Cruxes Innovation's response to Australian Universities Accord Discussion Paper, April 2023

Cruxes Innovation welcomes the opportunity to provide its response to the Australian Universities Accord Discussion Paper.

Cruxes Innovation exists to help unlock the huge impact potential of Australian research, by giving researchers and industry leaders the skills and support to become engagement leaders, by creating partnerships between research, industry, community and government. Cruxes' co-founders Emily Chang and Jonathan Lacey have a long history of involvement in the science and research innovation ecosystem, as researcher, innovation champion, strategic investor, spin-out CEO, technology licensee, and coach; in universities and PFROs, multinationals and start-ups; in Australia and Silicon Valley. For the last five years we have designed and delivered structured coaching and mentoring programs to help Australian researchers lead impact creation, by founding spin-outs and/or in partnerships with industry. Cruxes Innovation has worked with over 850 Australian researchers, in all fields and at all career stages, at more than 30 Australian universities, since its launch in early 2020.

Cruxes Innovation's goal is to help enable a system that, by 2025, creates ***thousands new Australian jobs per year***, driven by translation of Australian university research, and establishes Australia as a global leader in developing a resilient, sustainable, innovation-led economy. This system will enable both industry pull and research push, by established companies as well as start-ups and spin-outs; and it will support trans-disciplinary research, because of the pivotal role of humanities, arts and social sciences (HASS) research in technology adoption and behavioural change that drives lasting positive impact in society.

Cruxes' responses to selected questions in the discussion paper are as follows. These responses draw on our recent responses to the Federal Government's University Research Commercialisation, Australian Research Council review, National Reconstruction Fund consultations, and the National Science and Research Priorities Review. Cruxes Innovation consents to its submission being made publicly available.

Q23: How should an Accord help Australia increase collaboration between industry, government and universities to solve big challenges?

The Accord can play a key role in driving a transformation of Australia's research and industry cultures to increase collaboration by:

- Providing sustained, long-term focus on a clear mission to demonstrate and communicate the benefit that Australian universities bring to the nation's economy, society, culture, communities, environment.

- Be inclusive of all fields of research and professions to draw in the maximum research and intellectual capacity of industry, government and universities to solve complex, wicked problems.
- Support universities and the research ecosystem to create 'slack' in the current teaching and research resourcing system to allow more risk-taking for academics to pursue collaborations with industry and community which might not result immediately in highly cited papers.
- Continue long-term investment in the establishment of compelling, prestigious alternative promotion systems that give academics confidence to pursue a career pathway that isn't determined by publications. For example, offer highly prestigious government-funded positions for researchers focused on industry collaboration and entrepreneurship - equivalents of the ARC's DECRA, Future and Laureate Fellowships - to incentivise changes in university promotion criteria. This must be done at a scale that will drive large-scale change in the university culture. "Impact DECRAs" would encourage entrepreneurship by reducing risk for postdocs in founding research spinouts. We also recommend the creation of a highly-prestigious funding program for Centres of Excellence in Innovation, to parallel the ARC's existing Centres of Excellence in research, perhaps headed by "Collaboration Laureates."
- Facilitate sector-wide industry and government coordination to identify and solve sector-wide innovation challenges, and provide specific funding to support this.
- To encourage industry investment in innovation and R&D: provide a clear and consistent articulation of the roles of all the various government funding schemes available for innovation projects at every step along the innovation journey.
- Champion and support regular measurement of the Australian innovation system with a scorecard and extend this to include research translation measures as recommended by the Innovation Metrics review.

We note that a system-wide culture change of the scale needed here will require disruption, bold experimentations, tolerance to failure, and willingness to challenge existing practices that have succeeded in the past. To enable these changes, the Accord must create a safe space for individuals, organisations, and institutions to change and evolve.

Q24 What reforms will enable Australian research institutions to achieve excellence, scale and impact in particular fields?

For Australian research institutions to achieve excellence, scale and impact, we recommend that a number of barriers and constraints are removed and reviewed. These include:

- Changing of employment practices (see our response to Q38).
- Outcome and impact monitoring and planning must be mandated in government (ARC and NHMRC) research funding schemes to encourage

ownership of research engagement and translation by research institutions.

- Government research funding programs must enable researchers who have research outcomes with commercial potential to apply for funding while they wait for their university to progress IP protection decisions and execution. It is very important that researchers remain globally competitive as discovery researchers while they pursue research impact. For example, the ARC might enable funding applicants to select an "assessor do not disclose" option on their funding applications. This approach would have the additional benefit of identifying universities who have limited resources to progress IP protection.
- Government-funded research and research translation projects must mandate simple, clear IP terms favourable to Australian industry. University-industry IP misalignment today is compounded by under-resourced university technology transfer offices (TTOs), not incentivised to generate impact. We recommend that the Accord champions Australian universities that close the most IP licences each year. US universities have found that a high TTO ranking is a competitive advantage in recruiting top academics. Fostering a similar culture in Australia will incentivise universities to reward their TTOs for streamlining IP negotiations with industry and with entrepreneurial researchers (spin-out founders).
- Reducing administrative overload of academics by leveraging technology and removing process inefficiencies so that we allow researchers to focus on what they do best.

Q25 How should Australia leverage its research capacity overall and use it more effectively to develop new capabilities and solve wicked problems?

We believe that climate change is the greatest challenge facing the world, especially Australia. We need to urgently transition the Australian economy to survive climate change. In parallel, additional steps are needed to preserve Australia's standard of living: the Australian economy must become more complex and more directed towards providing higher-value goods and services. Many Australian companies and communities must innovate immediately and significantly to merely survive climate change, and must innovate further to generate more value. Much of this innovation can be driven by breakthrough science and research from Australia's universities. Australia is currently constrained from leveraging our world-leading breakthrough science and research to drive economic and social transformation by the limited collaboration between Australian scientists and researchers and Australian industry, government, and community groups. Further challenges include Australia's small size as a product/service and capital market, our low population density, and our distance from economic epicentres and larger markets; and our small manufacturing base.

We share the belief that the huge, fundamental, and painful transition that climate change is forcing in Australia's economy and society present a never-to-be-repeated opportunity for Australia. We have the opportunity to transform Australia into a nation that not only survives climate change but leads the world towards a safe and sustainable future, and through this transformation evolve into a more complex economy based upon creating and delivering higher-value goods and services.

To seize this opportunity, we must draw upon the huge and disproportionate strength of Australia's researchers and university research system. While immediate action is needed to address the challenges discussed above, we recognise that the required transformations will take decades to complete, and significant contributions from university science and research will be needed throughout this period. So it is important that Australia's research strengths are maintained during this period, and that fundamental research as well as applied research continues. More critically, for breakthrough science and research to be commercialised, translated and adopted, humanities, arts, and social science research disciplines, with their focus on human behaviour, social structures and policy, will play a vital role.

Q26 How can Australia stimulate greater industry investment in research and more effective collaboration?

We believe that Australian industry investment in research and Australian research-industry collaboration are at much lower levels than in other advanced economies because ***neither Australian universities nor Australian industry see the other as essential partners***. We believe there is an opportunity to leverage the Accord and the government's investment in the National Reconstruction Fund (NRF) to address this. Australian businesses in the NRF priority areas must be encouraged to take innovation risks to build products and services that are technically more complex, sophisticated, and/or advanced, so that they move to new positions in the value chain - higher or more closely towards consumers. To achieve this, industry professionals (engineers, technologists, scientists, product managers) in these businesses need the skills and tools to identify these new opportunities, and to collaborate effectively with research professionals to address innovation challenges to capture them. The necessary capabilities include:

- Identifying and validating innovation opportunities
- Identifying and articulating innovation challenges in language understood by researchers
- Collaborating with appropriately-skilled researchers to address these innovation challenges
- Defining research translation proof-of-concept projects to address these innovation challenges, and managing researchers' timely execution of these projects
- Identifying the role that intellectual property (IP) plays in capturing these opportunities, and creating and supporting the protection of this IP.

When these capabilities are in place and the system is working optimally, we will observe the following behaviours, enabled by these capabilities:

- Large-scale mobility of professionals between research and industry
- Sector-wide coordination and data sharing to identify and solve system-level innovation barriers and challenges
- Rapid prototyping and tolerance of failure
- Creation and protection of strategically significant IP
- Access to and engagement with early-adopter customers.

We recommend that the Accord addresses these barriers by supporting a sustainable model to catalyse and nurture the creation of industry-research collaboration success stories that demonstrate significant financial benefits for both industry and universities. We recommend that the Accord supports targeted initiatives including:

- Increase industry innovation and research collaboration capability through;
    - Attractive packages (including visas) to attract global technical & entrepreneurial talent with these capabilities to Australia, especially expatriate Australians
    - Structured, government-subsidised capability development (training, coaching and mentoring) programs for industry (especially SME) leaders.
- Reduce barriers for industry to identify and engage researchers to address innovation challenges: independent, government-subsidised industry-researcher match-making, potentially based on Scotland's Interface program, modified to initially offer each SME R&D challenge to the single university research group best-equipped to address it. This will seed long-term university-SME partnerships, rather than creating bidding wars between universities.
- Increase mobility between research and industry: greatly expanded industry PhD programs and industry fellowships (thousands per year) for university-based researchers and industry professionals.
- To encourage industry investment in innovation and R&D: a clear and consistent articulation of the roles of all the various government funding schemes available for innovation projects at every step along the innovation journey.

These steps will overcome these barriers and encourage additional industry investment in and collaboration with research.

Q27 How can we improve research training in Australia including improving pathways for researchers to gain experience and develop high-impact careers in government and industry?

We recommend that the Accord help improve pathways for researchers to gain industry experience and develop high-impact careers beyond academia by:

- Providing resources to equip researchers to develop "ambidextrous" skills - capabilities in both discovery research and research translation- and skills

to plan their research projects for impact, and to evaluate and monitor this impact. This could be achieved, for example, by supporting a government funding agency such as the ARC to run an "Impact Academy" to which all researchers applying for government research funding have access. This idea builds on the proposal from Science and Technology Australia (STA), of which Cruxes Innovation is a proud member, for the ARC to help researchers acquire science communication skills. Just as STA would be an ideal partner to deliver this training, Cruxes Innovation would be an ideal partner to deliver the broader "Impact Academy."

- To increase researcher capability to lead industry engagement and entrepreneurship: national-scale industry engagement coaching and mentoring programs for Higher Degree Research students and early-career researchers, aimed at reaching thousands or tens of thousands of researchers each year. Examples of successful international best practice include the US National Science Foundation's I-Corps and Innovate UK's ICURe. Based on these examples and our Australian experience, we recommend that the programs include:
    - Regularly-updated government certification of core program content and delivery personnel, to ensure and maintain uniform high quality.
    - Program delivery is primarily government-funded, e.g. by extra Research Block Grant funding to universities who offer the programs.
    - Universities provide sponsorship (in-kind or monetary) to their researchers who participate in the programs, to ensure that the university supports the participants and their projects.
- Funding trans-disciplinary research projects, programs and centres, capable of exploring complex solutions to complex problems, and therefore engaging more deeply with industry and government partners, and generating more career pathways for researchers than single-discipline research. Trans-disciplinary research breaks research organisations' "silos," so dedicated funding and support is needed to enable the organisational process and system changes necessary to remove barriers for nurturing trans-disciplinary research.
- Early- and mid-career researchers can find switching the focus of their career from academia to industry to be extremely challenging, given the personal investments they have already made to build their academic track record through traditional publication metrics, and the need to shift their personal identities away from one as a career academic. To helps these researchers explore and pursue high-impact careers beyond academia, we suggest the Accord supports the creation of a national mentoring program, similar to the Australian Academy of Technology and Engineering (ATSE)'s Industry Mentoring Network in STEM (IMNIS) for PhD students, to be offered to early- to mid-career researchers to give them access to non-academic mentors in government and industry.

We recommend that the capability development programs recommended above support early-career researchers (postdocs) as well as PhD students. Postdocs have developed research skills and are ready to engage with and contribute significantly to industry. However, they are employed on short-term contracts and often excluded from professional development. We recommend that this talent pool is nurtured and supported.

Q38 How can the Accord support higher education providers to adopt sector-leading employment practices?

We recognise that for universities to shift their employment practices and policies to incentivize their researchers' entrepreneurial and industry engagement activities. significant policy, process, system, and potentially business model changes will be required. We recommend that the Accord support universities to make these changes by funding willing "early adopter" universities to pilot these changes, to generate case studies that demonstrate the value of these changes to the universities in terms of prestige and industry research income.

To increase mobility of workers between research and industry, there is an opportunity for the Accord to greatly expand industry PhD programs and industry fellowships (thousands per year) for university-based researchers and industry professionals.

In order for universities to change their employment practices, other changes are also required, particularly in supporting international students to get into Australia and stay in Australia. We recommend that the Accord drives changes in visa fast-tracking and introduction of special visa categories that encourage international researchers to remain in Australia for future employment so that we can retain and nurture existing talent within research institutions.

Q41 How should research quality be prioritised and supported most effectively over the next decade?

For research quality to be prioritised and supported most effectively, we recommend that the Accord includes implementation of the recommendations of the Innovation Metrics review, so that data-driven insights are used to support enhancement of research quality that reflects the translation performance of research as well as rigour in research methodology.