Public Statement for the MBIE SRI Strategy Draft Consultation Meeting – Palmerston North

My name is Rob Elshire. I am here as an informed member of the public and not to represent any particular organisation with which I may be affiliated. My views are my own. I do not anticipate looking to MBIE for funding.

I have prepared a statement that I would like to share with you and the others gathered here this morning.

For the last several years, I have had in mind a plan for my retirement. I would spend time and effort to improve our science system so that it would better serve our fellow kiwis. A few weeks ago, I watched Greta Thunberg address the UN Climate Change Conference with urgency and righteous anger[i]. She was correct in what she had to say. To paraphrase "We must act now and we must be mature enough to do some difficult things, all of us." So, here I am today rather than at retirement.

I want to tell you a bit about my background to give context to my comments. The main focus of my research has been molecular genetics and genomics for public benefit. My work has been published in some of the top journals including *Science* and *Nature Genetics* and has over 7000 citations.[ii]

I was the lead developer for the genotyping-by-sequencing (GBS) method while I was at Cornell, and the first author on the paper[iii] reporting it. That paper is in the top 5% of research outputs measured by Altmetrics.[iv] It cost an estimated 500K USD and took just over a year to create and validate GBS. In my view, when research is done with public funds, the research outputs should benefit the public as much as possible. Public money, public benefit. We did this with GBS by making all of it available to anyone, anywhere. This method has allowed for radical change in the way genomics research is being done in all relevant sectors. Let me give you just two local examples of its application. Scientists at Plant and Food Research used it to assist in developing a PSA resistant gold kiwifruit and rebuilt that export industry.[v] Our company is currently working with Massey researchers to understand the genetic relatedness of Kiwi in Northland as part of the Kiwi Whakapapa project.

My partner Robyn and I opened up a GBS service lab in 2016 funded by our own savings. No overdraft, no venture capital, and no millions of dollars of public money. Since that time we have had projects from 22 different countries spanning agriculture, horticulture, conservation, ecology, evolutionary biology, climate change monitoring, and more. In FY 2019, our company, which is categorised as a small to medium enterprise, had an **international** revenue of 209K NZD / FTE. As a point of comparision, one of the larger Crown Research Institutes reported a **total** revenue of 229K NZD / FTE for FY 2018, much of which was public money. Our company, by proportion, is adding substantially more currency to the NZ economy than that Crown Research Institute. We have achieved this in spite of the exclusionary nature of the NZ science system. Much more could be achieved with the support of a well functioning science system.

In short, I am an internationally well connected and respected scientist, a demonstrated innovator, an entrepreneur, and a business person whose business adds income to the New Zealand economy. I have contributed to the discussion around the substantial issues with our science system in various ways including a plenary talk at the 2016 eResearch conference[vi] and a concept business plan[vii] for an advanced genomics research platform published under a CC-BY license which provided solutions to some of the issues I discuss here today. I have publicly stated that much of the policy

coming out of MBIE is good and should lead to a world class science system. We have not achieved that and the Science, Research, and Innovation Strategy draft, as it stands, is unlikely to improve things.

I will focus primarily on the metrics of success as presented in the draft document. This is because behavior is driven by the things that count (or are counted) and those are the metrics. In July of 2018, I attended a road show given by Margaret Hyland and Rob Murdoch at Victoria University on behalf of MBIE. There, I raised the issue that publications and patents, while widely used as metrics in science systems, are in fact known to be very poor metrics of the things they are claimed to measure. They agreed with this assessment and I appreciate their frankness.

Let's think about the effects of the metrics themselves in terms of the behaviors they promote. In some ways we can frame this in terms of exclusion or inclusion in relation to participation in and benefit from, the science system. Frankly, much of our science system is exclusive by design. It keeps people out. It should be more inclusive and more of society should be able to benefit and participate in it. We would **all** be better off for that.

One bullet point under the category of Excellence is: "Increased diversity of RSI workforce (eg, (sic) proportion of women/Māori in RSI workforce, potentially weighted by seniority)" There should be absolutely no doubt, in any informed mind, of the importance of this aim. But, the example metric is absurd in its presentation. There are many women and Māori in the RSI system. The problem is under representation in positions of leadership (which **may** be weighted in the example metric presented). Representation weighted by positions of leadership is a fundamental way one can see if the necessary increase in diversity is occurring. It is also the way to measure which groups are meaningfully included. If this is not clear in your mind, I invite you to read some of the documents I link to at the end of my prepared statement.[viii,ix,x,xi,xii]

Patents, are exclusive by design and exclude the use of the ideas in them by the many. Publications, if not licensed under open access terms (CC-BY for example), also exclude people from gaining knowledge contained in them if they do not happen to be in a university or independently wealthy. Patented and copyrighted works are often termed IP. The perceived value of IP is so thoroughly pervasive in modern society that it is assumed valuable without examination by many, including policy makers and scientists. I have been studying these issues for about 20 years and have been arguing for the need for a more nuanced approach. So do scholars studying these very things. If you are not familiar with the current literature in this space, please see the suggested references.[xiii xiv]

If MBIE counts patents, publications, and IP as important to them, those receiving MBIE funding also count them as important ways to demonstrate success. MBIE's metrics of patents, publications, and IP related things can result in bizarre behavior which does not necessarily end with the most public benefit possible.

For example:

A recently ended MBIE-funded research programme had a contract which was confidential (as they generally are) **and** which stated in it "All GBS-related aspects of the research, including source codes, protocols and system optimisation parameters will be open-source available to interested parties and provided on inquiry." Clearly, if one does not have knowledge of the contract (which is secret), then one would not know to ask.

A hypothetical:

A pathogen is causing widespread disease in a culturally significant (or economically significant) species. Off the shelf tests are expensive, take a long time, and are not necessarily accurate for local pathogen strains. What is needed is an inexpensive, accurate, and quick test for the presence of the pathogen. This would allow more testing to be done and appropriate epidemiological modelling to inform policy decisions. A scientist presents just such an assay to the responsible agency, but they are not interested because they would not own the IP and would not be able to commercialise it for themselves. Where is the public good in this scenario? Is this what MBIE policy is aiming for?

These IP related drivers also result in a system that is not at all transparent. Everything **may** be IP, therefore everything **could** have commercial sensitivity, therefore **nothing** can be disclosed and **everything** is confidential -- more or less. The taxpayer invests huge amounts of money per year on a difficult to determine number grants and does not have any way of knowing what the grants were intended to do, how much they invested in them, or what was achieved. The example I gave should make this glaringly obvious.

In the interests of time, I will not discuss the issues of increased wealth inequality fostered by these IP regimes in combination with venture capital. Only to say our science system should be, at minimum, neutral in its effects on wealth inequality in our society.

A system of secrecy and exclusion based on metrics that are not appropriate, like the science funding system we have, does not promote connections. In fact it is completely at odds with that major stated goal. It also does not get the new knowledge it generates out for others to build on and slows innovation because of it. The convoluted system we have is confusing, inefficient, and essentially impossible to engage with, especially for those working at the cutting edge of science coming home from overseas. It favors those already 'in the club' who are privy to an understanding of the process and assessment, and generally excludes the rest. If the metrics continue to be as they are, so will the processes and we will continue to have the same problems we have had for way too long.

The world is not lacking in better metrics and models for dealing with the issues we face in our science system. I have referenced some in my public works on this topic. There are many others.

MBIE must do better, much, much better and now. As Greta said: "We will be watching you."

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i Greta Thunberg addresses UN Climate Change Conference https://www.youtube.com/watch?v=h3SmqCcNbU8
ii Rob Elshire citations: https://scholar.google.com/citations?user=GzS71NwAAAAJ&hl=en
iii GBS Paper: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0019379
iv Altmetrics on GBS paper: https://www.altmetric.com/details/183056
v PFR Kiwifruit PSA paper: https://www nature.com/articles/s41438-019-0184-9
vi eResearch 2016 plenary, "Collaboration, Capabilities, and Impact in NZ eResearch: Bridging the Gap": https://www.youtube.com/watch?v=ePQ7_SGFNks
vii GFANZ concept business plan: https://genomics nz/publications/1/about?v=1
viii Sexism in the Academy
ix Science is sexist Te Pūnaha Matatini research shows
x Why isn't my professor Māori? A snapshot of the academic workforce in New Zealand universities
xi Why isn't my professor Pasifika? A snapshot of the academic workforce in New Zealand universities
xii Do Not 'Decolonize' if You are not Decolonizing

xiii"Why 'Intellectual Property' is a Misnomer"
xiv"The Second Enclosure Movement and the Construction of the Public Domain"