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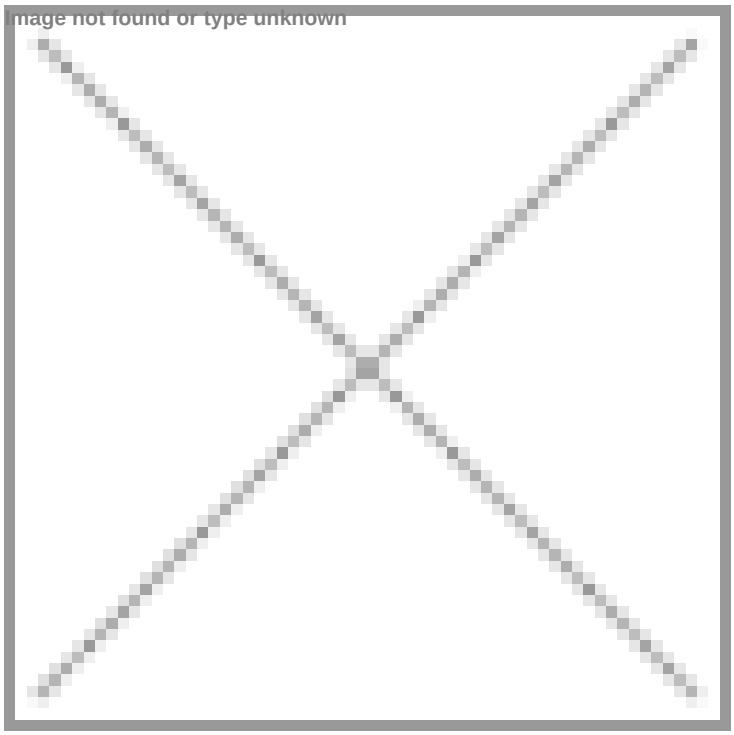

Dr Robert Samuel Langer was awarded the 2015 Queen Elizabeth Prize (QEPrize) for Engineering in February 2015 at the Royal Academy of Engineering, London, UK. He is a world-renowned American scientist, engineer, inventor and entrepreneur, and David H Koch Institute Professor at the Massachusetts Institute of Technology (MIT), USA.

The award is a global £1 million prize celebrating pioneering innovations that has had a profound benefit to humanity globally.

Dr Langer lab's work is at the interface of biotechnology and materials science. His lab's major focus is in studying and development of polymers to deliver drugs, particularly genetically-engineered proteins, DNA and RNAi, continuously at controlled rates for prolonged periods of time.

Dr Langer exclusively spoke to BioSpectrum's Raj Gunashekar, where he shares his passion origins, memories of his childhood laboratory, entrepreneurial tips and his award-winning work on controlled-release drug systems. Excerpts:

Q: Firstly, a hearty congratulations Dr Langer. Tell us about your award-winning work to our Indian readers, and the impact of your controlled-release drug systems.

A: Thank you Raj. I think engineering is such a wonderful way to contribute to society. The two things that give me the greatest satisfaction are discovering principles or making inventions that enable people to have happier and healthier lives, and seeing the people who train in our lab succeed to become future leaders in engineering themselves.

There are times when drugs administered to patients could react after being in the system for more than the required period of time or they might be ineffective by disappearing quickly. To tackle this, controlled drug release helps maintain and sustain the drug release at an effective level for the suitable period of time. The polymer which was invented through my study helps in controlled dissemination of the drug molecules. My work which won the QEPrize is on engineered polymers which control the delivery of large molecular weight drugs for the treatment of diseases such as cancer and mental illness. It is already being used in various countries, including India.

I am thrilled to be the recipient of the Queen Elizabeth Prize 2015. The prize celebrates ground-breaking innovations in engineering and in addition strives to celebrate stories of engineering successes, raising the international public profile of engineering and inspiring new generations of engineers to take up the challenges of the future.

Q: What sparked you to become a scientist?

A: Some of it started as a child having chemistry, microscope and erector sets. My dad also played a lot of math games with me. All this contributed to my liking science and math.

Q: Shed some light about the lab in your home's basement in Albany (USA).

A: It was a small basement and I had a Gilbert chemistry set. I put all the chemicals down there and I loved doing experiments where I would make things like rubber and make solutions change colors via chemical reactions.

Q: You have a background in Chemical Engineering. What made you to shift towards Biomedical Engineering?

A: I always wanted to learn biology. My PhD thesis was on the enzymatic regeneration of ATP. I did my postdoc in a surgery lab at Boston's children's hospital. I was the only engineer in the hospital. It really gave me all kinds of ideas as to how chemical engineering could be applied to medicine.

Q: You have been researching since the 70s. How difficult or hard has it been for you to achieve what you have achieved today? Were there any major obstacles or set-backs? How did you overcome them?

A: Very difficult. My first nine research grants were turned down largely because my research went against conventional wisdom. No chemical engineering department would hire me as a professor. And I ended up joining a nutrition department. The year after I joined, the department head who hired me left. So the associate department heads decided to give me advice. They told me to start looking for another job.

Time helped me overcome some of these issues as we proved that conventional wisdom was incorrect. And I just never gave up.

Q: You have over one-thousand patents to your credit. How will you define innovation?

A: A new idea or invention, and its implementation into real life

Q: You are also an entrepreneur too. What do you have to say to all the scientists who want to be an entrepreneur?

A: I think it's an attractive career path but not the only career path. Personally I love it because it enables myself and my students to take our ideas into the real world and help people. But science leads to many good career paths.

Q: What are the common mistakes committed by scientists while they pursue their entrepreneurial dreams?

A: Starting a company too early. Not having good intellectual property (IPs).

Q: What do you advice students who hesitate to become a scientist or pursue a research-oriented career?

A: I think that's okay. Everyone should get lots of advice. But they should follow their passion. I think people should do things that make them happy. And they shouldn't do things just to make money.

Q: As an entrepreneur, why do you think start-ups fail at times?

A: Starting too early, having a poor CEO and poor investors.

Q: Who or what do you attribute your success to?

A: Great mentors, learning something about 2 very disparate fields - engineering and medicine, and perseverance

Q: You head the world's largest Biomedical Lab at MIT. You may have had the chance to work with Indian scientists too. Tell us about your experience working with them.

A: They have been wonderful. Many of my Indian trainees are top professors in both the US and India. Some head top companies.

Q: Your final take-home message to our readers.

A: For young people, I'd say dream big dreams, dreams that can change the world and make it a better place. Many times you will run into obstacles, but don't give up on those dreams.