



Australian  
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OUR HEALTH IN OUR HANDS

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In 2017, the ANU announced a new funding scheme, the Grand Challenge, to support highly innovative research in any field of endeavour. Our Health in Our Hands was selected from approximately 40 highly competitive and diverse applications.

The team, including clinicians and researchers from five ANU Schools, aims to investigate and demonstrate how personalised medicine can address major global health challenges. These challenges include: rising costs, inequality in access to health care, an increasing prevalence of chronic disease, and issues associated with the health system's 'one-size-fits all' approach. Our Health in Our Hands will aim to achieve this by:

- Creating actionable personalised genomic and phenotypic datasets that provide the information to drive decision making in the clinic, and promote discovery of disease mechanisms;
- Effective data sets that will drive the development of portable and / or wearable technologies that can assist with diagnosis and / or disease management; and



- Using a co-design research implementation approach, collaborating with patients, clinicians and health services, to investigate and develop person-focused digital medical technology solutions for diseases, focusing on diabetes and multiple sclerosis (MS). Translating such solutions, which will typically be wearable technologies and / or portable devices, into health care will mean patients receive earlier diagnoses, enhanced disease management, and precision therapy regardless of their geographical location or social circumstances.

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Nationally, and globally, there is much research activity investigating how personalised medicine can transform health care, however, Our Health in Our Hands bring strengths that increase the likelihood of realising the project's goals. These include:

- A truly interdisciplinary effort between ANU researchers and external partners;
- Partnerships, with organisations such as ACT Health, to facilitate health care transformation and clinical translation;
- Expertise in developing sensing technologies will be leveraged and expanded, drawing on our unique achievements in leading the design and nanofabrication of electro-chemical and optical biosensors for biomedical sensing, with superior detection limits and sensitivities. In particular, we will build on our demonstrated nano-scale sensing concepts, which have been used for the engineering of the first portable devices for type 1 diabetes non-invasive diagnostics by breath analysis, to develop a miniaturised platform technology for advanced personalized phenotyping;
- An integrated approach to improve the diagnosis and / or disease management of diabetes and MS, by combining the discovery of novel clinically and / or commercially viable biomarkers through genomics and phenotyping, applying advanced data science techniques to the conditions, and developing person-focused devices for diagnosis and / or monitoring. The uniqueness of this approach was substantiated by findings from the environmental scan.

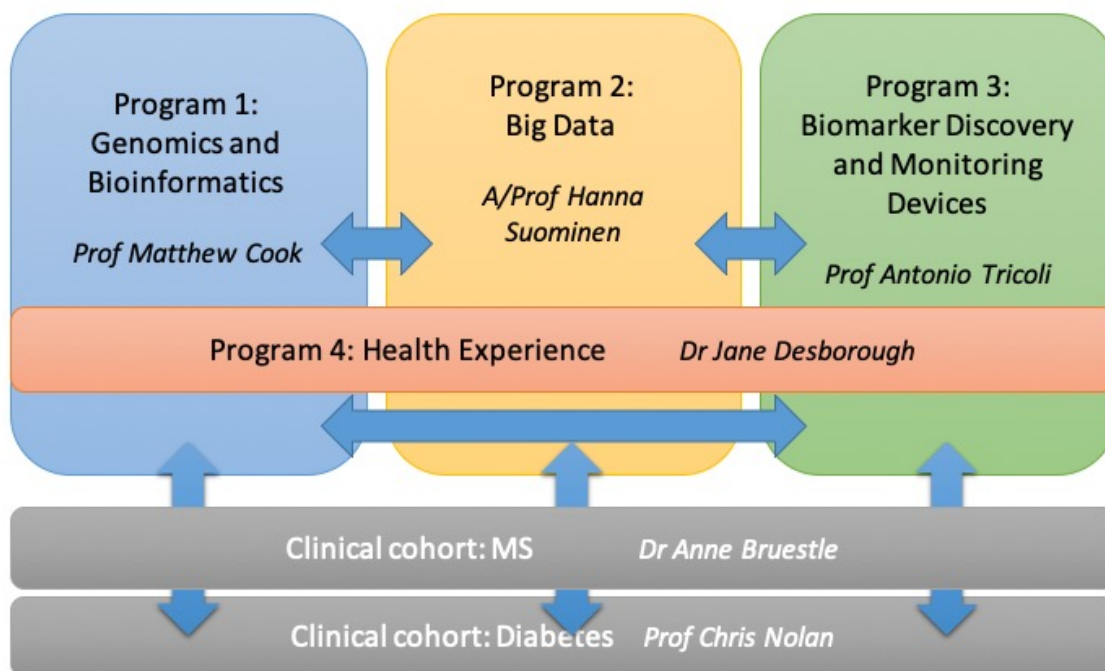
Our Health in Our Hand's 3-pillar strategy is designed to maximise impact, through:

- Planning and positioning, including strong and effective governance and planning for the future with partners;
- Leading innovation in personalised medicine via integrated research programs, supported by patient cohorts; and
- Realising potential, by partnering and collaborating for growth, leveraging Grand Challenge funds, and developing solutions that transform the health system

None of this can be achieved without the highly integrated research programs and patient cohorts, described below.

- **Program 1: Genomics and Bioinformatics** will bring together genomics and bioinformatics capability to integrate novel phenotypic information with genomic variation and solve data sharing problems.
- **Program 2: Big Data** will use machine learning to reveal early indicators of disease, details to differentiate disease subtypes, information on disease progression, and hidden knowledge about prognosis. If assigned correctly as features in machine learning, data from our novel sensors hold the potential for early detection and regular monitoring of diabetes and MS, as well as many other health conditions.

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- **Program 3: Biomarker Discovery and Monitoring Devices** will use combinations of traditional, genomic and phenomic data to develop new tools and devices for disease detection, management and understanding. These new tools and devices will be focused on non-invasive and patient-centred personalized medicine, and be informed by key findings from Program 4. They will feature characteristics such as small sizes compatible with the need of point-of-care implementation, and in many cases portability, wearability, remote monitoring and miniaturisation.
- **Program 4: Health Experience and Implementation** will use a collaboration and co- design approach to incorporate patients' perspectives and leadership, health services and policy engagement from inception to implementation. In addition, it will investigate ethical and cybersecurity issues associated with data, explore decision-making between clinicians and patients, identify ideal devices from a user / patient perspective. Mapping the landscapes of care for patients and the ACT's current health system ecosystem will inform change management initiatives.

### Collaborative Partnerships

Co-ordinated strategies for partnerships, commercialisation and innovation, and communication will be essential for the project's success. Realising the full potential of Our Health in Our Hands requires a well-considered innovation and commercialisation plan. Working with Strategic Projects and Partnerships, the team will develop a portfolio approach that aligns with the potential research outputs. Opportunities for further innovation and commercialisation include policy and practice, digital technologies and devices, companion diagnostics and genomic discoveries for use in the development of pharmaceuticals.