National Collaborative Research Infrastructure Scheme

Australian Academy of Technology Sciences and Engineering

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Comments on the National Collaborative Research Infrastructure Scheme

The Academy has sought the views of its Fellows with relevant expertise and wishes to provide the following comments on the development of a National Collaborative Research Infrastructure Scheme.

1. Principles of the NCRIS program

The Academy supports the principles established by the NCRIS Advisory Committee (Exposure Draft p3.). It is agreed that the National Research Priorities (NRPs) and their associated structural objectives provide a robust framework for decisions on NCRIS priorities, and the pre-eminent criterion should be strategic impact (ED p4) within the framework of the NRPs with the additional criteria increasing collaboration and reducing duplication and sub-optimal use of resources and other criteria listed on ED p.8, although text in that box does not mention strategic impact.

The biggest impediment to collaboration between institutions in Australia is competition for rights to “intellectual property” or possible future patents. There is competition between Universities themselves and also between universities and CSIRO and other research institutions. Each has its own “Business Development” office and lawyers who tend to kill collaborations with discussions which go on for far too long. The CRC program has gone some way to alleviating this competition by fostering collaborative work, but the problem is still a serious one. It should be recognised that only a fraction of research ends in a patent, only a fraction of patents end with a product and only a fraction of products last more than three years to earn anything to make payments on royalties. What is most important is that it is an Australian company or institution that owns the final patent, if indeed there is a patent. NCRIS funding should be structured such that operation of national collaborative facilities are not inhibited by restrictions due to intellectual property considerations.

The Academy endorses the principal that NCRIS funds should support adequate staffing and basic operating costs in addition to the capital costs for infrastructure.

2. The NCRIS Roadmap

The NCRIS Roadmap is valuable in that it takes a national view and seeks to identify critical capabilities that are needed to underpin scientific and industrial research in Australia although it is fairly short-term in its thinking. This may be understandable in view of the 5 year funding horizon of the current NCRIS program, but it would be enhanced by taking into account possible changes in infrastructure requirements in the medium term and from seeking input from knowledgeable people outside Australia - there are Australians working overseas, for example, who bring wider views. The Roadmap has already benefited from consideration of the two examples given (EU and Canada) but we should, at the very least, be taking advantage of the experience with major project planning in the UK and the USA. There is too much involved to ignore that experience.

As identified in the National Research Priorities, the thrust of our national research effort should be directed primarily to the solution of problems which we uniquely face and which we are more strongly motivated to solve than others are. For example, we have unique problems of water soil and air quality, potentially serious economic and social problems associated with poorly planned urban development and particular health problems such as melanomas where Australia has among the world’s highest incidence. A good example of such classification (one does not have to agree with the choices while admiring the strategy) is to be found in the 2004 White Paper 'Our Energy Future'. Technologies are classified in that document as 'world leader', 'fast

follower' or 'reserve' and while 'world leader' status can be conferred by possession of unique resources, it can as well be driven by confrontation with unique problems. The present Roadmap seems to be more based on resources (that is, present research strengths) than on Australia's unique needs.

The academy endorses the comment that we need to ensure that our capabilities are world class, and that we are involved in key research having potential value to all, but we ought to recognise that Australia presents a very different set of characteristics - from geology to society - from those of any other continent, and we need to learn how to develop it in a sustainable manner. This should be emphasised more clearly in the document.

In order to foster a long term perspective of the NCRIS Roadmap, there is support for its ongoing development. Communities of scientists, like the present working groups, should be encouraged to formally debate and decide strategic directions on a regular basis and identify large scale infrastructure needs so that the NCRIS Road Map can be kept up-to-date. Such an approach has been used regularly by the US National Science Foundation to identify strategic science directions and infrastructure needs.

3. Comment on specific Priority Capability Areas

6.3 Characterisation capability

World class characterisation capability is needed to underpin much of Australian scientific and industrial research. Of the capabilities identified, the Academy recommends that the highest priority be given to the completion of the initial suite of beamlines on the Australian Synchrotron and prospective additional beamlines that have been identified by the Australian pure and applied research community. It is likely that an Australian based synchrotron provides significantly greater economic and scientific benefit per unit capital investment than that from any alternative facility. This is also the international experience. Amongst its wide spread range of scientific capabilities, the facility will offer an extensive range of x-ray diffraction, spectrographic and imaging techniques that will be relevant to all four of the Australian National Research Priorities. The Academy has been a strong advocate of synchrotron science for more than a decade (e.g. the Academy funded an Australian – Korean workshop on Applications of Synchrotron Research in 1997) and a number of its Fellows have taken an active role in bringing the Australian Synchrotron to fruition.

Included in this capability are several other facilities that provide competitive international performance in areas that complement the capabilities of the Australian synchrotron. These are also endorsed by the Academy.

6.4 Fabrication

There was strong support for the proposals outlined in sections 6.4.1 and 6.4.3. The Academy expects that nanotechnology will be an important enabling technology for a number of future developments, and so it will be vital that workers in research and development of this area can rely on the very best infrastructure support.

6.12 Integrated marine observing system

The proposal to develop an Australian Coastal and Ocean Observing System as a mechanism to provide a national focus on the infrastructure needs for marine science research and its application to management of the marine environment should be welcomed.

Scientific research and knowledge generation in the marine environment encompasses some of

the roles of the National Oceans Office, CSIRO, Bureau of Meteorology, Geoscience Australia, DSTO, AMSA, Hydrographic Office, Fisheries R&D Corporation, state government entities including museums amongst others, as well as the universities. A major challenge in determining the research infrastructure priorities for the marine environment is reconciling needs and identifying productive partnerships with agencies with specific missions in this diverse space. It is essential therefore that an attempt be made to assess true priorities that reflect national needs and priorities. The Australian Marine Science and Technology Plan 1998 with appropriate updates is a useful starting point for this process for testing the need for specific types of infrastructure outlined in the ED.

Critical geoscience issues relating to Australia's marine jurisdiction have been identified by the National Strategic Plan for the Geosciences as:

- Determining the form, nature and crustal structure of the seafloor and its evolution.
- Elucidating the form, nature and crustal structure of the seafloor;
- Elucidating the physical processes that occur over various time frames, like sea level rise and fall, the retreat or advance of coastlines, the infilling of estuaries and the scouring and mobilising of the seabed by waves and tides.
- Establishing what needs to be understood about marine systems to ensure their sustainable management;
- Elucidating the processed for chemical and physical cycling of pollutant in relation to geological framework and climate;
- Establishing what exists in Australia's marine environment; and
- Determining how marine systems behave in response to different types of usage.

Whilst much modern oceanographic data collection can be accomplished through sensors on static and mobile floats integrated with satellite systems, geoscience investigations outlined above, along with those undertaken by the marine biologists, require access to ships. In particular for geoscience, there is the need for vessel mounted multi-beam sonar systems, capability to tow geophysical equipment and to deploy and sea-bed sampling and coring equipment.

Access to this capability is a pre-requisite for participation in the Integrated Ocean Drilling Program (IODP) and utilisation of this international capability to address scientific questions in the Australian region. This is because the scientific problems to be addressed by deep sea drilling and the sites where drilling is to be undertaken, have to be fully investigated by conventional marine geoscience techniques using a research vessel as part of the proposal to justify the deployment of the drill ship to the problem.

The Academy notes that development of the Australia Marine National Facility appears to be not included in the NCRIS Road Map because it is considered Landmark Infrastructure. It is important that this is not overlooked and national funding is provided in some form for this facility.

Leaving aside the Aurora Australis which is devoted to Antarctic and Southern Ocean research, Australia has one multipurpose, blue water research vessel (RV Southern Surveyor) with limited range available for 6 months of the year and with a limited life. It has been recently upgraded and full usage should be made of this upgrade in its remaining life. The incremental funding to increase the use of this vessel to a full year operation for the rest of its life is not beyond the scope of NCRIS and is clearly linked to any IODP proposal. Indeed the viability of any proposal

for Australia to participate in IODP is contingent upon access to a suitably equipped research vessel.

6.13 Structure and evolution of the Australian Continent
The Academy endorses the development of a national capability to investigate the Structure and Evolution of the Australian Continent. It should be emphasised that is not merely a terrestrial exercise since the Australian ‘continent’ transcends the shoreline to the edges of the continental shelf on the east south and west and to the plate margin collision to the north. The objectives of such a program are consistent with the “tectonic” and “subsurface process” themes of the Integrated Ocean Drilling Program and so Australia’s participation in IODP would be equally relevant to this topic as it is to topic 6.12.

6.14 Low emission, large-scale energy generation
The question of energy is not addressed adequately in the draft (p.44). Renewable energy is dismissed using wording that is inaccurate and belies the importance of this issue to mitigation of climate change. A narrow focus on geosequestration of CO2 puts all of our climate change eggs in one basket. The development of significant renewable sources of energy needs infrastructure support. It should not all go to coal, as proposed. We note the recent announcement by the Minister for the Environment and Heritage, Senator Campbell, of increased support for renewable energy technologies.

In addition, there is no mention of nuclear energy. In the past this subject has been 'untouchable' but it is possible that a re-assessment of Australia's position will be carried out in the near future and there may be associated R&D infrastructure needs if development of nuclear power or enhanced storage of nuclear waste should result from that re-assessment.

6.16 Systemic Information Infrastructure
The emphasis given in the ED to the issue of information infrastructure is highly commended. The geosciences necessarily undertake place based research, collect place based data and observations and make measurements on samples related to specific locations. Indeed it is the capacity to integrate many lines of data, information and knowledge into a coherent picture that characterises amongst the best research in the geosciences.

As a result the geosciences have had extensive experience in the handling, management and integration of very large data sets (terabytes) of diverse origins particularly through industry and the federal and state geological surveys. Notwithstanding the huge effort put in by these government agencies much data and information generated by the university sector and other agencies remains relatively inaccessible and research opportunities have not been pursued and data acquisition has been duplicated. There are some important learnings that have emerged from this history.

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