in my own words

Improving on the Language of Life

PHIL BARAN, Ph.D.
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Phil Baran earned his undergraduate degree from NYU at 19 and his Ph.D. in chemistry from The Scripps Research Institute at 23. Now 36, Baran has published over 100 peer-reviewed papers, holds several patents, and was recently named a MacArthur Fellow. Baran’s work involves synthesizing complex molecular compounds and developing new methods for creating chemical structures—both of which increase the ability to make a wide range of medicines and materials.

Pursuing my passion

I’d always had an interest in science, but my interest in chemistry really exploded in high school. I had a great teacher who gave me the opportunity to experiment. That’s when I realized that this was my purpose in life. I didn’t really care whether or not I’d be good at it. It was the only thing that I wanted to do.

I ended up pursuing a dual enrollment with a local community college and getting an associate’s degree at the same time I graduated from high school. From there, I got my undergraduate degree at NYU and later my Ph.D.—both in chemistry.

The basis of life

I found physics too abstract. I didn’t like the engineering aspects of what I would need to do in physics in order to discover. With organic chemistry, in particular, you can be creative very quickly. You can take a scribbling on the back of an envelope, go to the lab, and turn it into something that people at Pfizer will use, and that to me is very appealing.

Organic chemistry is very special. It’s like the language of how nature works. Just as letters are the basis of a language, organic chemistry is the basis of life.

Enabling chemistry

In my lab, we’re seeking ways to make large quantities of pharmacologically active natural products. We’re working with compounds found in marine natural products that could be next-generation medicines but for their expense and limited supply. Using a method called total synthesis, we’re essentially synthesizing these compounds from scratch. It’s the basic idea of using a chemical you can get at the gas station and turning it into a medicine you prescribe in the hospital. Graduate students come to my lab because they want to learn to do this type of synthesis from scratch.

We’re also developing tools of chemistry—methodologies—that will allow people to make new types of molecules, so they can make structures that were difficult or impossible to make before. With novel structures, you facilitate drug discovery, agro chemical discovery, and material science … everything that relies on chemistry is enabled by new methodology. For example, we’ve recently invented a series of

Applied creativity

As a kid, I liked tinkering with stuff, figuring out how things worked, and building with LEGOs. I also liked role-playing games where I could create things. Today, games like SimCity let you explore universes and worlds, control characters, and build cities. There’s an element of creativity in chemistry. You can be an artist and create, and you can explore new worlds. There’s also the element of utility in chemistry. I like things that have practical applications.

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reagents that are now commercially available that help drug makers optimize drug candidates, compounds that have been determined to have potential for treating disease.

Streamlining science
I’m most excited about the concept of doing more with less, which is the core principle of innovation. For example, we’ve experimented with omitting the traditional practice of “masking” and later “unmasking” certain reactive chemical subunits during the process of chemical synthesis. Not only did we eliminate a practice that adds multiple steps and ultimately years to the process of discovery, but using the natural reactivity of those molecules has allowed us to devise even more efficient methods for synthesizing compounds.

If a compound requires 20 steps to make, and 10 years from now we can make that compound in 1 or 2 steps, it’s going to have ramifications for the rate at which compounds can be discovered, for the costs associated with bringing a drug to market, and for how quickly a patient can use the drug. That’s the tangible impact that advances in chemistry can have for society at large.

An underappreciated industry
There’s a lack of societal appreciation of chemistry in general and organic chemistry in particular. Organic chemistry is fundamental, and it can be challenging to explain to people why it’s such an important science. Most people probably don’t realize that everything from their motor oil to the food on their table was influenced by an organic chemist. If you take medication, you may not realize that it took the work of many, many chemists to make that drug available to you. Even the color screen of your iPhone is possible because of organic chemistry, but it’s kind of an invisible industry.

That I was awarded a MacArthur Fellowship may mean that people are paying more attention to organic chemistry. If that leads a couple of kids who didn’t know about the field and who have a natural gift for it to go into it, then that’s great.

Playing chess in 40 dimensions
Chemistry needs motivated, passionate students. Kids who are grandmasters of chess at age 12 or kids who are really into building LEGOs would make great organic chemists. Doing organic chemistry is like playing chess in 40 dimensions. If you’ve watched the Star Trek episode where they’re playing chess with three boards—3D chess—multiply that by 10, and that’s the type of thing you’d be doing. But unlike a game, where the consequence is a notch in your belt or a change in your ranking, you might actually help somebody who is dying of cancer. What better way to use your talents than to try to cure the ailments of society?

Curious about chemistry
If you’re curious about chemistry, look for opportunities to intern at a university or college. Often, there’s someone who will open their lab and let you see what organic chemistry is about. If you find out that it is your passion, then really focus on it.

Chemistry is not something that will come to you as a gift. It’s something you have to work really hard at. In the movie Ratatouille, the lasting lesson is that even a rat can cook really good food. He just has to work hard at it. But if you really love what you’re doing, it doesn’t feel like work. Chemistry can be the most miserable undertaking ever if you’re not in love with it, but if it’s something you’re really passionate about, it can become more important to you than oxygen.

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Learn more about Dr. Baran’s work at www.macfound.org/fellows/884.