

global and parts are sourced from across the globe to deliver critical infrastructure projects it is critical that everything is exact. Some industries work within tolerances of tenths of millimeters.

Whilst errors in measurement can have catastrophic consequences, good measurement practices can transform for the better. To me, measurement's value boils down to one thing: confidence. Confidence is the key, confidence in the data you have, and confidence in the decisions you make with it. Only then can you make a decision to invest or purchase a new product or service. As such, measurement has a significant role to play in economic growth. Before I joined NPL I was sent a pack of documents as a synopsis of the laboratory's work in recent years. Included in this was a set of case studies developed by an independent research company. This assessed the impact of working with NPL for a selection of UK SMEs, with the results highlighting a scale of financial benefit of between 10 and 30 times the public investment (in NPL).

On a broader scale, measurement allows the establishment of standards. Being able to identify the 'gold

... leading centre for doctoral training and skills ...

standard' in a particular area and measure performance of specific companies or products against that ultimately leads to a higher quality result for all, and can offer an alternative to regulation and red tape.

In research and development, measurement helps us validate, verify and progress new breakthroughs. 60 years ago

Louis Essen and Jack Parry designed and built the world's first caesium atomic clock at NPL, transforming the way we measure and use time. The caesium fountain atomic clock used at NPL today measures time to an accuracy of one

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second in 158 million years. We are now looking to develop miniature atomic clocks for use in space, as part of the recently launched Quantum Metrology

from both the financial sector and other measurement institutes.

However, the continued value that the UK receives from measurement in increasing the productivity and competitiveness of UK manufacturing and

industry, depends on having the right skills to implement it. The UK is consciously addressing the STEM skills shortage and within this there is a shortage of



Dr Tania Mathias MP and Dr Peter Thompson NPL CEO at the opening of the QMI. ©NPL

Institute at NPL. The new facility provides verification for quantum technologies; technologies based on abstract science, but that offer incredible applications

measurement skills. Automation of processes has led to many knowing how to operate the kit and not about the fundamental measurements that underpin the kit's effectiveness. Educating industry about measurement skills is helping improve productivity and efficiency.

We ensure that the UK has these skills and is doing it through a number of ways. NPL conducts extensive outreach programmes, reaching around 30,000 people a year and educating them about the role of measurement in society. To further inspire the next generation of scientists and engineers we have this year

bolstered our involvement in apprenticeships, by working with government to develop a Trailblazer apprenticeship in metrology, and give young people job-relevant skills.

At a different level, we've also just launched the Postgraduate Institute for Measurement Science, which will bring together 150 researchers co-supervised by NPL staff, in collaboration with over 30 UK universities. The Institute is managed in association with the Universities of Strathclyde and Surrey to enable a postgraduate experience that will place students well for future employability and skills. My aim is for the Institute to be the

... win the confidence of investors and customers ...

leading centre for doctoral training and skills development in metrology and its applications in physical, engineering, biological and chemical sciences.

It is clear that NPL's work is intrinsic to the success of UK industry. Its importance will increase with the government's drive to improve UK productivity and international competitiveness. I strive to see NPL giving its all in delivering the best solutions for customers, which help them to succeed. To do this, we need to coherently and consistently communicate the message about the value of measurement by highlighting the amazing science happening at facilities like NPL. It's very simple really; we just need to have the confidence to say it.

Reference

1 <http://www.npl.co.uk/upload/pdf/customer-survey-2012.pdf>

QUEEN ELIZABETH PRIZE FOR ENGINEERING

Presented to Dr Robert Langer

On 26 October 2015 Her Majesty The Queen presented the Queen Elizabeth Prize for Engineering (QEPrize) to a chemical engineer who has made revolutionary advances and leadership in engineering at the interface with chemistry and medicine, Dr Robert Langer.

Dr Langer received the QEPrize trophy in a ceremony at Buckingham Palace. Influential international engineering economies were represented, with Ambassadors and High Commissioners from countries including the United States, China, Japan, Germany, South Korea, South Africa, Singapore and India in attendance. They were joined by senior business leaders from the QEPrize donor companies and young engineers from the QEPrize Engineering Ambassadors Network.

The day also marked the release of the first QEPrize Create the Future Report. The Report revealed the changing nature of engineering perceptions across 10 key markets and provided a fascinating insight with country comparisons alongside expert commentary from the fields of commerce, science, academia and the full breadth of engineering disciplines.

DR ROBERT LANGER

Robert 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



Photo by David Parry

– 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 is the most cited engineer in history (Science, 2014). His work has helped lay the foundation for long-lasting treatments for brain and prostate cancers, endometriosis, schizophrenia, diabetes 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 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

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.

... fascinating insight with country comparisons ...

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

Together with another Harvard surgeon, Dr Joseph Vacanti at Massachusetts General Hospital, Dr Langer helped to pave the way for major innovations in tissue engineering, pioneering synthetic polymers that could deliver cells to form specific