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# HUMAYUN



*Nominated by the  
Chief Medical Editor  
and Associate Medical  
Editor of*

**RT**  
Retina Today

**D**r. Humayun, a Professor of Ophthalmology and Director of the University of Southern California Roski Eye Institute in Los Angeles, is the only ophthalmologist ever to be elected a member of both the US National Academies of Medicine and Engineering. In this interview, he explains how his grandmother inspired him professionally, and he describes his experience being contacted by the government about winning a prestigious presidential award.

INTERVIEWED BY KAREN ROMAN, *RETINA TODAY* EDITOR-IN-CHIEF

**BMC: Who or what drew you to ophthalmology?**

**MARK S. HUMAYUN, MD, PhD:** I was initially interested in neuroscience and becoming a neurosurgeon, but during medical school my grandmother lost her sight as a complication of diabetes. I remember taking her to all the top retina facilities, but at that time we still hadn't figured out the role of laser in diabetes, and nobody really knew what to do. Her blindness redirected my focus to ophthalmology, retina in particular, and to developing therapies to prevent vision loss or to restore vision in those with sight-robbing ophthalmic conditions.

**BMC: What fueled your interest in innovating and inventing?**

**HUMAYUN:** I have always enjoyed coming up with new ideas and developing them into something bigger and better with the help of others. I knew I didn't want to do the same thing over and over again—I wanted to be engaged in doing something novel, something that hadn't yet been figured out. I like trying to address the unknown. I was interested in figuring out the puzzle of the brain and how that works and also the difficulties and the challenges that we are facing with the eye. I remember saving up all my

money to get a telescope and staying up late into the night, trying to see the moon, trying to see the planets. Jupiter, we could see at times of the year, Venus is really bright and you can see that relatively easily. It was something that I loved thinking about. I liked quantum physics—for example, the whole aspect of gravitational fields on space and time.

I audited some quantum physics courses during my PhD in biomedical engineering because I liked it so much. The thing that was lacking in it was that it was very abstract; I wanted to be involved in a more applied field. And then of course, my grandmother's blindness really made me focus on trying to solve puzzles and things that can be translated and applied to patient care.

**BMC: You have a Wikipedia page devoted to you. How do you feel about that?**

**HUMAYUN:** I check it periodically to make sure it's factually correct. It's gratifying, to some extent, that somebody thought it was worthwhile to add a Wikipedia page about me. What helps is, when I'm giving a talk, the moderator can go to the Wikipedia page and read it and then use those comments in my introduction. So it has some value, and I think it's fairly accurate.

**BMC: You were a co-inventor of the Argus II Retinal Prosthesis System (Second Sight Medical Products), which has been implanted in more than 300 patients worldwide. Did you expect it to reach this level of success?**

**HUMAYUN:** I didn't expect this level of success, but I hoped for it, and it's great to see how well certain patients do with the implant. The thought of restoring eyesight with an electronic implant was science fiction. If you were to tell someone that you were going to implant a chip in his or her eye so that he or she could see again after being blind for decades, that person would tell you that you are dreaming. Turning this dream into reality has been worth it all.

Although, and perhaps naively, I never doubted *that* it would work, in the back of my mind I always wondered *how well* it would work. That's something you just can't tell from preclinical testing. You can test as much as you want on a desktop and in preclinical models, but you will never know what level of vision you will get. That's the difficult part. The level of vision some patients get with the Argus II amazes me.

The next area of development for the Argus II won't be only in the hardware implant, but also in the software. In fact,

***“I was given a number to call the White House ... I had won the National Presidential Medal of Technology and Innovation. I was completely astonished. I mean, this medal had been previously given to Bill Gates, Steve Jobs, and Charles D. Kelman, MD.”***



I would like to develop software that provides color perception, helps with digital zoom, and maybe even helps with region of interest. (Think about the yellow box on an iPhone camera when it recognizes a face.) Region of interest can be useful in digital signal processing. Augmented reality could be an interesting area to explore. But taking advantage of the camera, the digital input, and the software and coding is where near-term advances will come.

**BMC: What was it like to receive the 2016 National Medal of Technology and Innovation from President Barack Obama?**

**HUMAYUN:** It was amazing. The person who initially contacted me about it was from some government agency—maybe the CIA or the FBI, I don’t remember. But he didn’t come right out and tell me that I won anything. I thought it was hoax, but then I was given a number to call the White House, and it seemed official. I still had no idea what was going on. I was asked if I was available on a specific date, and I was finally notified that I had won the National Presidential Medal of Technology and Innovation. I was completely astonished. I mean, this medal had been previously given to Bill Gates, Steve Jobs, and Charles D. Kelman, MD. My mind was spinning. How did my name come up? Who nominated me? Did I even deserve it?

It was a great trip, a great ceremony, and it was an honor to meet President Obama and to accept the medal. He is smart: In a short period of time he understood the concept of the Argus.

**BMC: If you were stranded on a deserted island, what three things would you want to have with you?**

**HUMAYUN:** I’m a practical person, so, before I answer, are you saying I’d already have what I need to live, like water?

**BMC: Yes, you’d have the basic necessities.**

**HUMAYUN:** I would love to have the ability to write down my thoughts in the form of a book. It would be fun to reflect back on some things and chronicle what has been done. For my second thing, can I have other people with me?

**BMC: Sure, let’s say they were stranded with you.**

**HUMAYUN:** Okay, because I would like to have my family there. I would hate to have them stranded with me, but it would be nice if we were together. I really can’t think what else I would need. If I could have access to a computer and the internet, that would be great, but I’m not sure you’d allow that—that’s not being stranded. I would like to be able to learn how to program better. It’s frustrating to see the kids now—they

can program so much better than I can. Or maybe learn how to play the guitar.

The third thing would be access to information, so I could document what I was going through.

**BMC: If you had to nominate one creative mind in ophthalmology, whom would it be and why?**

**HUMAYUN:** Hands down, the person who comes to my mind is Napoleone Ferrara, MD. He helped discover vascular endothelial growth factor (VEGF) and created the first anti-VEGF antibody. This single contribution is pretty amazing—he basically discovered the penicillin for retinal diseases. Dr. Ferrara won a Lasker Award (given by the Albert and Mary Lasker Foundation), which is regarded as the medical equivalent of the Nobel Prize. ■

Editor’s Note: This is an abridged version of Dr. Humayun’s interview. To read the entire interview, log onto [www.crsaday.com/issues/](http://www.crsaday.com/issues/) and click on the April issue.

**MARK S. HUMAYUN, MD, PhD**

- Cornelius J. Pings Chair in Biomedical Sciences; Professor of Ophthalmology, Biomedical Engineering and Integrative Anatomical Sciences; Director of the Institute for Biomedical Therapeutics; and Director of the University of Southern California Roski Eye Institute, Los Angeles
- [humayun@usc.edu](mailto:humayun@usc.edu)
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