18 March 2022

RE: **Green Paper submission**

TO: FuturePathways@mbie.govt.nz

To whom it may concern,

I am making this submission in my role as the Director of the Ferrier Research Institute because:

- Although the Green Paper has a focus around the settings for CRIs, my Institute is a key applied, professional science capability for New Zealand. We used to be in a CRI (IRL) that no longer exists, but we maintain the same focus of creating value for New Zealand, in our case in economic, environmental and health measures. The changes foreshadowed by the Green Paper are likely to impact us just as much as other research institutions. Please don't overlook us!
- I will boldly claim that we are New Zealand's leading applied (bio)chemistry R&D team, its most nationally and internationally collaborative science team, and that we have experience of what works.
- We have experience over the last 40 years of creating sustainable research careers for top talent in (bio)chemistry.
- I wish to provide some observations about New Zealand's Research Priority setting and meeting our Treaty commitments.

To understand our experiences, I thought it might be useful to first provide some background to the Institute, then address the above points.

A little history of Te Kāuru - Ferrier Research Institute ("Ferrier")

As of today, we are a **team of 78**, comprising **54 science and technical staff** (46 with a PhD degree, 37 on permanent employment contracts, 17 on fixed-term contracts), **6 support staff** and **24 PhD students**. We operate from laboratories at Gracefield (rented from Callaghan Innovation) and Kelburn.

This team was founded in 1984 from the Applied Organic Chemistry section of DSIR Chemistry with 4 staff members. By the time it transferred to Industrial Research Limited (IRL) in 1992 as the Carbohydrate Chemistry team, it had 14 science staff. In its 20 years at IRL, the team continued to grow, split off its process chemistry section (5 science staff) to found GlycoSyn, and founded a Protein Science & Engineering section based at University of Canterbury. After IRL was absorbed by Callaghan Innovation, most of the Carbohydrate Chemistry team (25 science and 1 support staff) transferred to Victoria University of Wellington to establish the Ferrier in January 2014.

When the then VUW Provost Prof Neil Quigley brought us in to the University, it was on the basis that we would be moved to Kelburn at the "first opportunity". This hasn't really happened. Although, in 2017, when Prof Emily Parker and her team were a strategic appointment for the Ferrier - new labs had to be furnished for them at Kelburn (after Callaghan Innovation was unable to provide space for her team at Gracefield Innovation Quarter)

Facilities

In our eight years, the Institute has experienced rapid growth, to a point where it is now constrained by (over)-full use of available space.

A roof fire in 2018 displaced a significant portion of the Institute at Gracefield into temporary labs around the site. This was remedied by the creation of a Portacom village for support staff (Kahiwi), a refurbished vaccine research laboratory and the construction of Flexible Labs (Te Pā Harakeke), a $6M investment by Callaghan Innovation, to be occupied in May 2022.

The Gracefield Innovation Quarter (GIQ) has world-class scientists, and they have state-of-the-art scientific equipment, but the site and buildings are, to be polite, 'tired'. At Callaghan Innovation's initiative, we have been one of three key stakeholders (along with Callaghan's GlycoSyn and Bioactive Technologies teams), contributing to a business case for a GIQ BioTech Hub, for consideration by Government. Unfortunately, after 2 years of work, this was not invited for consideration in Budget 2022.

So here we are today, a world-class applied science Institute, split over two sites, space constrained and at Gracefield in yester-years buildings, with no specific plan to address this on the horizon. *We are keen to present our case for relocation to a purpose-built new facility as part of the outcome of the Green Paper!*

Collaboration

Our institute specialises in organic chemistry, biochemistry and synthetic biology. In our mission to deliver the science & technology packages needed for new product development by industry, there are many other disciplines that need to be brought to bear. Having come from DSIR Chemistry then IRL, where we did not have access internally to such skills, we chose to make our weakness our strength. We focused on being superb at what we do, sought out world-class science partners and formed strategic research collaborations with them, sharing the costs and benefits of commercialisation.

In every case where we have been successful in these collaborations both nationally (AgResearch, CI, ESR, Malaghan, Manaaki Whenua Landcare, NIWA, PFR, and Auckland, Canterbury, Otago, Waikato Universities) and internationally (Australia, Singapore, UK, USA), these relationships work because we have something they need, and they have something we need. In no case has distance been a problem. A 28-year collaboration with the Albert Einstein College of Medicine in New York is our stand-out example. Transitioning from fax to email, to visits, to Zoom meetings, it's all been about communication and having strong personal connections.

Co-location is not a panacea – I found one study that showed the benefit of proximity dropped off to near zero if there was a stairwell involved. But there are two definite benefits of clustering:

- Clustering an area of expertise and facilities as we have done with the Ferrier, and as the Malaghan Institute of Medical Research have done in Immunology, is a way to gain more efficient use of resources and to be more competitive internationally. At Gracefield,

Ferrier and Callaghan Innovation's GlycoSyn and Biotechnologies operations have supported a shared, now jointly owned and operated NMR Spectroscopy Facility with 4 high-field instruments. Similarly, a CI (GlycoSyn) - VUW (Ferrier) Joint Venture provides clients a smooth transition from bench to scale-up to GMP manufacture. These are definite benefits of co-location.

- There are real benefits of size when considering the management and maintenance of the infrastructure for a cluster of research facilities, as in a University Campus, or at the Gracefield Innovation Quarter (GIQ). After some inertia, there is now real clarity of purpose and action at GIQ.

Science careers

We have direct experience with creating sustainable employment for scientists. With or without a FRST Postdoc scheme in place, we have been pro-active in bringing kiwi talent home following their OE (post-docs in Oxford, Cambridge and other leading institutions), bringing with them an understanding of their ability to match the overseas talent, and with great connections and new knowledge. We have moved with the times to have a pro-active EDI policy, facilitate return to the workforce after childbirth, and provide role models for junior staff and post-graduate students.

To do this we have had to overcome our owners' reluctance, and our own fears for our team, towards taking on the financial risk of making staff permanent (after proving themselves in a 2-year spell of fixed-term employment). Our belief is that if we are excellent at what we do, interact positively with the outside world, and deliver on promises, then we will always be wanted (and funded). The reality is, however, that each investment in personnel largely precedes funding. So far, so good, but the fear never goes away. The risk can be debilitating for those without the size and track record we have built up.

The Implementation Steering Committee, in setting up the CRIs said "scientists just have to get used to the idea that the Government doesn't owe them a living". The CRI Act separated the purchaser of services from any responsibility as an Employer; in consequence the "doing it for NZ" culture was eroded in the face of a "doing it for the financial stability of the Employer". As evidence of the (perverse?) incentive to drive for increased revenue, for two years IRL had a team profit share scheme where, in its first year of operation, each of my team members was paid the maximum $20,000.

I look forward to seeing a practical plan to address stability in the science infrastructure and talent recruitment and retention. Part of the answer may be to strengthen and stabilize the Institute model within Universities (that currently are not incentivized to take risk). Meanwhile our Institute will continue to do what it can towards these goals.

Research Priority setting

I am reminded of Sir Paul Callaghan's cryptic comment that in New Zealand "we will be good at what we are good at". Certainly, we face major challenges as a Nation, with top-level Government priorities such as climate change, wellbeing, renewable energy, pest control, and not the least – **having enough money to pay for the products and services** we require from offshore. But, while we can make scientific contributions to these challenges, we rely on progress from the global science community to make any real headway.

So, we need a well-informed, career-committed science workforce who accept the "**doing it for NZ**" spirit. The Universities can definitely lead in being well informed and having the freedom to

publicly communicate their expertise. And the Governmental Science Advisors are a brilliant invention, informing those with needs of what providers have to offer.

When we support specific research programmes against top-level Research Priorities, however, we need wise heads to select the sensible ideas where NZ investment can make a difference. The best ideas come from bottom up in a science system, so who is best able to recognise, encourage and invest in them. Over time we have tried different approaches - Are these wise heads to be found in the career science managers of DSIR? Are they to be found in the Government bureaucracy? Are they to be found in the panels brought together to review applications? Are they able to be assembled in NSCs?

In my experience, it works better when **those who select the investments are there to be responsible for the outcomes – career science managers with budgetary discretion**. Unfortunately, we have almost completely disassembled these career paths, and will continue to suffer poor strategic outcomes until we reverse this. Such managers would never think that an 87% discard rate in contestable funding rounds was acceptable for carefully thought out Programmes of work, involving hours spent building relationships with users. Maybe as a first step, set a goal of no more than a 50% discard rate and work out how you get there. And make sure that we re-educate our scientists to forget the times when "the biggest lie wins".

One of the hardest things for working scientists to do is the engagement with end users. Part of it is the culture barrier, part of it is its not what they want to do. But in the end, if their science is to have impact on Government priorities, it is this interaction, the **building of long-term trusting relationships and the commitment to implementation by the end users** that is necessary.

There are always good examples but not enough of them, and I don't see as much of this being incentivised as I think is necessary. It's not easy to do when research funding remains a lottery. Certainly, it's a real struggle for University academics to find the time with their heavy teaching loads and fitting in supervision of PhD and post-doc research. My ambition at VUW is for our Institute (in our area of operation) to facilitate these interactions as joint initiatives. There is real enthusiasm for this across the board with Prof Ehsan Mesbahi, PVC-SHEADI.

Having enough money to pay for the products and services from overseas

MBIE Science Investment for many years has had a strong focus on creating economic benefit to NZ. It is not particularly easy to see where this focus aligns with the most recent Government top-level Priorities, though I am sure it is not the intention to turn down the heat on boosting export income.

Our Institute strategy to deliver economic benefit to NZ is based on making research discoveries, where we are the first to think of something, the first to show it works and the first to apply for patent protection. The International Patent System, to which NZ is a member, and the application of Trade Secret laws, provide great ways to establish a time-limited monopoly on products and services arising from such scientific discoveries. When combined with a technology package demonstrating the practical application of a discovery, this can be the basis for significant investment in product development.

Conversely, if we apply other people's inventions to address our top-level Priorities in NZ, we will need to pay the premium to those who have the use of the protecting patents.

Increased participation in Scientific Research by Māori and Pasifika

I acknowledge that in addressing our obligations under the Treaty of Waitangi that considerations of Maori aspirations need to be considered separately. Nevertheless, my thoughts on the following elements of how we might better address the aspirations in these communities for a greater participation the conduct of research and development have common strategic elements. There are simply not enough Māori and Pasifika students taking up STEM subjects at University for University personnel to have the necessary impact on this issue in their normal work activities. STEM subjects are mostly practical subjects, yet most secondary schools are unable to provide their students with sufficient exposure to this practical side. This is particularly the case for Māori and Pasifika students. Working with the Robinson Research Institute on its Boot Camps we have been able to give them a taste for science and the life of a scientist, and the surveys taken afterwards demonstrate how much their Boot Camp experience has set them on a course to do STEM at University.

A key part of the GIQ BioTech hub proposal is the inclusion of teaching laboratories, so that we have the facilities to host many more secondary students and give them extended Master Classes in practical subjects. Our PhD students and younger Research Fellows really enjoy doing this teaching and are age appropriate. I believe this would be the most effective intervention that we could make to address Māori and Pasifika student recruitment into science careers. We would need to get the Ministry of Education on board to share the cost of this investment, I suspect

A final comment

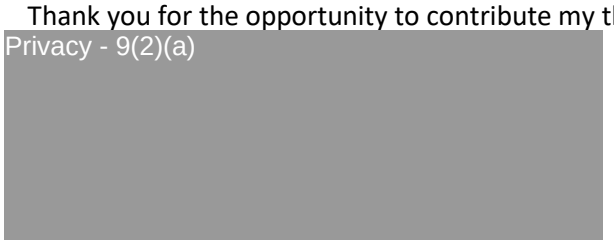
The Green Paper foreshadows the third major restructure that will have impacted my team, the previous ones being DSIR to IRL, then IRL to Callaghan Innovation then VUW.

We experienced a significant loss of productivity against prevailing research priorities during these change processes, a result of our science leadership being distracted.

The Green Paper is clear about the benefits of change, but silent on the cost of change. Let's have a plan for how we maintain the momentum of the research community as change is implemented.

Our Institute is already constrained by both the aged nature and the limited space of the available building infrastructure. I worry that our pressing needs are already being lost sight of.

Thank you for the opportunity to contribute my thoughts,



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