes out of, in some sense, the artisan, of the master and the apprentice, right? It's this apprenticeship role that comes a couple of thousand years later, in my read of history, to the mission of the university. In modern times, these two things have been firmly welded together in all the societies that I'm aware of.

Forster

I would affirm your account of the ancient model of education. If nothing else, the death of Socrates really underlined the tension between what Plato wanted to do when he founded the academy and what the Athenians wanted from their intellectual figures. There was a clear parting of the ways between the public square and the academy. You're right about job training becoming part of the mission of the university in the Middle Ages. The first universities were preceded by other kinds of educational institutions. One of the things that marked the emergence of what we call the university is that they were training lawyers and clerks, and that meant serving other constituencies outside the school's immediate community. It subjected them immediately to the kind of pressure that we're still talking about, right? Because of course, the kings and the lords had different opinions about how the lawyers should interpret the law. They wanted the universities to teach their version. Nothing like that happens today, of course.

Gates

No, of course, no, no, that would never happen today. Of course not.

Forster

It's comforting that we are not the first to face these sorts of tensions.

Gates

Yes, but it's also very interesting that the discussion that we have just had about these emerging roles of the university and this inherent tension in the creation of this institution that we call "university," I never, ever hear in public policy circles or essentially even in the discussion of university leadership.

Forster

It is not in very many people's interest to have a frank conversation about the fact that the university is expected to do at least 10 different major things, and powerful constituencies want each of those 10 to be the first and most important priority. I pass no judgment on university presidents who find that difficult to discuss in public. I would find it difficult too.

Gates

I have many friends who are university presidents, and I pity every single one of them.

Forster

That's a comforting note to end on. Jim, thank you very much for being with us.

Gates

Thank you for the opportunity, Greg. It was fun.