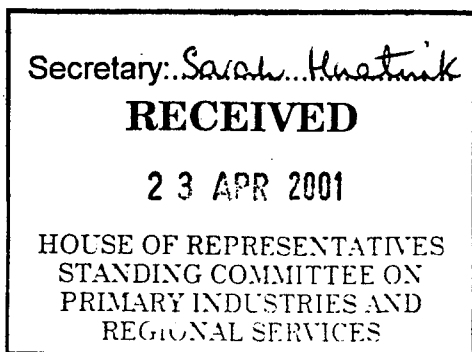


VICE-CHANCELLOR
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12 April 2001

Mr Ian Dundas
Secretary
Standing Committee on Primary Industries and Regional Services
Parliament House
Canberra ACT 2600

Dear Mr Dundas

Please find attached a submission from The University of Queensland to the "Inquiry into Development of High Technology Industries in Regional Australia based on Bioprospecting". This submission has been prepared on behalf of the University by the Executive Dean of the Faculty of Biological & Chemical Sciences, Professor Michael McManus.

I apologise for the lateness of the submission, but we were advised that a late submission would be acceptable. The University is very keen to participate in significant and important policy issues like bioprospecting and sustainable development.

We look forward to participating in this debate as you progress your inquiry.

Yours sincerely

Professor John Hay
Vice-Chancellor

Submission to The House of Representatives

“Inquiry into Development of High Technology Industries in Regional Australia Based on Bioprospecting”

*From the Faculty of Biological & Chemical Sciences, University of Queensland,
Queensland 4072, Australia*

Opportunities for science-based regional industries from the Australian natural environment

There are genuine opportunities for Australia to develop high-value regional industries based on knowledge of the unique biodiversity and biocomplexity of our natural environments. Our natural ecosystems are reservoirs of uncharacterised biodiversity, and we have not yet imagined the full spectrum of genetic and physiological activity in most species, or the full range of medical and industrial uses of their natural products.

The current regional industry based on biodiversity in the natural environment is tourism. Such ecotourism is increasingly knowledge-based, both to sustain the resource and to satisfy the increasing sophistication of international tourists seeking an understanding as well as an experience of the natural environments they select to visit. We are entering a new era of scientific and educational ecotourism as a value-added regional industry.

Bioprospecting for high-value natural products is a far more ancient human activity than tourism. They can be compatible or synergistic (tourists are interested in the unique sources of valuable products). Bioprospecting is also undergoing a metamorphosis in approaches and commercial potential through the application of recent developments in the Biological and Chemical Sciences.

The extraordinary diversity of bioproducts in natural systems arises from millions of years of evolution by diverse species, under selective forces from their peculiar environments and their interactions with surrounding species. We have no prospect of simulating such complex evolutionary events to recreate the products, if the resulting species are lost. If those species can be conserved we have excellent prospects for discovering and developing new and useful bioproducts as we develop new needs and screening capabilities, long into the future. Now is the time to act to conserve and exploit biodiversity as a continuing source of wealth for Australia.

The immediate challenge

It is not true that “within as little as five years all Australia’s biota could be screened with the resulting intellectual property (IP) and knowledge sold off”. This is an over statement and a little emotive but does highlight the need for us to develop a real and meaningful strategy to capture the value that potentially exists in this area. The first challenge for Australia in capturing that value is thus to combine conservation with smart approaches to discovery and development of useful products. It will also be important for Australia not to take an inward looking and restrictive approach to bioprospecting. Indeed, we will need to form strategic alliances that will enable us to be part of the new biotechnology that will spring from leads obtained from studies with natural products. It is also important for decision makers to realise the financial cost of exploiting our natural products. For example, in the pharmaceutical area most new drugs take 15 years to develop following their initial discovery and cost around \$300 - \$500 million US before they reach the general clinic (see <http://www.phrma.org/>). Further, there are now companies that already have a global perspective in natural product research and development and it is highly unlikely that Australia will be the only repository of interesting new molecules. Hence, bioprospecting and development is not something that we can do alone and mechanisms will need to be put in place for

Australian institutions and industry to operate by forming smart alliances with international companies.

Smart bioprospecting based on unique insights in biological & chemical sciences

The Faculty of Biological and Chemical Sciences at the University of Queensland is exceptionally placed to provide these smart approaches. The combined strength and reputation of the Faculty in this context is unrivalled in Australia; spanning ecological and evolutionary perspectives across aquatic and terrestrial environments, including microbial, plant and animal species, through natural products chemistry and molecular genetics, to the design and development of new drugs and other value-added biomaterials.

Identifying bioprospecting hotspots

Australia needs a science-based strategy to identify and protect bioprospecting hotspots, within our broader strategy for environmental management and conservation. Some of these hotspots will be based on species richness or genetic diversity within species, and others on unusual conditions likely to select for features of particular commercial interest. The Faculty and its collaborating industry and government partners are eager to contribute to this process. Our Marine Studies, Ecology and Conservation Biology Centres are the hubs for such insight and collaborative effort, bolstered by strong specialist capabilities in our Schools of Biomedical Sciences, Life Sciences and Molecular Microbial Sciences.

Smart bioprospecting strategies

Australia lacks the early stage capital investment for competitive advantage in a high-throughput, random screening approach to discovery of high value natural products. We have to combine our unique biodiversity and biocomplexity with a smarter approach to bioprospecting to obtain a competitive advantage. Unique knowledge and insight about how particular organisms function in any natural system is a foundation for smart bioprospecting. For example, in a search for bioactive compounds from plants, what situations are likely to favor the development of defense mechanisms? (Slow growing, shade tolerant rainforest species are more likely to have chemical defences against herbivory than shade intolerant pioneer species; long lived plants are more likely to have defenses than short lived species; green fruit seed coats are more likely to have chemical defenses than ripe ones; etc.)

Integrating skills for bioproduct development

Smart bioprospecting must integrate skills across disciplines to conceive, reveal and develop commercial opportunities. For example, the opportunity to obtain benefits through IP-protected value-added industries in regional and rural areas will sometimes be maximised through intermediate steps in product research and development carried out in a biotechnology hub such as the UQ precinct. There the essential advanced facilities for genetic and biochemical screening and chemical characterization are in place, including the UQ Institute for Molecular Biology, and the School of Molecular & Microbial Sciences. The School of Biomedical Sciences also has significant expertise in the pharmacological screening of potential active molecules. A similar capability also exists in the School of Molecular & Microbial Sciences in respect to potential new antibiotics.

Sustainable regional industries, based on IP-protected bioproducts, require not only continuing discovery through smart bioprospecting, but also the development of second-generation products by improvement of the natural structures for commercial purposes. Again the UQ BACS Faculty and IMB have unique capacity to combine strengths in molecular biology and chemistry for rational design and engineered biosynthesis of improved biomaterials. Equally important, we have the environmental and evolutionary expertise to ensure that managed bioproduction systems using improved varieties are designed without negative impact in regional environments. Finally, our commercial successes with the recent formation of a number of spin-off companies (egg. Promics,

Xenome etc.) indicate the capability to identify and partner with funding sources for on-shore development and commercialisation of high value bioproducts.

I would welcome the opportunity to discuss this area more fully with the Committee at the interview stage of your inquiry.

Michael E. McManus
Executive Dean
7 April 2001