

Response to the “2030 Strategic Plan Issues Paper” by the EMCR Forum of the Australian Academy of Science

Introduction

The Australian Early- and Mid-Career Researcher Forum is the national voice of Australia's emerging scientists, representing researchers who are up to 15 years post-PhD (or other research higher degree), irrespective of their professional appointment. The Forum engages with early- and mid-career researchers (EMCRs) from around Australia and advises the Australian Academy of Science on issues relevant to EMCRs, to help inform its policy recommendations to government and develop its EMCR activities. It also liaises with other national organisations to positively contribute to both Australia's scientific research and the future careers of emerging research experts. The Forum provides a vital connection between Australia's most eminent scientists and tomorrow's future scientific leaders.

The responses presented in this submission are based on a consultation process with EMCRs from around Australia: 138 EMCRs responded to a detailed survey, and provided follow-up feedback to specific questions.

It is the position of the EMCR Forum that emerging researchers should play a key role in defining Australia's scientific future. Not only are we the group who will be most affected by changes in the scientific landscape, but young researchers possess the enthusiasm, innovation and understanding of cutting-edge science necessary for effective change. We are therefore grateful for the opportunity to prepare this submission and would welcome a continued role in the preparation of the 2030 Strategic Plan.

The EMCR Forum identified challenge 4 and challenge 6 of the issues paper as those most relevant to EMCRs. Our submission focuses on these two challenges. We also offer some general principles which we think need to be considered in crafting the 2030 Strategic Plan, including considering the main purpose of innovation, considering equity and diversity and supporting the future of research capability in Australia.

General Principles

The main purpose of science and innovation in Australia is to benefit the Australian economy and its people, and address big challenges to improve lives around the world.

When asked *What do you see as the main purposes of innovation in Australia?*, EMCR responses clustered in the following categories:

- *To benefit the nation:* innovation is seen as essential for Australia to be globally competitive, both economically and socially. In particular, innovation is crucial for the creation of future industries that will provide employment and strengthen the economy.
- *Improving lives in Australia and globally by addressing big challenges:* innovation is viewed as a means to improving quality of life and preparing society for the future challenges of population growth and climate change.

Future research innovation will require diversity and equity

The EMCR Forum strongly advocates that any plan for the future of Australian research must include mechanisms that support equity and diversity. When asked the question *How can the 2030 strategic plan support the principles of diversity and equity?*, many respondents stated that the most diverse teams are the most likely to be innovative. Many respondents recommended clear, actionable policies and targets that promote diversity and equity, based on the latest research and evidence.

It was also deemed of high importance to ensure that diverse voices are contributing to the strategic plan. Innovation can be measured in more than economic terms and respondents suggested targeted efforts to support marginalized scientists, de-stigmatising those who take a break from research regardless of reason or gender, and developing innovative workforce programs such as job-share, longer term postdoctoral positions, and undertake an Australia-wide audit of skills diversity.

Respondents requested specific funding for early career researchers to kick start equality that will lead to greater innovation. To support this, we think that the 2030 strategic plan should enable free movement of researchers, including at borders, between industries and institutions.

Supporting future research capability requires development and financial support of future research leaders.

Amongst responses to the question *How can we effectively support future research capability*, unsurprisingly, the most common answer centred on the need for increased funding for research. However, a common theme emerging from these answers was that existing and future funding must be divested in an equitable manner, rather than being

biased towards the most established researchers whom, under the current system, are already very well provided for. Greater opportunities for career progression and development was also identified as being essential for retaining researchers and preventing talent being lost overseas. Other factors that were identified as being essential to future proofing the scientific workforce were greater job security, and assistance with heavy administrative loads in many institutions.

Challenge 4: Maximising the engagement of our world class research system with end users

A well-supported and impactful world-class research base

A focus on research translation is not sufficiently supported by the current system.

Over three quarters of all respondents (spread across academia, government and industry) answered “Yes” to the question *In your current job, do you feel the need to prioritise research output over research impact?* From the accompanying comments, it is clear that the majority think that employers prioritise research output over impact and that funding success (both for the ARC and the NHMRC) is heavily weighted towards research output. This is of particular significance for EMCRs, many of whom rely on annual contract renewal based on publication metrics, and because there is a longer lead-time in demonstrating research impact. However, if fundamental scientific research is to continue to be a priority in Australia, then the definition of research impact must be sufficiently broad to apply to such research.

Importantly, respondents who answered “No” identified the support and encouragement of their employers towards impact over output as being key, thus identifying the crucial role of institutional change in driving this frame shift in the future.

Current grant funding is insufficient to support research that has impact in Australia and globally. Over 95% of respondents answered “No” to the question *Do you think that current grant funding is sufficient to address the needs of the nation, as well as global challenges?* In particular, EMCRs are concerned about:

- The inefficiencies generated by the large efforts exerted in grant-writing, for such low success rates; and
- The fact that grant success is skewed towards senior researchers, preventing EMCRs from establishing productive research careers that will continue into the future.

When asked to *identify the priority for increased research investment*, responses were split evenly between fundamental research, global challenges and needs of the nation.

Enhanced mobility for innovators across the system

There is currently a lack of mobility between academia and industry, largely due to an emphasis on track record in academia. Over 80% of respondents answered “no” to

the question *Do you think that it is (generally) possible to move away from research, and then return at a later time?* Over half of these responses identified the pressures of maintaining an academic track record as the primary reason for their answer. While funding bodies and employers continue to rely heavily upon publication metrics as a measure of research potential, researchers will continue to be discouraged from moving between academia and industry.

From among the EMCR community in Australia, there are notable examples of those who have successfully moved between academia and industry. It is important that these success stories are showcased to those seeking to do the same. The EMCR Forum is currently compiling case studies that highlight successful individuals.

There must be further opportunity for interactions between industry and academia.

A large number of EMCRs identified the need for schemes that enable academics (or research students) to take part in industry internships. The Industry Fellowships (Royal Society) and Innovations Partnerships Fellowships (Science & Technology Facilities Council) schemes in the UK provide a model for a successful scheme of this type. Furthermore, less formal interactions at conferences and meetings were identified as crucial to facilitating face-to-face interactions. Cultivating productive industry-academia partnerships often has a long lead-time, far longer than typical grant timelines, necessitating more long-term support to move researchers along this pipeline. Industry-academia engagement is a key priority of the EMCR Forum's activities: we have released a discussion paper on the topic (www.science.org.au/files/userfiles/support/emcr-activities/academia-industry-discussion-paper-consulation-draft.pdf) and are currently preparing best practice guides to this end.

Academics must be supported in commercialisation activities. The innovation industry in Australia will be revolutionised when the latest innovations coming from research are commercialised, but this is not an area in which academics are usually trained. National schemes that provide commercialisation training and house start-up incubators will greatly facilitate this process. The cultivation of relationships with industry must be valued more within academic institutions and funding bodies.

International research experience is key to a productive research career and must be facilitated. The Australian research community is limited in size, so to ensure that researchers have access to new ideas and skills, it is essential that they have the opportunity to train and work for periods overseas. Only 12% of respondents believed that it was “easy or very easy” *for someone to develop a productive research career without any international experience*. Over half of the responses indicated “difficult or very difficult”. Given the value of overseas training, it is important to develop mechanisms by which researchers can undertake periods of training overseas, whether as part of postgraduate studies, postdoctoral research, or for sabbatical research. Broad funding schemes will ensure equal opportunities to access such a scheme across sectors, employers and regions. At the same time, an expectation that other countries will provide training to Australian researchers mandates a reciprocal arrangement, and it is therefore

essential that researchers from around the world can perform research in Australia, for example through an academic or research visa.

Increased mobility requires the creation of new funding schemes and initiatives. A number of respondents identified the typically short contracts of EMCRs and the associated pressure to produce output to secure further employment, as key deterrents to seeking mobility opportunities. Longer contracts, along with the availability of specific travel grants are essential to enable a more broadly-trained cohort of innovators. Many also identified the need for assistance in relocating families and for support of researchers seeking to return from overseas. EMCR respondents suggested that the EU's Horizon 2020 model should be studied as an exemplar for promoting mobility between sectors.

A flexible research training system

PhD training should prepare graduates for a range of careers, but it currently does not. In Australia, in all sectors, there were 8100 PhD completions in 2014 and a net increase of only 1200 academic jobs[1]. It is clear, therefore, that PhD graduates must be prepared for a range of careers beyond academia and, perhaps, beyond research. Over 88% of respondents agreed that *research training degrees should produce graduates for a diverse range of sectors, even those beyond science or research*, but less than 50% believed that *current research training degrees are producing graduates for diverse careers*. We support the implementation of recommendations to improve the delivery of transferable skills in higher research degree training, which were identified in the recent review of the Australia's RTS undertaken by the Australian Council of Learned Academies.

Research training should be driven by the student, not the supervisor. The current Research Training System (RTS) provides students with funding to complete the PhD project of their choice. For RTS-funded students, therefore, their funding is not tied to that of their supervisor: while they would be expected to contribute significantly to the research of the group, their independent funding places them in a position to ensure that their own training needs be met as appropriate for future career aspirations. Such a scheme aligns well with the aspirations presented in the issues paper and we feel that this model should be retained.

Challenge 6: Bold, high-impact initiatives

Undertaking bold, high impact initiatives

Research that does not fall under the remit of "bold, high impact initiatives" must still be valued. While over 75% of EMCR respondents agreed that *Australia should identify key bold initiatives to pursue*, less than 7% agreed that *Australia should solely focus its research on key bold initiatives, at the expense of small-scale blue sky activities*. Given unpredictability surrounding high impact initiatives, a small country such as Australia must invest in a balanced portfolio of research. A failure to maintain small-scale

research operations will stifle innovation, and thereby affect future research efforts. A number of high impact innovations have come from fundamental or small-scale research projects; for example, the CSIRO Wi-Fi patents were developed for radio astronomy as part of a fundamental research project - the commercial implications did not initially drive the project. This highlights the fact that often the most successful bold initiatives do not come out of careful planning, but from reacting quickly to exciting research results, whatever their origin.

Taking a consultative approach

The decision-making process regarding bold initiatives must be led by experts and include the involvement of EMCRs. Over 50% of EMCR respondents suggested that a specialist team of experts *should make the decision on which bold initiatives to address*, rather than universities, government, voters or funding bodies. Furthermore, we believe that EMCRs should be key to this process, as they are often leading the most innovative research and have a broad perspective on the future of research in Australia.

Being rigorous in selecting and executing high impact projects

Australia must lead in selecting relevant bold initiatives, rather than react to the agendas of other countries. The Australian research community cannot compete with the research agendas of many larger countries. In order to have global impact, it is important that the Australian agenda is not driven by that of other countries.

Over 65% of the respondents to our survey identified one or more national burning platforms. We summarise the most prevalent findings here, and can provide more detailed information on request. Over two-thirds of responses related to climate change and renewable energy, encompassing cleaner power generation and optimised usage; ecological sustainability; and solar energy. Other common responses included the aging population, agricultural research such as increased food production; computational capacity; and health.

[1] Department of Education and Training (2015) *Staff: Selected higher education statistics 2014* and *Students: Selected higher education statistics 2014*, Department of Education and Training