

## Professor Robert S LANGER

Citation

In today's world, where a combination of fields is key to unraveling the complexity of the global challenges we face, Prof Robert S Langer is fortunate enough to be a cross-disciplinary master all on his own. Materials science, chemistry, engineering, biomedicine, you name it, and Prof Langer, David H Koch Institute Professor and Head of the Langer Laboratory at MIT, has an award for it at the highest possible levels. Add in the dizzying heights he has attained as an inventor and spin-off company catalyst, and reading out his accolades alone – over 220 major prizes, awards, and medals – would take the time allotted for this citation, and more!

Graduating from bachelor and doctoral chemical engineering degrees at Cornell University and MIT in the early 1970s, a time when most in his field went into the energy industry, Prof Langer's goal was always to more directly help others. Thanks to his collective individual brilliance and resilience to rejection, he has done just that, with his work leading to startling advances in healthcare, improving millions of lives globally.

It all began with his polymer-based research breakthrough on controlled drug delivery in the mid-1970s. Derived from new materials synthesis and applied engineering, the technology went on to form the basis for treatments for conditions from brain cancer and schizophrenia to diabetes. It then leapt over further boundaries into food and agricultural applications and even cosmetic uses.

Prof Langer's lab is now the world's largest academic biomedical engineering facility, with more than 100 researchers exploring drug development, novel biomaterials, tissue engineering, stem cells and nanoscale drug delivery. He has published over 1,300 papers and has been named by *Forbes Magazine* as one of 15 innovators worldwide who will reinvent our future. He has received 29 honorary doctorates and is an elected member of four US National Academies: Medicine, Engineering, Sciences, and Inventors. Among those many honors mentioned earlier are the 2002 Charles Stark Draper Prize, known as the Nobel Prize for engineers, 2008 Millennium Prize, the world's largest technology prize, and 2015 Queen Elizabeth Prize for Engineering, a recognition of his ground-breaking work on behalf of humanity.

But it has not always been easy being Bob Langer. On graduation, education and hospital doors remained firmly closed. His personal breakthrough only came when Harvard cancer research pioneer Dr Judah Folkman lived up to his reputation for taking on "unusual people". Once on board, the young engineer quickly showed how his vision and skills could add a new dimension. He published two seminal papers with Dr Folkman in 1976: on restricting tumor growth by inhibiting blood vessels, which appeared in *Science*; and controlled-release drug delivery systems in *Nature*, which remains Prof Langer's favorite discovery. His battles for acceptance, though,

were just beginning as established engineers and chemists dismissed his work.

It took 20 years from that paper in *Nature* for the US Food and Drug Administration to approve his polymer-based brain cancer treatment. During that time, he persevered with his innovations, venturing into patenting and entrepreneurship to get his research off the library shelf and into people's lives. He now has 1,100 patents granted or pending, with licensing arranged with over 300 companies, of which he has co-founded around 30. Among the numerous products being created are a miniaturized chip to test for diseases, sugar-sequencing tools to create safer blood thinners and other drugs, and aerosols to treat diabetes and Parkinson's disease.

His professional family is rather larger. Over 280 of his graduate and postdoctoral scholars are now themselves leading professors, company presidents, and heads of academic labs worldwide. Many are also academy members. He is regarded as a great mentor with an endless supply of ideas to solve problems and technologies that can realize these solutions. In turn, he sees working with great people as being the reason he accomplishes so much, and is immensely proud of his researchers' life achievements.

"Very often when you are going for real innovation, you have to go against prevailing wisdom," Prof Langer has said. As his own extraordinary contribution shows, having such courage can bring about the most remarkable of advances. But equally momentous are the inspiration and time willingly given to motivate so many others to go beyond conventional thinking and drive forward discovery for the benefit of us all.

Mr Council Chairman, on behalf of the Council of the Hong Kong University of Science and Technology, I have the high honor of presenting to you, Prof Robert S Langer, David H Koch Institute Professor at MIT, for the award of Doctor of Engineering *honoris causa*.