Reaping a harvest from bioprospecting

Prospecting for minerals has long been recognised as a legitimate way to develop Australia's natural resources and create wealth. Prospecting among plants, animals and microbes to find valuable substances is a much less familiar idea. Yet this is now happening on an increasing scale. Known as 'bioprospecting' or 'biodiscovery', this new industry is a potentially huge money-spinner, and the subject of an investigation by the House Primary Industries and Regional Services Committee.

In the past, valuable substances and processes were discovered by chance. They fuelled the creation of folk medicines in many different cultures, and also gave us new foods and drinks produced by baking and brewing. Now, because of recent technological advances and our better understanding of the natural world, it is possible to thoroughly and systematically 'search' biological materials for useful chemicals and activity.

Australia is perfectly placed to be at the forefront of this process. We have great biological diversity, spanning environments from the tropics to the Antarctic. Many plant and animal species are only found here. Australia is, in fact, one of only 12 mega-diverse areas in the world, with a wealth of resources to explore. Those biological riches are found not only on land, but also in our massive marine domain.

Australia also has the scientific and technological expertise to explore and use these resources. It is the only mega-diverse country that has.

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Given these natural advantages, the House of Representatives Primary Industries and Regional Services Committee, chaired by Fran Bailey, Member for McEwen (Victoria), is investigating the potential bioprospecting has in Australia.

Organisations and individuals involved in the different stages between the initial collection of material by bioprospectors and bioproduction on a commercial scale all agree there is potential for Australia to exploit its flora and fauna. Some believe that potential is immense.

The question the Committee is posing to those individuals and organisations is: what do we need to do to ensure that Australia gets maximum benefit from using its biodiversity to generate useful products?

The answers point to some structural measures and other actions that governments can encourage or take. They say we need to:

- be well informed about our biological resources and have access to that information, so that we can make intelligent use of them;
- have access to the resources, and this has been a major problem. Commonwealth,

State and Territory governments are now working to improve access arrangements, but not fast enough for most of the stakeholders in biodiscovery;

- have arrangements in place between the owners of resources and the bioprospectors to ensure that benefits are shared by all stakeholders;
- develop promising leads to the stage at which they can be patented; and
- consider the rights of Australia's indigenous peoples.

Focus on regional possibilities

The Committee is particularly interested in the possibility of bioprospecting businesses and their value-adding, high technology spin-offs being established in rural and regional areas.

How far this can or will happen is a matter of some disagreement. Some feel that bio-industries are much more likely to be developed in the cities or overseas, where facilities for sophisticated, complex operations and a skilled workforce already exist. In this scenario, rural and regional Australia will be where bioprospecting is carried out and, perhaps, where some initial processing of the material will take place. However, once the molecular structure of an active component has been established, it may well be possible to synthesise it without ever referring back to the original material and place where it originated.

Others see a greater role for rural and regional areas. They point out that some substances are expensive or difficult to synthesise. It is more economic to harvest from the wild or to farm them. In the case of farming, where better to do it than in the area where the material comes from? For example, sponge farms, such as the one to be established on Palm Island off the Queensland coast, promise yields of compounds that can be used to develop medicines, agri-chemicals and antifouling agents for ships. A milligram of some of these substances is valued at thousands of dollars.

Where there is a regional city with a university, a skilled workforce and a local business community, some of the necessary ingredients for bio-industrial development may exist. Townsville and Lismore are examples of such cities. Closeness to biodiverse areas is another plus: rainforest in the case of Cairns; the Great Barrier Reef with Townsville; the Antarctic and southern ocean for Tasmania. However, these regional centres may be missing some necessary resources: for example, local entrepreneurs or knowledge of how to manage intellectual property. Help may be needed to overcome some of these problems.

Consider the environmental impact

The Committee is also looking at the environmental impact of bioprospecting. There is general agreement that bioprospecting is unlikely to cause major environmental damage. Usually only very small amounts of material are collected and, where larger amounts are needed, existing conservation legislation will control the impacts. When permits are issued, it will be possible to put conditions on what and how collections can be made.

Many argue that bioprospecting has, in fact, already benefited the environment. It draws attention to the value of biodiversity and encourages conservation. It yields information that can be used to better manage and conserve biodiverse areas. Bioprospectors can be required, as a condition of their being allowed to bioprospect, to deposit information and samples in public institutions, where it will be widely available. In addition, biodiscovery has identified micro-organisms and plants that can be used in remediating polluted areas, as well as microbes that extract minerals from low-grade ore without the use of polluting chemicals.

At present, Australia's bioprospecting industry is relatively small and immature. The challenge is to harness our many natural advantages to contribute to the production of new drugs and other chemicals for use both domestically and internationally. It is this challenge which the House Primary Industries and Regional Services Committee is taking up with relish.

For more information

Visit: www.aph.gov.au/house/committee/primind
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Australia's biodiversity leads to 'smart' biodiscovery

- **How do corals avoid sunburn?** They produce a UV blocking sunscreen that protects them. This chemical will be the basis of a sunscreen for people and will protect plastics and paints from weathering.
- **What protects ants – creatures which live together in large numbers like us – from the spread of disease?** Glands in the ants' bodies empty antibiotics on to their external surfaces, which then end up cleaner of bacteria and fungi than human skin is. In addition, the ants' immune system produces immunopeptide molecules. Both antibiotics and immunopeptides may lead to the development of new drugs.
- **Why is the sea floor not covered by plant growth in some places?** Scientists who noticed this tested many of the marine samples held in the collection at the Australian Institute of Marine Science. They found that extracts from several Great Barrier Reef animals have the capacity to selectively kill plants at very dilute concentrations. Such chemicals are being developed as herbicides.

These discoveries capitalise on millions of years of development, testing and fine-tuning carried out in nature. They have been patented and are being further developed in joint ventures with business.