Jefferson Faculty

Jeffrey L. Benovic, PhD
Exploring the Basic Science of Disease

Long before he had academic degree letters after his name, Jeff Benovic, PhD, says science always interested him. "My parents weren't scientists, but as far back as third grade, I wanted a telescope and microscope — and when I got a little older, I asked for a chemistry set," he remembers.

Benovic's scientific interest grew unabated, taking him from a childhood in Erie, Pa., to a PhD in biochemistry at Duke University. There, he trained under Robert J. Lefkowitz, MD, recipient of the 2012 Nobel Prize in Chemistry. In the Lefkowitz lab, Benovic worked on G protein-coupled receptors (GPCRs), ultimately discovering a novel protein kinase that phosphorylates activated GPCRs.

"I was fortunate to go to a lab where the amount of discovery going on in the 1980s was phenomenal. It was an incredible environment to train in and set the tone for my whole career in science," says Benovic, the Thomas Eakins Professor and Chair of Jefferson's Department of Biochemistry and Molecular Biology. Since he arrived at Jefferson in 1991, his research has included GPCR signaling and trafficking; receptor overexpression and cell migration in cancer; and the role of various proteins that regulate GPCR function.

Benovic has mentored about 40 trainees and authored or co-authored nearly 300 peer-reviewed publications and reviews. He holds several patents and speaks often at conferences. In recognition of his research contributions, leadership and mentorship, he was awarded the 2014 Julius Axelrod Award in Pharmacology by the American Society for Pharmacology and Experimental Therapeutics.

Although he is credited with opening new research avenues, Benovic admits he's less than adventurous outside his lab. "I'm very set in my ways," he says. "If I go to a restaurant, once I figure out what I like there, when I go back, I will get that same meal every time." By contrast, his wife, Lorie, a social worker, "always wants to try something new." Their daughter teaches ESOL (English to Students of Other Languages) in Maryland; their son, a financial analyst, lives in Philadelphia.

What drew you into biochemistry?

I initially started in chemical engineering at Penn State as an undergraduate, but switched to biochemistry in my sophomore year. In senior year, you finally get to work in a lab. I would go to classes, then go to the lab and sometimes work all night. I just loved doing experiments.

Do you still have that sense of excitement in the laboratory?

I think that's what's always driven me. Some people like working at the bench. There's thinking about what question to address and what experiments to do to answer it. Then actually going and doing the experiment, getting the result and testing and retesting your hypothesis. When you get an exciting result, there's nothing like it. It's really like scoring a touchdown.

Why explore the mechanisms behind GPCR signaling?

Humans have about 800 different GPCRs. About half are olfactory receptors found in the nasal cilia, while the other half are expressed in various cells throughout your body. One receptor can be expressed in many different cells and, in some cases, respond to different hormones. We're really only scratching the surface in understanding how GPCRs function, but they are involved in many physiological processes. They're the targets of about 40 percent of pharmaceuticals on the market. The more mechanistic insight we get, the better we'll become at developing drugs with lesser side effects that are more effective. Our current focus is relevant to precision medicine, where we can try to target GPCRs more selectively.

How does your work in basic science translate to clinical treatment?

The most translationally relevant work we're doing is in asthma, where we're trying to develop compounds that function as biased agonists to interact with the receptor and give a more specific response than a normal agonist. If a person with asthma has an inhaler, it's often a beta agonist. That opens up the airway, but also carries a black-box warning because it can cause a severe asthmatic attack and, in rare cases, death. We're trying to develop a biased agonist that will interact with the receptor and promote airway smooth muscle relaxation without the side effects.

As a mentor and educator, what do you enjoy most?

One of the things that gives me the most satisfaction is seeing the people I've trained and how successful they are when they go out on their own. It's kind of like raising your children. You want them to do well when they're here in the lab but then do well on their own, too.

What's the biggest challenge facing your field?

For academic science in general, the big problem now is funding. A lot of very good labs are not able to get grants renewed, so researchers might have to find other career opportunities. We're also losing a whole generation of young people who aren't going into science because of funding problems. The long-term impact of that is not going to be good in terms of scientific understanding.

This country has historically been a leader in basic and translational science. But it's incredibly expensive to do this work, and the National Institutes of Health budget hasn't gone up in the last 10 years. Money is needed to support research. There's no way to get around that.

— Robin Warshaw

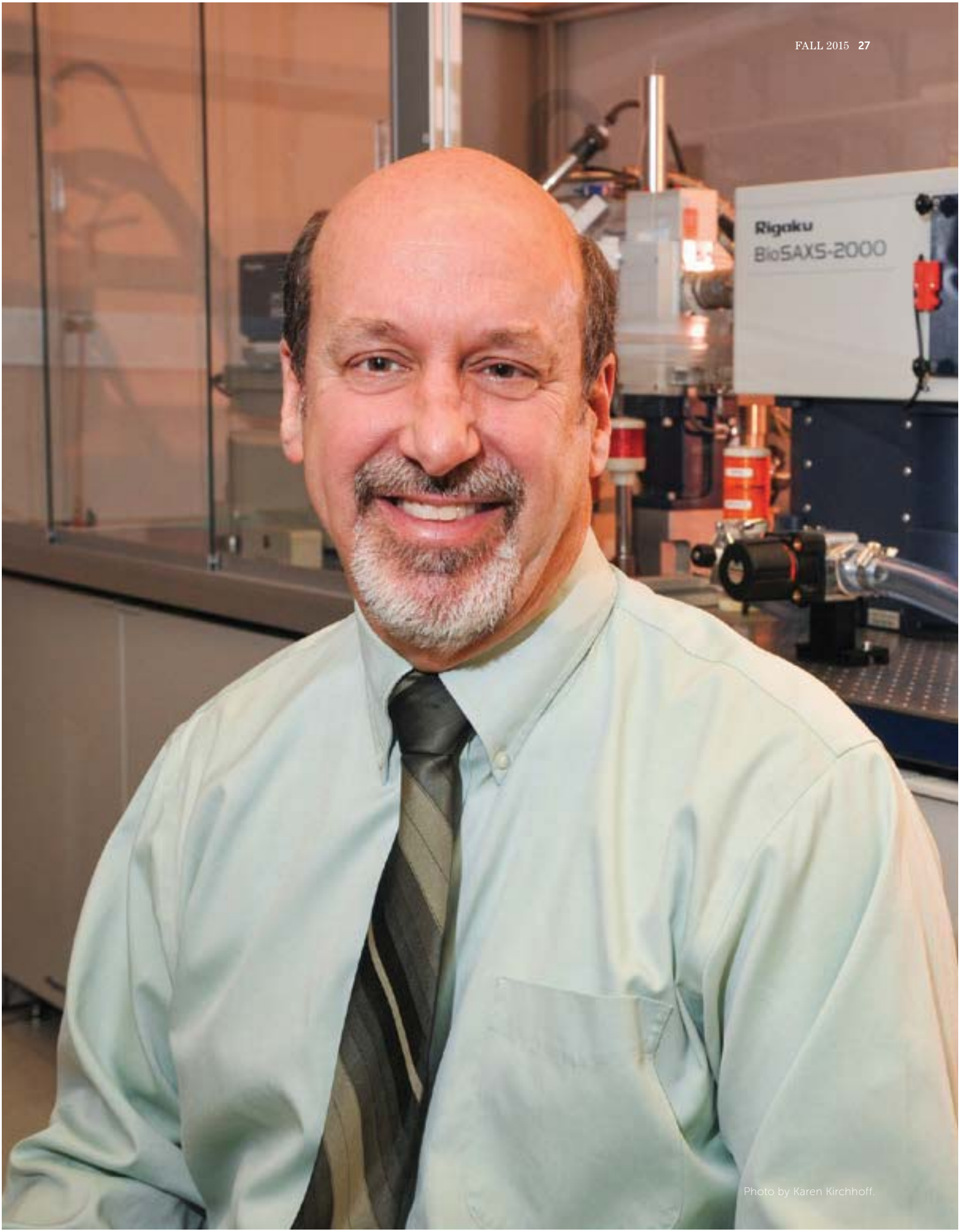

Photo by Karen Kirchhoff.