

# Submission

## 2016 National Research Infrastructure Roadmap

### Capability Issues Paper

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#### Questions

Question 1: Are there other capability areas that should be considered?

- **The integration of biomaterials, advanced fabrication and clinical applications of these is an area requiring investment.**
- **A translational facility is needed to support the development of materials, 3 dimensional structures and medical devices resulting from them with good manufacturing practice (GMP) traceability. This capability is essential to support investigations of new materials and structures from them and is essential for advanced biofabrication in Australia.**
- **NCRIS Facilities should actively engage in the development of emerging regulatory framework discussions particularly in the bio and nano-domains.**

Question 2: Are these governance characteristics appropriate and are there other factors that should be considered for optimal governance for national research infrastructure.

- **International benchmarking and assessment should be a governance characteristic.**

Question 3: Should national research infrastructure investment assist with access to international facilities?

- **Absolutely. Australia's national infrastructure will never be able to provide access to every facility needed by researchers.**

Question 4: What are the conditions or scenarios where access to international facilities should be prioritised over developing national facilities?

- **Where the international facility is leading-edge and for which there is no comparable national facility and/or where international access is the most efficient use of resource relative to building a national capability.**

Question 5: Should research workforce skills be considered a research infrastructure issue?

- They are inextricably linked. The NCRIS facilities provide an opportunity to provide training to the next generation workforce. In the case of ANFF this includes those required to lead the next generation of advanced manufacturing technologies.

Question 6: How can national research infrastructure assist in training and skills development?

- NCRIS facilities are playing an increasing role in nationally funded activities such as the ARC Industry Training Hubs and CRC funded research training scholarships. It should not only assist Universities but users in the industrial sectors.
- These facilities are also used in preparing on line education such as the MOOC produced by the ANFF Materials Node on 3D Bioprinting, see: <https://www.futurelearn.com/courses/bioprinting>

Question 11: When should capabilities be expected to address standard and accreditation requirements?

- Regulatory restrictions (NICNAS) are out of tune with the development of R&D nanomaterials e.g. the production of bulk materials for R&D applications is at a workable limit 100 Kg but when nanomaterials are considered a 100g limit is set. NCRIS needs to be engaged with regulatory bodies in the area of nanomaterials production for academic and industry based R&D developments.

## Health and Medical Sciences

Question 15: Are the identified emerging directions and research infrastructure capabilities for Health and Medical Sciences right? Are there any missing or additional needed?

- Medical Devices that require materials development seamlessly integrated with emerging customised fabrication capabilities should be included. Examples of this include sensor systems for medical diagnosis, health monitoring, implantable structures to address clinical challenges such as tissue regeneration and the realisation of neutrally driven prosthetics. The realisation of 3D cell printing is facilitating such developments as well as providing unprecedented experimental models (e.g. the brain on a bench project) for fundamental exploration into the development and treatment of neural diseases.
- A missing emerging direction is in the area of medical devices where developments in science and engineering are driving medical applications (e.g. printed organic electronics for sensor applications and for neural monitoring/stimulation).

Question 17: Is there anything else that needs to be included or considered in the 2016 Roadmap for the Health and Medical Sciences capability area?

- Australia is well placed to lead the world in developing the most effective Materials Discovery - Advanced Fabrication – Clinical Solution pipeline possible (ultimately being translated to and based in hospitals).
- The development of a network of rapid-prototyping centres across the country that are focussed on the fabrication of medical devices and structures for the Health and Medical Sciences with the appropriate regulatory controls (e.g. good Manufacturing Practice) is required.

### Advanced Physics, Chemistry, Mathematics and Materials

Question 21: Are the identified emerging directions and research infrastructure capabilities for Advanced Physics, Chemistry, Mathematics and Materials right? Are there any missing or additional needed?

- **Key missing capabilities are systems for rapid new materials screening including integration with the most advanced (probably customised) fabrication methods. These will be crucial for the translation of physics/chemistry and materials science into economic, health and social impact over the next decade.**

Question 22: Are there any international research infrastructure collaborations or emerging projects that Australia should engage in over the next ten years and beyond?

- **The development of an international advanced materials fabrication network; providing Australian researchers with access to global fabrication facilities, similar to the International Synchrotron Access Programme. Australia is well placed to play a leadership role in such a development.**

Question 23: Is there anything else that needs to be included or considered in the 2016 Roadmap for the Advanced Physics, Chemistry, Mathematics and Materials capability area?

- **The development of a network of rapid-prototyping centres across the countries that are focussed on the fabrication of cutting-edge devices and structures for industry.**
- **The enhanced interactions of medical and biomedical capabilities with the materials and advanced fabrication domains will be critical into the future.**
- **There are opportunities for NCRIS to provide a more integral supporting role in ARC funded industry training hubs as well as CRC's across the country.**

### National Security

Question 29: Is there anything else that needs to be included or considered in the 2016 Roadmap for the National Security capability area?

- **There is a clear opportunity for enhanced engagement with other NCRIS capabilities (e.g. ANFF) to address issues of sensing and detection for biosecurity applications.**

### **Underpinning Research Infrastructure**

Question 30: Are the identified emerging directions and research infrastructure capabilities for Underpinning Research Infrastructure right? Are there any missing or additional needed?

- **Good Manufacturing Practice (GMP) facilities for the development of materials for use in the biomedical and bio-devices sector is a missing national capability. While GMP facilities are available under NCRIS for novel therapy capabilities, such as immunotherapies, there is a gap in the area of the production of materials and subsequent fabrication into structures and devices, under a manufacturing traceability framework afforded by GMP, for clinical application. An example of this can be seen at the ANFF Materials Node where bioscaffold materials such as gelatin methacrylate (GelMA) hydrogels have been produced for 3D Bioprinting. However translation of these materials beyond simplistic animal models into human application is hindered through this missing capability link.**