SRHMRA Submission 57 — Ian Majewski

My name is Ian Majewski and I've been working in the life sciences for over ten years. I completed my PhD at the Walter and Eliza Hall Institute of Medical Research in 2007, since then I've worked as a post-doctoral research fellow in Australia and internationally. I'm currently working in the Division of Molecular Carcinogenesis at the Netherlands Cancer Institute in Amsterdam.

My research applies genomics to identify signaling pathways that become activated in cancer. My work puts me in contact with health care professionals on a daily basis; in this role I'm witness to a health care system that is struggling to keep pace with the dramatic advances occurring in genomics and molecular diagnostics. I feel that as a research community we need to prioritize a larger investment in informatics (for the biological sciences, generally referred to as bioinformatics or systems biology), to improve the way we collect and interpret data, to speed the translation of research findings, and to improve the way we communicate our findings to the healthcare system and to the public at large.

My submission concerns the last two questions being considered by the panel:

Q3. What are the health and medical research strategic directions and priorities and how might we meet them?

Q4. How can we optimise translation of health and medical research into better health and wellbeing?

Suggestion: Australia should prioritize research spending to develop bioinformatics expertise locally. This could be in the form of a dedicated research institute, or a network of researchers spread throughout the country. This bioinformatics infrastructure should bridge between the research community and the healthcare sector.

An investment in bioinformatics will ensure full value is extracted from research expenditure. The government invests significantly in data generation - through NHMRC and ARC - but the research community should be working to adopt a more holistic approach to data analysis. We need to engage diverse data types that span molecular data (like genome sequencing and gene expression arrays), clinical trial data (patient metrics, drug usage patterns, therapy response measures) and epidemiology (disease incidence).

SAGE bionetworks (http://sagebase.org/) provides an example of an organisation that is dedicated to applying bioinformatics to problems in human health. SAGE bionetworks is a non-profit organisation that builds analytical tools to study large biological datasets. The group has built an analysis pipeline that harvests data from online repositories (e.g. the Gene Expression Omnibus, which stores gene expression data), from collaborations with pharmaceutical companies (e.g. patient data from clinical trials) and from large genomics efforts that are focused on disease (e.g. from the International Cancer Genome Consortium, The Cancer Genome Atlas and the National Institute of Health). SAGE bionetworks doesn't

invest in generating primary research data, instead they develop tools to process and analyse the available data. The group invests significantly in computing and in developing analytical tools and modeling approaches. They have a post-graduate program that is designed to encourage individuals who have studied mathematics, physics and computer science to engage complex questions in biology.

The NHMRC has made some signs that it is moving to embrace the benefits of bioinformatics in healthcare. For example, NHMRC released a discussion paper that encouraged the establishment of 'Advanced Health Research Centres' that would implement advanced technology in hospitals. While I think this is a notable effort, I think it is also important to consider how we can shape the health care system to feed information back to the research community (with appropriate privacy safeguards). Developing these integrated systems will allow for the application of unbiased computational approaches that will identify trends in patient data. This would benefit many areas of research, including: 1. The identification of biomarkers (tests to stratify patients for different therapies) and 2. The identification of preventative health care measures (identifying individuals at-risk of developing disease).

Over the next five years, under the auspice of the International Cancer Genome Consortium, the Australian research community will invest approximately 40 million dollars in genetic studies in pancreatic and ovarian cancer. How will we gauge the return on such an investment? It is relatively straightforward to monitor research output in the form of publications or patent applications, but we should be looking to monitor data usage and translation. Some guiding questions could be: Who is accessing the data funded by the grant? How is the downstream data being used? How is it being applied to improve health outcomes in the community?

Australia should invest to recruit and train researchers that are familiar with these approaches to accelerate the connection between the health and research sectors. Targeted recruitment programs are beginning to appear in major European institutes. For example, the Flanders Institute for Biotechnology (VIB) in Belgium has partnered with the European Commission Marie Curie FP7 People Fund to recruit post-doctoral researchers with experience in ‘integrative biology’. This is a quote from their promotional material:

‘… This EU-supported program targets the recruitment of international postdocs who can accelerate the integrative biology approach in VIB labs. Integrative biology is a holistic approach to biological questions (genome-wide, omics approaches) combined with functional analysis and computational biology in order to integrate the wet-and-dry-lab approach.’

The ‘omics@vib’ program obtained over 2.9 million Euros from the EU, and will fund 20 post-doctoral fellows for three years. I believe a similar program would have major benefits for the Australian research community.