Scientific Life: TrendsTalk

CellPress

An interview with Robert Langer

Robert Langer

Robert Langer is the David H. Koch Institute Professor at the Massachusetts Institute of Technology (MIT) (there are 11 Institute Professors at MIT; being an Institute Professor is the highest honor that can be awarded to a faculty member). He has written more than 1250 articles. He also has 1050 issued and pending patents worldwide. His many awards include the US National Medal of Science, the US National Medal of Technology and Innovation, the Charles Stark Draper Prize (considered the engineering Nobel Prize), the Albany Medical Center Prize (largest US medical prize), the Wolf Prize for Chemistry, and the Lemelson–MIT prize, for being 'one of history's most prolific inventors in medicine.' Langer is one of the very few individuals ever elected to all three of the most prestigious scientific academies – the Institute of Medicine, the National Academy of Engineering, and the National Academy of Sciences.

Where do you think great ideas come from?

For me they can come from everywhere – music, TV shows, magazines, talking with my students or friends. But I do think that, for me, one thing that has been useful is to stretch myself and learn new things. For example, when I was a postdoc I worked in a surgery lab in a hospital even though I was a chemical engineer. I think I was the only chemical engineer in the hospital. Today, I'm in a building at MIT (Koch Building) that's half engineers and half biologists. By exposing myself to people who know things very different from what I know, and who do research very different from myself, I've learned a tremendous amount. And it has given me all kinds of ideas at the interface of engineering and medicine, such as in tissue engineering and new biomaterials.

What is the best piece of advice you have ever been given?

I think the best advice I received was not so much by words as by deeds. When I was a postdoctoral fellow I had the opportunity to work with Judah Folkman. What I saw in him – although he never said it explicitly – was someone who dreamed big dreams and never gave up. No matter how much he may have been criticized at particular times in his career, and no matter how many obstacles stood in his way, he persevered. As I began to pursue my own independent career as a young professor, I found that no chemical engineering (my undergraduate and graduate major) department would hire me. When a Nutrition and Food Science Department did hire me, a year later, the department head who hired me left and two of the most senior members of the Department told me I should look for a new job. Also, my first 9 grants were turned down. It would have been easy to quit, but Judah Folkman's example stayed with me and I was eventually able to turn things around. And today I try to tell my students to Dream Big and Never Give Up.

What is your philosophy for establishing and running a thriving research lab?

I don't think I have a particular philosophy much beyond how I answered the previous question. But I would add that is also really important to me to train future leaders and to treat people well. Over 250 of my trainees are now professors, and I want them to have wonderful careers. It's almost like an extended family and I'm really proud of them. I'm also really proud of the people we've trained who have made big contributions to industry.

You have enjoyed extraordinary success in both academia and industry. What, if anything, do you think that biotech and academia have to teach each other?

I think academia has a long time-horizon. I'm sometimes disappointed that industry often has a short one. But I think industry can make products that really help people and society in general. All too often, academic discoveries are dropped, and the good they might do for society doesn't happen.

You have published more than 1200 scientific articles – do you have a favorite?

My favorite is probably 'Polymers for the sustained release of proteins and other macromolecules', which I published with Judah Folkman in *Nature* back in 1976. The paper centered on our discovery that it is possible to design biocompatible polymer matrices to release ionic species and large molecules continuously and slowly. This paper was originally met with great skepticism because scientists generally thought that you could only deliver a few molecules this way: those that were very lipid-soluble and of low molecular weight. I like to think that this discovery changed the thinking on drug delivery because, before this, only a few molecules could be continuously delivered though polymer matrices, and now almost any molecule can be.

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What do you think is the biggest challenge facing scientists today?

One-word answer: 'funding'. Many scientists have great ideas but obtaining funding seems to be harder than ever. And sometimes when that happens funding agencies become more conservative – and big, speculative ideas are not funded. It is also becoming more and more difficult for young people to find funding.

Tell us about something from your work that is exciting to you right now.

There are quite a few things. We are very involved in nanotechnology. From a drug delivery standpoint, we are looking at new ways of possibly treating cancer and heart disease using nanotechnology. We are also looking at nanoparticles as a means to deliver genetic medicines such as siRNA. I'm also very excited about tissue engineering. We are trying to contribute to creating someday an artificial pancreas, new intestines, spinal cord repair, and creating other tissues, as well as trying to understand how materials interact with cells and affect cell growth and differentiation – which will also help us and others in the quest to engineer new tissues and organs.

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