

National Physical Laboratory - the UK's National Measurement Institute

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Professor Pethica took up the role at the tail end of 2007 and here lays out his vision for the future.

For 30 years I have worked across both public and private sectors, using cutting-edge science to establish new businesses and advise on public policy. This has taken me from the UK to the US and back again, via Ireland and Switzerland. The experience has given me an insight into how a publicly-funded laboratory can operate to optimum public and commercial effectiveness.

Now, as Chief Science Adviser at NPL, I am in a position to use this experience to help to shape one of the few remaining public laboratories in the UK. NPL is operated by SERCO, a quoted company, and so it functions as a private institution. Yet a large element of its funding direction and remit still comes from government sources, so it mixes public and private stakeholders and private and public drivers.

It is important to state that the core role of NPL is measurement. Basic things such as litres, weights, and more subtle and powerful quantities like time, require standards that people can trust. To have private companies provide these standards is not realistic. Would you like to see oil companies telling us what a gallon was and brewers defining the pint? Good standards require science with independence and public trust.

NPL has three over-arching roles that I want to outline in more detail. They are:

1. To promote and deliver top-end, quality science.
2. To make sure that that this science is exploited publicly and commercially.
3. To be an independent reference point.

Quality science

To achieve this, we need to ensure that we are doing great research. If NPL wants to provide definitive standards it needs to be as good if not better than anyone else when it comes to research. It also needs to be working in the right areas as a national measurement institution. The economy in the UK is not large enough to accommodate everything, so research areas need to be targeted wisely. NPL has to decide where its strengths lie and to play to them, and where there are new opportunities and areas where it can leverage its expertise. My role at NPL will ensure that the laboratories and support facilities enhance this process and that the talented people at NPL have what they need to deliver research at the cutting edge.

During the coming years, NPL will look to set the foundations for delivering leading science in support of measurement and standards. It will create an innovation centre to support UK businesses, focus on developing those areas where it is already close to the leading edge, and make strategic investments in areas where it believes



a critical need for support will arrive in the future.

Successfully exploiting quality science

I believe that by enhancing its research capability NPL can expand the commercial application of its science and I want to fully exploit the public asset base of this knowledge for the benefit of the UK.

Successful commercialisation of top-end science is something that I have done throughout my working life so I am familiar with what needs to be in place for this to flourish. Following some work in the 1980s in Switzerland on equipment for thin-film characterization and in Cambridge developing nano-scale probe techniques, I set up a company called Nano Instruments. It was based in the US rather than the UK. I want to discuss why I believe that over 20 years later it is still not as easy to exploit science successfully in the UK as it is in some other areas of the world.

There are several reasons why the US works so well for exploitation of technical knowledge. One is the psychology of those looking to build new businesses there; they are happy

to take risks. In the UK there is more of a comfort zone mentality.

It is not all down to psychology. The environment of the US is another factor. The scale is large and all levels of its business eco-system are working – there are lots of companies of all sizes in this massive market, and they grow and are absorbed, created, and bought at all sizes. In the UK and Switzerland, we are not too bad at nurturing companies of small and large sizes but need a bigger market – which is where Europe can help. The bigger the market, the bigger return companies receive on their R&D investment, helping to successfully exploit new technologies.

So the US benefits from its market size, but just as important is the state and federal governments' role in the US tax and support system. I believe the UK is still behind the curve in this respect and the US is much more proactive.

Imagine the exploitation of knowledge and new research being dependent on the support of a three-legged stool or tripod, with each leg an equally vital component to provide a balanced success. One leg represents the science and technology itself. Another is the regulatory and legal system, and the final one is fiscal. To have one weak leg destabilises the system, making it more likely to collapse. This cannot be compensated by strengthening the other two legs. All three have to be internationally competitive.

In the UK our research base continues to be excellent, with a superb reservoir of talent. The regulatory and legal system is also very encouraging, as the recent vote on the Human Fertilisation and Embryology Bill shows. But fiscal support is the weak leg that threatens the whole structure and makes the UK less competitive. One example is the corporate tax rates that negate any benefits of research freedom or grant support. It simply makes other countries, especially our Irish and Swiss neighbours, a far more attractive

proposition for starting a business or for investment. Other countries such as the US in fact do everything in their power to tilt the balance in favour of their local companies, making them better equipped to succeed in the global market. It's not just tax rates, but things like Small Business Innovation Research (SBIR), long range US Department of Defense research, and a willingness to radically shut down less promising areas. If other countries do not have 'level playing fields' then why should UK companies not have a competitive tax and support environment? You can see what a 10% effective tax rate in the finance sector did. Opportunity costs must be allowed for in research as in everything else.

Because of its position between the public and private sectors, NPL has an important role to play as the broker of a better landscape for technology transfer in the UK. We can demonstrate to the commercial world how public research can serve the needs of business. We can also be a mouthpiece for businesses, helping them feed messages back from companies trying hard to succeed in a system that has not been designed to offer them so much competitive advantage. We are experts in technology transfer and we will use this expertise to guide for the future as well as deliver today.

Providing a reference point

By establishing standards NPL provides a level of confidence, trust and independence that comes from being a leading scientific institution. UK Government may need an independent, credible public laboratory perhaps more than it currently realises. It cannot just buy unbiased technical advice and credibility from purely commercial entities, as they are (rightly) interested in retaining a contract. You also can't guarantee the independence and confidence unless you're doing cutting edge, published science. Indeed you

have to lead the field, which comes back to the first role of NPL.

There are laboratories similar to NPL in other countries, such as Physikalisch Technische Bundesanstalt (PTB) in Germany and National Institute of Standards and Technology (NIST) in the US. NIST has a central role in establishing security procedures and information handling for the US Government, something I believe that NPL could help with in the UK. NPL actually has a famous track record in this area with the invention of packet switching, which is the basis of computer communications and the internet worldwide today. It was developed by Donald Davies at NPL from the 1960s. As systems get more complex, the protocols and standards also get more complex. NPL has the expertise to help with that.

Industry, as well as government, relies on an independent reference point. NPL provides the ultimate in confirmation when it says that something meets a standard which a company wishes to claim it is meeting. And it is very desirable for the UK to have an interest in the process by which international standards are set, to support its own corporations.

NPL responds to the kind of industries that are predominant in this country, which is why there's a strong emphasis on materials research, quality control, materials analysis for example.

NPL can increase the effectiveness of industry and help with the transfer of research and development into actual products and services. Underpinning this will be its work in informing new standards and regulation. At root, it is a publicly trusted point of reference for science and technology. The talent pool is here and we are building the infrastructure to support those areas that will produce the high quality science we need to take the laboratory forward for many years to come.