

David Relman of Stanford University was awarded a 2025 Barry Prize for Distinguished Intellectual Achievement. In [this video](#), Academy Executive Director Greg Forster interviews Dr. Relman about how the behavior of microbes is both like and unlike the behavior of people, why different schools need to pursue the mission of the university in different ways, and how a pedagogy of lifelong learning and citizenship holds the mission of the university together.

Greg Forster, American Academy of Sciences and Letters

Hello everybody. I'm Greg Forster with the American Academy of Sciences and Letters. Today I'm speaking with David Relman of Stanford University, one of the recipients of the 2025 Barry Prize for Distinguished Intellectual Achievement. David, thank you so much for being with us.

David Relman, Stanford University

It's my pleasure.

Forster

Let me begin by asking, what are some underappreciated ways in which work that's done in your field contributes to human understanding and human well-being?

Relman

Happy to talk about that. My work has largely focused on the microbes, the microbial communities that make up part of the human body. This is an area that I became interested in several decades ago at some of the earlier stages in the advent of modern molecular biology, when it became possible to, in essence, see the microbial world in ways that we had not been able to before. As you certainly know, the first lenses through which we were able to see the microbial world were those of the microscope in the 1600s. Antonie van Leeuwenhoek, one of the first users of the microscope, actually took a scraping from the teeth of some of his colleagues and discovered for the first time little *animalcules*, he called them, little animals that were scurrying about, moving about under the microscope. That was the first true recognition of the microbial world.

About 150 years later, the second lens became available, which was the lens of cultivation, the growth of microbes in a laboratory so that one actually could see the mass of microbes with the naked eye. It was often done with the idea of isolating individual microbes and their descendants and separating them from the others. That became the guiding approach to recognizing microbes, beginning with Louis Pasteur and Robert Koch and all of the greats who discovered disease-causing microbes that affect us and animals and plants and so forth. They focused on disease because disease itself was visually apparent. That served us reasonably well until it became clear that not everything grows in our laboratories under our requirements. In other words, we're not quite smart enough to know what microbes really want and need. One of the things that we were completely oblivious to was the fact that they really don't like growing by themselves. They are social beings. Microbes are almost always living in a community, and that's true for the microbes that make up the human body.

When I was starting my career, I became aware of a third lens through which the microbial world might be seen, and it was the lens of studying molecules and their sequence. It turns out that all life shares certain molecules, although in different forms with different sequences and that there are ways of pulling

these molecules directly out of samples from wherever and sequencing these molecules and figuring out what microbes are actually there without growing them. I got interested because I was aware as a young clinician that there were a lot of diseases that for all appearances were likely caused by microbes. They had all the features of infectious disease – fever, contagiousness, et cetera – but nobody could grow anything that made sense.

So, I turned to this new third lens that the environmental microbiologists were using and applied it to the human body. And lo and behold, I started to discover sequences that suggested the presence of novel organisms that were probably there all along, either causing disease or even more often, causing health. That's when I became very interested in the possibilities, and my career then turned entirely to the use of this technology to understand who's there in the human body and to realize that we are not alone. When we go to sleep at night, we're not sleeping by ourselves, regardless of who else might be visible in the bed next to us. We are sleeping with billions and billions of different microbes who have adapted to our body as their home and, as it turns out, are not there just for the ride. They're contributing in fundamental ways to what makes us human, to what makes us healthy. It certainly seemed to me that it behooved us to understand that better so that we could leverage that knowledge to improve human health or restore human health and understand what's going on.

Forster

One of my favorite things about my job is I get to hear what's going on in practically every different corner of the university. As someone who's not a specialist in natural sciences and medicine, I get to learn so much about what's going on there. It stood out to me almost immediately when you talked about communities of microbes. I'm a social scientist and I thought, wow, we're using this metaphor from human experience to describe the behavior of microbes. And then you said, and they're social creatures and we can't understand them when we take them out of their social context. Something that really stands out to me in what you're talking about is the interdependence of basic science and applied science. For a while, we're growing microbes in a laboratory and we're learning about them by growing them. And then observed experience in the field tells us, oh, wait, there are things we can't learn about microbes from growing them in the lab because the lab is not the natural environment. The whole point of a lab is to make it a non-natural environment so it's experimental and you can control it and learn things there. The basic science / applied science barrier is constantly being crossed in both directions because we have to learn in the field as well as learn in our controlled environments.

Relman

You're absolutely right. A big dose of humility is something that I have always sought to achieve and suggest to others because it's only with a little bit of hubris do we insist that microbes adopt requirements that we impose on them. I learned from a wonderful mentor as I was finishing my training, a microbiologist named Stanley Falkow. He always told me that microbes were the best teachers, that we could learn so much by simply trying to understand what it must be to be a microbe and make a living on this planet. I've thought about this a lot in the last several decades.

One of the things I've realized is that microbes sacrifice for each other all the time. They're among the most altruistic beings, if you want to put it that way. And, of course, they compete. They have all kinds of mechanisms for antagonizing each other, but they also cooperate in ways that we would be lucky to

be able to emulate. I fear that we have lost much of this as a species or at least lost or never gained the perspective that much of life is about supporting other aspects of life.

Forster

Dependency. “Cooperation and competition” really is a powerful metaphor from human experience. It leads me to my next question, which is, how would you describe the mission of the university, which involves a lot of cooperation and also some competition, and why is that mission important?

Relman

It’s extremely important. It’s very important that we talk about that question more broadly, especially today. I would start by cautioning that I am not a deep scholar of the academy, but I’m a committed observer and certainly a believer in the purpose. In a very basic way, the mission would be threefold. One, education and training. Two, research and creation of new knowledge. And three, service to the community and betterment of society. Every university likely embraces those three things in some form.

At the same time, it’s hard for a university to do all those things equally well to the degree that we might like or expect. For that reason, I hope that every university today thinks harder about how they can both satisfy those three mission spaces but also identify the place in that world that they think they can best fill a critical role. Not every university *should* be trying to do everything the same way. It’s also true that some universities are much better at one or a part of one of those things than another might be. We need them all, but we need them to be very clear about what it is they’re trying to do, articulate it and then, most important, think about how to measure that. How do you know if you’re doing it well or not? As I sit now, in the later parts of my career, I realize that the universities where I’ve spent time certainly seem to embrace all of it and defend all of it appropriately *but* have not made clear how they know how well they’re doing.

I’ll just throw in one further thought about this, which is that it sometimes seems in a general way that the default measurements of success are things that really don’t hit the mark. They’re not really all that appropriate, such as ratings, such as awards to faculty, such as acceptance rates for applicants. All these things are a little distracting and delusional. They don’t really cut to the heart of those mission areas, and it’s hard to measure those properly, but that’s where I would like to see universities spend a little more time.

Forster

A little bit like businesses getting so caught up in quarterly earnings reports, maximizing the amount they’re able to say they made this quarter. If you’re going to run a business, you have to care about the quarterly earnings. You can’t ignore those indicators, but if that’s all you care about, your long-term health will be endangered. You’ll be pumping those short-term sources of revenue and eating your seed corn, metaphorically speaking. Of all institutions, universities are some of the ones that have to care most about the long-term, because credibility is so important to the business model. If we’re going to be this crass about it, the business model of the university depends on us having credibility, so we really can’t just chase short-term metrics.

Relman

That's right. We can also agree that there isn't necessarily fault that needs to be assigned, but rather a more careful conversation about how we got to where we are. If you take that business model, for example, I don't fault any public business with shareholders from fulfilling their legal mandate to make sure that shareholders receive their due returns. That's their legal obligation, but it, of course, arises from the incentives and the structure that we've created for businesses. When we think about a university, we should be thinking about what kinds of incentives have we allowed to proliferate that guide this situation, and can we revise those a bit? Who are the shareholders in a university, public or private? They each have shareholders that include students and the faculty and the public in different ways. Getting back to my earlier point about one size doesn't fit all, I would think about different incentives and perspectives for a land-grant university than I would a private research-based university.

Forster

Circling back to that idea from your earlier answer about how there are different purposes to be balanced and they can be balanced in different ways, one thing I appreciate about that tripartite structure you've articulated – educate students, research for future knowledge, and serve the general public – is you can see how they're connected. By educating students, we serve the public. By producing knowledge, we serve the public. And yet, you can't reduce any one to merely a puppet of the other. So, for example, if the only thing we care about is serving the public, then we're not educating students as the human beings they are. We're just turning them into cogs in a social machine. We want to train you to do what the public wants you to do. Any teacher who really cares about teaching is going to care about the students for their own sake and not just serving the public.

All of which is to tee up my next question, which is, where do you think the university today is doing a good job of balancing knowledge for its own sake and serving the public good? Where do you think we could stand to do some improving on maintaining that balance?

Relman

In a general way, I would suggest that those universities with durable value have really thought about how to train a student for lifelong learning and citizenship. What does that mean? And how do you optimize the likelihood that a student leaves with a greater set of skills that allow them to continue learning, continue testing and understanding what is useful knowledge, truthful knowledge and thereby serve as valuable citizens. Those universities will have durable value because that aspect of education does cut across the other two. Not all universities have thought about that the same way. I feel blessed to be at a university that has thought about what innovative thinking looks like. What does innovation mean in the creation of new knowledge, and how can students learn what that looks like, learn how to explore it, learn how to test whether it works for them? That's something that Stanford does pretty well.

There are downsides to focusing too heavily on that because it tends to veer into the usual unfortunate measurements of innovative success, return on investment, the number of startups and capital accrued and so forth. That's not the way I would be measuring these things, but it is indirectly related. I understand that. Universities that provide and value opportunities for students to engage with the community as they learn help to remind students of the setting, the circumstance, into which they will

return at the end of those X number of years. Those universities are also providing an important additional piece to that mission.

Forster

Our pedagogical goals are essential to these questions. When the modern research university emerged in the late 19th and early 20th centuries, the pedagogy centered on information transfer. The service we provided to students was to give them lots and lots of information that they don't have other access to. That made sense 100 years ago when there was a lot less access to information and very few people went to college in the first place. It was a unique and important service to provide access to information. Information is a little easier to come by nowadays. We were already reaching the limits of information transfer a generation ago. But now in the age of the internet, we really have to rethink what it is that we provide to students, and access to information is probably not at the top of the list.

Relman

Correct. Instead, how do we evaluate, make use of, judge, critique information that is available? That is increasingly important as we live in a world of escalating myths and disinformation. I fear the effect of that. I fear the effect of wanton adoption of artificial intelligence tools and models. In the educational system, without first teaching how one can serve as an effective human steward of those tools, not to get off onto a different tangent here, but all of those who would like to see artificial intelligence flourish in an unbridled fashion, say that we need humans in the loop. We need humans who can exercise prudent oversight. How do you do that if the basis upon which you have learned everything prior was through the use of these very same tools? It's a circular, illogical premise.

Forster

It's very easy to see the cliff that we will fall off if we don't maintain a frame of reference for understanding information, making sense of it and using it that is not itself captive to the AI loop and the algorithm.

Well, much to chew on there, but David, thank you so much for being with us. I really appreciated this conversation.

Relman

Greg, it was my pleasure. I enjoyed talking to you.