Scientists

Interdisciplinary Success

Scott Diamond

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Scott Diamond's leadership in founding the Penn Center for Molecular Discovery and demonstrated success in working across the engineering and biological disciplines caught our attention. Curious to know more, *BioTechniques* asked him about the ambitions, character, and motivations that led to his success.

Have you ever developed a hypothesis or come to a conclusion in an unusual way?

Genentech sells tissue plasminogen activator as a blood clot–dissolving enzyme. That's the gene I studied in graduate school, so I was very familiar with that gene pathway—the fibrinolytic pathway. The targets of that therapy are blood clots of about a centimeter in length in the coronary artery, and the protein therapeutic actually destroys the clot in a very rapid timeframe of about 15–30 minutes. It would take weeks to months for a protein to diffuse across the length of a blood clot. This is where the engineering view was very important, and we saw that there had to be another transport mechanism there.

We hypothesized that the pressure generated by the beating heart could actually push fluid through the clot. Invoking a physical mechanism of delivery really changed our understanding of how this therapy worked. The only way to explain the ability of the drug to dissolve the target was to include this transport mechanism. Otherwise, you have very little linkage between molecular structure and clinical function.

You have had great success in the difficult task of combining disciplines. Do you primarily describe yourself as a biologist or an engineer?

That depends on who I'm talking to. I think that's a really important question. I'm not alone. There are a lot of people who work between disciplines and they should be bilingual (oftentimes they speak both languages simultaneously). The problems don't respect specific disciplines. The central obstacle is one of communication: trying to communicate results in a coherent way so that both engineers and clinicians, for example, can really respond to the value of the work.

What was your biggest professional obstacle and how did you overcome it?

I started as an assistant professor in 1990, one of the worst times to begin in terms of funding. Funding rates were really low, which I think disproportionately discouraged young people. The first 20 grant proposals I sent out over the first 2 years of my career were rejected. There is a learning curve there and you have to stick with it. The next five grants I sent out were all funded.

What did you improve that led to the funding of your grants?

I learned how to really focus the idea so that the novelty of it was communicated to a reviewer who may not necessarily be in my same field. I learned how to really think about how a reviewer perceives the grant.

What is the most important current research question in your discipline?

Let me answer with respect to what I'm working on now since I think any scientist feels that the question they are working on is the most important in the discipline. I think that is probably the sign of a good scientist.

What we're trying to do is look at blood as an organ and understand how it works under hemodynamic conditions, how it responds to perturbation, and how it changes with pharmacological intervention. In terms of systems biology, I think that blood is one of the most tractable organs to approach: it's readily available and one of the only human tissues you can get repeatedly from the same donor. We use microfluidics, microarrays, automation, and simulation to predict an individual's unique blood phenotype in response to disease or therapy.

Do you have any pet projects outside your major research focus?

No, and the reason is that when you run a high-throughput screening lab like the Penn Center for Molecular Discovery, you have so much biology going on in front of you. We have projects with malaria growing in the lab, an Ebola project, a severe acute respiratory syndrome (SARS) project, and we work in stem cell differentiation. So high-throughput screening and working collaboratively in so many different areas of biology has satisfied the pet project gene in me.

What interests or hobbies do you have outside the lab?

I have always had an interest in art and I paint. My paintings are a mixture of representational and abstract work. Very rarely would there be anything analytical or scientific in them, but my ability in art fits really well with my interest in communicating science. Science is very visual and being able to describe, visualize, and draw processes is essential. For example, diagrams have to reduce a very complex dataset into something that is meaningful.

Interviewed by Kristie Nybo, Ph.D.

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