

News Release

STRICTLY EMBARGOED until 12 noon on Tuesday 3 February 2015

Visionary chemical engineer Robert Langer wins the Queen Elizabeth Prize for Engineering

The 2015 [Queen Elizabeth Prize for Engineering](#) has been awarded to the ground-breaking chemical engineer Dr Robert Langer for his revolutionary advances and leadership in engineering at the interface with chemistry and medicine. The QEPrize is a global £1 million prize that celebrates the engineers responsible for a ground-breaking innovation that has been of global benefit to humanity.

The announcement was made by Lord Browne of Madingley, Chairman of the Queen Elizabeth Prize for Engineering Foundation, in the presence of His Royal Highness The Duke of York at the Royal Academy of Engineering in London on 3 February. Her Majesty The Queen will present the prize to Dr Langer at Buckingham Palace later this year.

Dr Langer is one of 11 Institute Professors at the Massachusetts Institute of Technology (MIT) in Cambridge, USA. This is MIT's highest honour. His laboratory at MIT - with over 100 students, postdoctoral students, and visiting scientists at any one time - is the world's largest academic biomedical engineering laboratory. He has over 1000 issued and pending patents, over 200 major prizes to his name, and he is the most cited engineer in history (Science, 2014). His work has helped lay the foundation for a myriad of health innovations, including the long-lasting brain cancer treatment Giladel® Wafer; the prostate cancer and endometriosis treatments Lupron Depot®, Zoladex®, and Decapeptyl SR; the schizophrenia treatment Respidal® Consta®; the diabetes treatment Bydureon®; and the drug-coated cardiovascular stents that alone have benefited 10 million heart patients.

A chemical engineer by training, Dr Langer was the first person to engineer polymers to control the delivery of large molecular weight drugs for the treatment

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of diseases such as cancer and mental illness. His unconventional thinking toppled the established view that controlled-release drug delivery would not work for large molecules like proteins, which are very sensitive to their surroundings.

From the start, Dr Langer's work has been characterised by a truly interdisciplinary approach. He developed his first drug delivery system during the 1970s while working with Dr Judah Folkman, a Harvard professor and surgeon at Boston Children's Hospital. Folkman hypothesized that the growth of cancerous tumours could be restricted by stopping angiogenesis, the formation of new blood vessels, and he asked Langer to find a way to inhibit it. Once he had discovered how to create polymer micro- and nano-particles that could support and release sensitive protein-based drugs in the body, he used this technique to test possible drugs to control angiogenesis. He and Dr Folkman isolated the first substances that blocked angiogenesis; such substances have been used to treat over 20 million patients.

An early application of the controlled release technology was in polymer microspheres that deliver nanopptide drugs over several months and are now widely used to treat prostate cancer and endometriosis. Similar approaches have led to new treatments for schizophrenia, alcoholism, and drug addiction.

Together with another Harvard surgeon, Dr Joseph Vacanti at Massachusetts General Hospital, Dr Langer helped pave the way for major innovations in tissue engineering, pioneering synthetic polymers that could deliver cells to form specific tissue structures. This concept led to the development of a new kind of artificial skin, now approved by the FDA for use on burn victims and patients with diabetic skin ulcers. Many other such systems, including ones for new cartilage formation and spinal cord repair, are now in clinical trials.

Professor Lord Broers FREng FRS HonFMedSci, Chair of Judges for the QEPrize, said: "Robert Langer has made an immense contribution to healthcare and to numerous other fields by applying engineering systems thinking to biochemical problems. Not only has he revolutionised drug delivery, but his open-minded approach to innovation and his ability to think 'outside the box' have led to great advances in the field of tissue engineering. He is a truly inspiring leader who has attracted brilliant people to these relatively new and exciting areas of research and is extremely involved in the commercial development of his group's research."

One of Dr Langer's most recent projects is a microchip-based implant capable of storing and releasing precise doses of a drug on-demand or at scheduled intervals for up to 16 years. Microchips, the company he co-founded to commercialise the development, announced in December 2014 that it has completed clinical demonstration. Unlike traditional drug delivery platforms, Microchips Biotech's implant can respond to wireless signals, which can activate, deactivate, or modify

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the frequency or dose of the drug, without being removed from the patient. The company is looking initially at three areas for such an implant: diabetes, female contraception, and osteoporosis, which all require regular, long-term dosage. The contraceptive approach is funded by the Gates Foundation, as are new ways of providing single-step immunizations for polio and other vaccines, providing long-acting malaria drugs, and providing essential minerals. All of these new techniques are currently being pursued in Dr Langer's lab.

Prime Minister, The Rt Hon David Cameron MP said:

"We want Britain to lead the world when it comes to engineering. Equipping our young people with the skills they need to help them secure the well-paid jobs of the future is a crucial part of our long term economic plan. I hope this prestigious prize will excite and inspire the next generation up and down the country to take up careers in engineering, so we continue to build a highly-skilled workforce that gives us a competitive edge on the world stage."

Deputy Prime Minister and Leader of the Liberal Democrats, The Rt Hon Nick Clegg MP said:

"The Queen Elizabeth Prize for Engineering - which recognises and celebrates the best engineers around the world, delivering life-changing innovations - also exists to inspire a whole new generation of young engineers to follow in the footsteps of legends like Brunel, Babbage, Johnson and Shilling. We need millions more engineers in the decades ahead to help us tackle the world's biggest problems such as hunger, climate change and disease. In the UK also, we need highly skilled young people with the right ideas to help us create jobs and drive our future growth. Whatever your background, whatever your gender, if you have the talent, enthusiasm and commitment to work hard, you could be that bright spark who makes a world of difference. The prospects are endless, so get involved."

Leader of HM Opposition, The Rt Hon Ed Milliband MP said:

"Growing our high skilled sectors such as engineering is a central part of our plan to build an economy that works for working people. Britain has led the world in engineering, and the Queen Elizabeth Prize for Engineering plays an important role in celebrating success and inspiring young people to work in this vital sector. We will work with industry to tackle engineering skills gaps by creating more high quality apprenticeships, and for this to succeed we will also need to support more young women to go into engineering."



QEPrize Judge Professor Lynn Gladden CBE FREng FRS, Shell Professor of Chemical Engineering, University of Cambridge, said:

“Robert Langer took the guesswork out of designing controlled drug delivery systems, using his profound knowledge of chemical engineering, chemistry, biology and polymer science. There was originally great doubt that a polymer delivery system would be able to deliver the macromolecules required for various medical treatments, but he challenged that thinking and produced a methodology that is now the foundation of much of today’s drug delivery technology. His great skill as an engineer is matched by his knowledge of other disciplines - it was almost a natural step for him to move on to tissue engineering, which requires many aspects of that original methodology identified for drug delivery and which remains firmly underpinned by his chemical engineering skills.”

QEPrize Judge Dr C.D. Mote, Jr., President, US National Academy of Engineering, said:

“The Queen Elizabeth Prize for Engineering celebrates engineers, bringing their efforts into public view and giving them the recognition they rightfully deserve. It is important for our society, especially for our young people, to appreciate what our future depends on. The work of Robert Langer, and the example he sets as an engineer and as a mentor, shows how much extraordinary engineering underlies every aspect of our lives.”

Erik Bonino, Chairman, Shell UK, said:

“STEM skills are the lifeblood of the innovation economy. If we are to seize the opportunity to create a rich talent pool for the future, Government, business and the engineering community must work together to grow the number of scientists and engineers. In our industry alone, this is critical if we are to meet the significant energy challenges of the future.”

Noriaki Hashimoto, Corporate Vice President, Toshiba said:

“Our world faces many complicated issues affecting society, such as ensuring stable energy supplies whilst preserving the environment. Added to that are the challenges of creating a secure information age and a rapidly growing population. Key to resolving these social issues is innovation. To turn innovation into reality, we need more engineers. Toshiba sees the Queen Elizabeth Prize for Engineering as a great way to inspire the next generation of engineers worldwide.”

Shankar Narayanan, Head, UK & Ireland, TCS said:

“As a technology company, we have seen first-hand the growing demand for coding and software engineering skills in the UK. These are the skills which are going to drive digital innovations across all sectors over the coming years. TCS believes that industry has a vital role to play in fostering these skills within the UK. It is an honour to support the QEPrize, an organisation that shares our passion for inspiring young people into STEM careers.”

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Steve Holliday, Chief Executive, National Grid, said:

“People have this perception that engineering is all about oily overalls and not a place for girls. The QEPrize rubbishes all that and shows both girls and boys that if you want the opportunity to travel, if you want a job that’s different every day, that stretches you, requires creativity, pays well, and is helping to solve some of the world’s biggest global challenges, then you should become an engineer.”

Juergen Maier, Chief Executive, Siemens plc said: “The Queen Elizabeth Prize for Engineering sends a clear signal to the world that the UK values engineering and is committed to inspiring the next generation of engineers.”

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Notes for Editors

- 1. The Queen Elizabeth Prize for Engineering** is a global £1 million prize that celebrates the engineers responsible for a ground-breaking innovation that has been of global benefit to humanity. The objective of the QEPrize is to raise the public profile of engineering and to inspire young people to become engineers.

www.qeprize.org

- 2. His Royal Highness The Duke of York** promotes British Science, Technology and Engineering expertise. The Duke also supports initiatives which attract investment into UK science and technology, promote the further translation of science into business, and recognise world class scientists who undertake research in the UK. The Duke is a Royal Fellow of the Royal Society, and Patron of The International Year of Light 2015 and the Young Engineers, among others.

<http://thedukeofyork.org>

- 3. Royal Academy of Engineering.** As the UK's national academy for engineering, we bring together the most successful and talented engineers for a shared purpose: to advance and promote excellence in engineering. We provide analysis and policy support to promote the UK's role as a great place to do business. We take a lead on engineering education and we invest in the UK's world-class research base to underpin innovation. We work to improve public awareness and understanding of engineering. We are a national academy with a global outlook. We have four strategic challenges: Drive faster and more balanced economic growth; foster better

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Prize for
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education and skills; lead the profession; promote engineering at the heart of society.

www.raeng.org.uk

Gura, Trisha. "Robert Langer: Creating Things That Could Change the World." *Science* (2014). Web.

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