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Future Pathways Policy Team Ministry of Business, Innovation & Employment
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To Whom it May Concern

Te Ara Paerangi – Future Pathways Green Paper: School of Biomedical Sciences Submission

Overview

The School of Biomedical Sciences at the University of Otago is a research-intensive academic unit that undertakes research across a range of disciplines including the biomedical and biological sciences and trains a significant proportion of New Zealand's graduate workforce in these areas. Our School has achieved sustained success through the Marsden, MBIE and HRC funding rounds over many years, hosts significant components of the Maurice Wilkins and Healthy Hearts for Aotearoa New Zealand Centre of Research Excellence and the Ageing Well National Science Challenge, and is a major science contributor to Aotearoa-New Zealand's science ecosystem.

We support the review of Aotearoa-New Zealand's science sector and welcome the opportunity for positive change. However, we note that substantive structural change will not fix major impediments to improvement in our science sector without additional investment.

As a nation, Aotearoa-New Zealand, delivers well on the investment in its science against international peers. Indeed, we punch significantly above our weight for the investment made. However, as has been long recognised, as a nation we substantially underinvest in our science based on OECD benchmarks. We strongly support the ongoing endeavours to increase investment in research and development to 2% of GDP and ideally beyond.

In this submission we have responded to all sections of the Te Ara Paerangi – Future Pathways Green Paper, but have provided a specific focus on workforce issues given much of our research effort is focused on training and mentoring New Zealand's future scientists.

1. Ngā Whakaarotau Rangahau: Research Priorities

o What principles could be used to determine the scope and focus of national research Priorities?

o What principles should guide a national research Priority-setting process?

o How can the process best give effect to Te Tiriti?

o How should the strategy for each national research Priority be set and how do we operationalise them?

We favour a portfolio of research that spans basic to applied targeted research. Over recent times the investment in basic research has dwindled and we would welcome a reversal in this trend. This is particularly important as basic funding has a critical role in supporting cutting edge projects that are often at the forefront of method development and technological innovation. Even if the specific project is not a national priority the workforce involved in such projects will invariably have an important role in bringing new technologies into the New Zealand science ecosystem. For example, until the latest Covid-19 pandemic, the study of viral evolution would not have been a key national priority yet it has been fundamental to the way our nation managed our response to Covid over the past two years.

National priorities of research with direct application to NZ should be set through broadly consultative processes. Furthermore, we should be ambitious in setting long-term, mission led, objectives that meet our national, and international aspirations and obligations. Care in the development of processes to set priorities will be important to ensure that they are not rooted in past successes/areas of strength that favour senior research leaders, at the expense of innovative young scientists.

2. Te Tiriti, Mātauranga Māori me Ngā Wawatao Te Māori: Te Tiriti, Mātauranga Māori and Māori Aspirations

o How would you like to be engaged? What are your thoughts on how to enable and protect mātauranga Māori in the research system?

o What are your thoughts on regionally based Māori knowledge hubs?

o How do we design Tiriti-enabled institutions?

Māori aspirations and the application and enhancement of mātauranga Māori needs to be Māori led. We favour a multi-strand approach, such as that emerging in healthcare, where Māori have an independent authority for funding and promoting mātauranga Māori, which works in conjunction with the existing funding bodies and science providers. Each funding entity has capacity to set its own path, while encouraging work that weaves mātauranga and western science. Such an approach, over time, could address capacity issues, support the establishment of Māori knowledge hubs, and the integration of Te Tiriti throughout our science sector.

We broadly support the idea of establishing regionally based Māori knowledge hubs, but additional new funding will be essential to develop and sustain these. Further if established in isolation, without substantial systematic change we are unlikely to meet the aspirations of Māori. Achieving this will require an ongoing commitment across the science sector to make all institutions Tiriti-enabled. In our view, each entity needs to prioritise and fund appointment of Māori staff at the highest levels to inform and drive the institution's research agenda, and to encourage and support their mahi.

3. Te Tuku Pūtea: Funding

*o How should we decide what constitutes a core function and how do we fund them?
o Do you think a base grant funding model will improve stability and resilience for research organisations, and how should we go about designing and implementing such a funding model?*

Basic science should continue to be funded based on excellence. The RSNZ Marsden fund, MBIE Smart Ideas and HRC project grants work well, but with success rates of ~10%, they remain brutally competitive. Internationally similar funds have success rates ranging from 18% (Australia) to >30% (Switzerland, Israel). Comparisons of the economic growth achieved by OECD competitors, which invest more in research and development than our nation, suggest strongly that increasing our basic science funding would deliver substantial benefits to Aotearoa-New Zealand¹.

The time cost associated with extensive annual application processes, coupled with low success rates, remains a burden on our system and results in scientists spending less time on research activities than they might and causes attrition of young scientists from the system. We believe that in addition to the classic contestable funds we currently have, that there is value in establishing base grants for all scientists which would provide a greater level of stability, resilience and science activity across the sector and reduce the time cost of the grant application process. Such a system, where individual researchers are reviewed every three to five years, would reward achievement while ensuring basic allocations for all. The Canadian science and engineering research system operated in this manner for many years and was highly successful². Our TEC funded PBRF system, at face value does this, with remuneration to tertiary providers linked to individual staff performance that is reviewed every five years. However, as currently implemented our PBRF system does not result in direct research support to staff based on their performance.

To meet its objectives, which are commonly long-term, science needs to be funded appropriately to encourage and facilitate collaboration. Continual cycles of short-term grants with low budgets result in “compartmentalisation” of science, at the detriment of the ‘big-picture’ thinking needed to tackle our most challenging problems. Our most significant societal problems cannot be tackled, innovation is hampered, and discovery is dampened, when research cannot gain or retain traction. Unfortunately, we have a poor history when it comes to long-term investment in science, allowing it to become captured by entities that often become focused more on maintaining the funding than on delivering value. This issue is particularly acute when funding does not adjust for inflationary pressures. We note that many of our National Science Challenges, CoREs, Science Platforms, and other strategic investments have not achieved their full potential because we manage our larger science investments poorly, allow them to become captured by one or two entities, and lose sight of their role and mission.

The overhead model currently applied to science funding in New Zealand is also problematic and can drive quite adverse behaviours that promote the recruitment of students to deliver our research over staff, which contributes to the perceived over supply of PhDs and lack of job opportunities for new graduates. Review of the overhead funding methodology might help address some structural concerns and provide a heightened number of opportunities for early career researchers.

¹ [https://one.oecd.org/document/DSTI/EAS/STP/NESTI\(2015\)8/en/pdf](https://one.oecd.org/document/DSTI/EAS/STP/NESTI(2015)8/en/pdf)

² https://www.cca-reports.ca/wp-content/uploads/2021/05/Powering-Discovery-Full-Report-EN_DIGITAL_FINAL.pdf

As a last point, we need to be mindful of the ongoing need to keep the compliance costs of science funding modest, whilst ensuring that our processes are robust, defensible, and deliver the intended outputs and outcomes. We tend to over manage and over govern our science investment. Science absolutely needs to be accountable, transparent in the way we spend public money, and able to demonstrate the value we deliver to our stakeholders. However, as a nation, complex governance structures often manage relatively small investments (10% of some CoRE budgets are spent on governance). There is also opportunity to simplify reporting for some entities – we favour the yearly reporting adopted by funds such as Marsden. We would welcome a higher trust model that supports our science sector than the low trust watchdog model we have had this past 30 years.

4. Ngā Hinonga: Institutions

- o How do we design collaborative, adaptive and agile research institutions that will serve current and future needs?*
- o How can institutions be designed to better support capability, skills and workforce development?*
- o How should we make decisions on large property and capital investments under a more coordinated approach?*
- o How do we design Tiriti-enabled institutions?*

The New Zealand science ecosystem has not always incentivised collaboration. Notably, the business models used to run our predominantly publicly funded CRIs and tertiary institutions for the past decades have often proven an impediment. We believe the creation of collaborative, adaptive and agile research institutions will significantly enhance research.

We have had some success when we have approached problems from a mission led perspective, with various CoREs, NSCs and other entities established to deliver against our various mission-led objectives. Unfortunately, because science funding remains so competitive and budgets remain static, these entities frequently become insular, institutionalised clubs, that are hard or impossible to join, and thus rarely achieve value that is greater than the sum of their parts. As a result, such entities are often a barrier to a diverse workforce. If we are to pursue these sorts of models in the future, care must be taken to ensure they remain open, collaborative, dynamic and responsive to embracing new opportunities, new knowledge, new approaches and new talent.

5. Te Hunga Mahi Rangahau: Research Workforce

- o How should we include workforce considerations in the design of national research Priorities?*
- o What impact would a base grant have on the research workforce?*
- o How do we design new funding mechanisms that strongly focus on workforce outcomes?*

Our science workforce is world class, but ongoing issues remain. Key among these is the need to enhance the diversity of our workforce and provide career paths that have flexibility and stability. Base grants may reduce some of this precarity, but to ensure that funding supports research, and not other institutional activities, the details of how funding follows through our science system will matter.

For many young people the structural challenges of the system are a significant impediment to recruitment and retention. At many levels salaries have been eroded, while positions lack security and opportunity. These issues pose challenges when trying to build a bright and diverse workforce – for many being a scientist is considered alongside opportunities as a health professional/IT specialist etc. When compared to the opportunities in other careers, a research path of short, fixed term positions, with little prospect of promotion, and high degrees of uncertainty, does not hold much appeal for our best and brightest students. These issues need to be addressed to ensure we have a strong workforce in the future.

Additional funding for postdoctoral and career development fellowships would help develop early career researchers into research leaders, but in addition to training these individuals as academic leaders we need to develop and support a greater level of entrepreneurship in our science workforce. This will require greater focus on career path and security of funding – not just for the leaders of research initiatives, but also for the excellent practitioners (senior technical staff and research fellows) that are vital to the success of all research groups.

In general, we need to strengthen our business linkages to create workforce outcomes. We also need to retain and, enhance our international connections. These connections are vital for knowledge and skill transfer. Schemes that encourage and support a nationally mobile and internationally connected workforce, and that ensure New Zealand develops and maintains connections with international leaders, is critical to our future success. Such matters are easy to overlook when focused on the issues within our science sector, but we need to look outward as well as inward.

Capacity building for Māori and Pacific research needs greater resourcing, starting early with a focus on widening participation. Engaging Māori and Pacific communities so that they can observe and experience the value and impact of science on their daily lives and the value of science as a career, of equal value to that of a doctor or lawyer is essential. Again, this is where career stability is a necessity. We must provide a system that nurtures, supports and values our researchers to enable healthy and productive research careers. This needs to be achieved through mechanisms that support researchers at all career stages.

6. Te Hangahanga Rangahau: Research Infrastructure

o How do we support sustainable, efficient and enabling investment in research infrastructure?

We support UNZ's position that there is a need for large capital infrastructure to be funded by government, perhaps via competitive rounds, and that this is accessible to all relevant researchers at appropriate market cost. However, alongside any large infrastructural investment, it is important to ensure that highly skilled technical staff are funded alongside capital investment so that we can achieve maximal benefit for New Zealand from our infrastructural investments.

The Australian and Canadian science systems seem to have tackled infrastructural support better than many and may be models worth considering. There are good models where access to infrastructure is managed in an independent manner that avoids issues of institutional capture.

As with our points above, there needs to be a more collaborative and integrated approach across our science sector to the acquisition, running and maintenance of our research infrastructure.

Increasing New Zealand's national research infrastructure will have positive effects for the workforce, including technical support capability. Improved research infrastructure will also help in training, recruiting and retaining research talent.

Yours sincerely

A handwritten signature in black ink, reading "Neil Gemmell". The signature is written in a cursive style with a large, stylized "N" and "G".

Distinguished Professor Neil J. Gemmell
Dean
School of Biomedical Sciences