

# A Science Manifesto

or plan for the recovery of New Zealand science

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BECAUSE NEW ZEALAND NEEDS GREAT SCIENCE

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*This Manifesto has been written by the National Science Panel of The Royal Society of New Zealand to encourage urgently-needed public discussion about research, science and technology in New Zealand. It outlines a vision for the future of science in New Zealand.*

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## Our Vision

**W**e are a group of senior scientists. We believe passionately in the fundamental role of science in making the world a better place. We value science for its character – its endless capacity to enliven, engage and enrich peoples across all cultures. We love to see the same passion sown in the minds of students who will, at some time in the future, take up the mantle of leadership in our country.

But we also know the science system intimately – its strengths, and its all-too-many shortcomings. Between the vision and the reality there is a serious disconnect. We are deeply concerned about the careers of students coming through and we are concerned that the public value of science is not being fully recognised or realised. In our view, science policy over the past decade in New Zealand has resulted in a gradual disempowerment of science and scientists. As a result, science has ceased to play a leading role in shaping the nation's future.

That is of concern, because science represents the point at which the human mind engages with the world around it. Science touches all aspects of our lives every day – the homes we live in, the food we eat, our parents, our children and our health. Scientific knowledge also materially affects what will happen to our environment and resources. It underpins any improvements we hope to make to our economy, infrastructure, energy supply, communications, entertainment and indeed the operation of the many institutions on which a civil society depends.

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New Zealand needs a science system that is a visible contributor to the nation's well-being; one that is practised with energy and passion; one that attracts the best students. Our vision is for science to be central to the New Zealand identity in the same way that sport is already and the creative arts are becoming. We want to hear our nation's leaders speak about our 'smart country' – the problems we solve and the opportunities we create through science.

New Zealand does produce some outstanding science and has a rich heritage derived from its past great scientists. But low levels of funding, combined with high transaction and compliance costs and insufficient intakes of high quality students from our secondary schools, mean that our capacity to continue to do so is diminishing. We need to make our science system more effective and to make science once again a desirable profession for young people.

Moreover, if New Zealand is to achieve economic transformation, social well-being and environmental sustainability, we have to do more than simply carry out excellent science. We must, as a nation, use science and scientists better than ever before and find new ways of enhancing their contributions.

We have identified the following ten initiatives as central to renewing our national science system. This is our manifesto for the recovery of science in New Zealand.



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# A Ten Point Programme

## 1. DEVELOP A NATIONAL SCIENCE STRATEGY

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We need to develop a National Science Strategy that identifies New Zealand's science needs and directions, identifies resource and capability needs and takes account of international science trends. This strategy must consider the roles of government and the private sector, and identify and support the necessary links between research organisations, education providers, businesses, policy groups and other organisations.

## 2. ESTABLISH AN OFFICE OF THE CHIEF SCIENTIST

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Many countries, like the UK, Australia, the USA and those in the Nordic group have found that to get the most benefit out of their investment in science, there is a need for a strong strategic drive at the highest political levels. This has been achieved by establishing an independent Chief Scientist or Science Council directly advising the leader of the government. New Zealand should follow this successful model and establish an independent office of the Chief Scientist, which would be responsible for ensuring that science is drawn upon appropriately in all phases of government decision-making. The Office would be charged with informing government policy and decision-making and representing science as a key stakeholder in the innovation system. It would therefore be active in advising government on the nation's scientific strengths, capabilities and challenges.

### 3. ENHANCE INNOVATION POLICY

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To achieve economic transformation we need a clear national policy on innovation. Such a policy must recognise the critical contributions that research, science and technology (RS&T) each make to innovation. It must optimise interactions between the public and private sectors and harmonise the activities of different science institutions. Importantly, it must acknowledge that innovation represents more than mere efficiency gains and enhancements to business practice. Innovation is also about capitalising on scientific and technological knowledge to achieve a competitive edge. Often the gains will be incremental but from time to time major breakthroughs will create entirely new markets or processes.

To build an innovation-based economy we need policies that enhance relationships between the wider business sector, the Crown Research Institutes and universities. Science institutions need to co-operate with businesses, not compete with them as they do under current policy. Excessive competition creates barriers to knowledge transfer and a breakdown in trust. Instead we need an innovation ecosystem in which intellectual property and new business opportunities flow better from primary science organisations to the private sector.

### 4. ENSURE THAT GOVERNMENT POLICY PROCESSES ARE EVIDENCE-BASED

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To ensure that government initiatives are not misdirected and resources wasted, New Zealand must have its best researchers involved in government's wider policy processes, providing input to policy and legislation. Leading researchers should be called upon to inform government policy and legislation around such areas as new technologies, new business sectors, climate change, energy and sustainable development. Science is equally relevant in social areas, and should inform and underpin policy on childhood education, social welfare, family violence, the drinking age or the age at which we can obtain a driver's licence.

## 5. REDUCE TRANSACTION AND COMPLIANCE COSTS

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For many researchers, the current administrative overburden is simply crushing. We must change the way our science is funded. The process should be less bureaucratic, with lower transaction and compliance costs. Science will thrive when scientists can spend most of their time engaged in research (or the application of research). We need to institute policies that keep transaction and compliance costs to the minimum necessary to ensure accountability. Research organisations should be empowered by involving them more in decision-making. Increased bulk funding will provide the stability that is essential for long-term programmes, for the maintenance and redirection of capability, for career development and for building strategic science initiatives. New Zealand also needs to develop high-quality retrospective science monitoring processes involving peer review.

## 6. CONTINUE TO INCREASE BOTH PUBLIC AND PRIVATE RS&T INVESTMENT

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By any measure we lag seriously behind our global competitors in RS&T investment, and increasingly so. Their aggressive investment targets reveal a clear understanding of the link between research and prosperity.

If we are to regain parity with other developed nations, increased investment in science, including basic science, is essential. Most science funding applications in New Zealand have a failure rate greater than 80%, with some, like the Marsden Fund, consistently rejecting over 90% of proposals – not based on the quality of the proposal but solely as a consequence of having insufficient funding available – leading to widespread cynicism within the research community.

New Zealand needs a deeper pool of research knowledge, ideas and opportunities. We need to retain excellent people. We need to build critical mass.



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We need, in fact, to have the resources to attract internationally-leading individuals and their teams to New Zealand, as Australia and many other nations now do. Critically, we have a very low capital investment in research equipment and infrastructure. We need to bring about a vital culture change to encourage greater private sector research investment. Again, less competition with the public sector and more collaboration are needed. Staff must be able to move freely between the two sectors without compromising their careers.

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## 7. IMPROVE THE PATH TO COMMERCIALISATION

To achieve economic transformation based on innovation we also need to address the link between innovation and commercialisation, improving the pathway and removing barriers. Many good ideas never get past what is known as the 'Valley of Death' to reach the marketplace, because public research organisations are not equipped or funded to take the work to the point at which businesses or individuals will invest.

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## 8. PROMOTE SCIENCE ACROSS THE ENTIRE EDUCATION SYSTEM

New Zealand needs to at least double its number of science PhD graduates in order to provide the human capital needed to drive an internationally competitive knowledge economy. This means that we must lift the profile and status of science in the eyes of students across the entire educational system, starting from primary school. There are many



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ingredients that make up the healthy science education system that we envisage. These include: first-class science teachers who are well trained in the subjects they teach; well-resourced teaching aids and laboratories; increased engagement between active researchers and schools; schools and institutions that cooperate rather than compete. With a healthy and effective science system schools will also have good reason to promote careers in science to their brightest students.

## 9. BUILD NATIONAL RECOGNITION OF THE PUBLIC VALUE OF SCIENCE

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Central to the function and role of science is its public value at the national level. Science drives the knowledge and innovation that transforms society in every sector: economic transformation, environmental transformation, cultural transformation and social transformation. In short, the application of public and private scientific research underpins the overall health and wealth of a nation. Science is not simply about individual achievement. It is a vital factor in determining both our nation's performance in an increasingly competitive world and our ultimate survival with respect to the mounting challenges facing our seriously over-extended planet. We must, as a nation, embrace the public value of science.

## 10. TRUST SCIENCE, SCIENTISTS AND SCIENTIFIC INSTITUTIONS

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As a nation we need to rebuild trust in our research institutions and our scientists. This means devolving greater decision-making responsibilities to the science agencies and allowing them to engage in creative work with less interference. It means providing long-term funding for public good science, leading to appropriate career stability and prospects. It means promoting cooperation rather than competition, and it means assisting scientists' development, particularly early in their careers.

We believe that addressing these issues is critical if New Zealand is to achieve economic transformation, undertake sustainable development and build a society capable of making informed and effective decisions about its use of science.

## Our Science Legacy

It's not that we have to start from the beginning. New Zealand has an enduring heritage of scientific achievement. We rightly honour our great scientists: Rutherford, Levy, Wilkins, Tinsley, Axford, MacDiarmid, Jones and Pickering. Together they cover the fields of physics, ecology, agriculture, molecular biology, chemistry, mathematics and engineering.

These are our totara nui – our tall-standing icons of scientific achievement. The Maori proverb, Ko te totara totika ki roto i te wao, tells us that the straightest, tallest totara stand in the heart of the forest. In former times our scientific totara nui flourished in the forests of foreign soils. But today we must find ways for them flourish on our own soil – in the heart of our own forest. And our own forest must be strong and healthy if the call of many birds is to be heard.

The metaphor says it all. Our science system – embracing innovation, research, science and technology – supports all that we seek to achieve in our national life: prosperity, health, sustainability and credibility. Without a healthy science system we will always fall short of those goals. Our international competitors have accepted this as a fundamental truth and have adopted aggressive goals, investing heavily in their science systems. The risk is clear: unless New Zealand responds to the challenge laid down by other nations, we will fall increasingly behind them in competitiveness.

Many companies in New Zealand have taken up that challenge investing in RS&T and establishing their own climate of innovation. Amongst their number are well known companies such as Fonterra, Zespri, Fisher and Paykel Healthcare, Tait Electronics, Fisher and Paykel Appliances, Gallagher, Hamilton Jet, Rakon and Weta Digital. These companies believe in research. They invest in research. To these we can also add Douglas Pharmaceuticals, New Zealand Pharmaceuticals, Cookson Boats, Rayglass Boats, Buckley's

Systems, HTS-110, Magritek, Right Hemisphere, PGG Wrightson and Trimble Navigation. While these companies are enjoying spectacular success on the global stage, they remain too few in number.

If New Zealand is to lift its GDP per capita to that of Australia or our European competitors, we need far more of these high-income-per-employee businesses, which are based on strong RS&T. Most New Zealand businesses, however, do not look to RS&T to build their growth. Generally they invest far too little in this area compared with businesses in other countries. This crucial neglect is taking its toll on our nation. Per capita productivity in New Zealand is not only low but actually falling. This surely demands an urgent response.

It is true that a new generation of New Zealand-based scientific leaders has emerged, people who are truly international leaders in their fields and many of whom are contributing increasingly to value creation. But can we keep them here? Do we resource them adequately? Without top local scientists we cannot hope to progress our aspirations as a modern first-world nation. GDP-rated investment has been static in absolute terms and has declined rapidly relative to our competitors. At the same time the system languishes under inordinate accession and compliance costs.

The forest is neither strong nor healthy and the bird calls are too few. The challenge is urgent. He rakau morimori e kore e taea te piki – a tree shorn of its branches cannot be climbed. By dint of scarcity of resources, complexity, neglect and lack of trust we are shedding branches from a system that could be great. The heights will not be scaled without an urgent response to these issues.

This manifesto outlines the challenges and opportunities we face with our science system. The issues are well known. What we must now demonstrate is a determined commitment to address them.

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A .pdf version of this document is available for download from the Royal Society's website, [www.rsnz.org](http://www.rsnz.org)

To discuss this paper further, please contact panel chairman, Dr Jim Watson, [jim.watson@purepowerglobal.com](mailto:jim.watson@purepowerglobal.com)

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