

Attention: Secretary of Committee of Inquiry  
Standing committee on Primary Industries and Regional Services  
RE: Inquiry into Development of High Technology Industries in Regional  
Australia based on Bioprospecting

Dear Secretary,

Please find as an attachment my submission to the the Committee of Inquiry. It includes a front page summarising the contents by key words, the body of the submission and separately, to be included as an appendix, a brief CV of myself. It is all in Word 98.

None of the data, is confidential and can be published at your discretion, except for the CV with my personal details.

I hope you and the committee find it acceptable. Please advise me if I need to provide more. I expect to be away for long periods in May and then from perhaps from June - July on assignments which may make appearing before the committee difficult in this time.

Yours sincerely,

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## Summary of Contents

**A Submission to a Parliamentary Inquiry by Dr Eugene Dimitriadis (Xylo-australis)  
on the subject of Bioprospecting and Regional Industry Development in Australia .**

Key words and phrases used in this submission include:

Mans impact on Australia and its endemic species

Opportunities missed and some that are still available, namely:-

- Craftwoods - export opportunities for
- Musical instrument timbers
- Plant extractives eg
- Medicinals and biochemicals
- Essential oils
- Foods, flavours and sweeteners
- Cosmetic ingredients
- industrial (barks, charcoal, gums,)

Market-led Commercialisation? Does it have value?

Identification of Species with potential:

- Outback & Dryland Farming (Opportunities & benefits for)
- Sandalwood
- Weeds with Value
- Native Grasses

Export Opportunities

University collaboration and commercial approaches

Agroforestry

Market Importance & Approach to

Intellectual Property (IP) - protection & reward for knowledge

Barriers and some key questions

Ethics / Codes of Practice?

## BIOPROSPECTING AND REGIONAL INDUSTRY DEVELOPMENT IN AUSTRALIA

SUBMISSION TO A PARLIMENTARY COMMITTEE of INQUIRY

Dr Eugene Dimitriadis  
*Xylo-australis*

Australia is an old, unique and fragile continent. It's flora and fauna are so unique that they are found nowhere else on earth. Many species have adapted to difficult climatic and environmental conditions in relative isolation. Our marsupial population and the unique woodlands, trees and shrubs are all obvious examples. New discoveries are still being made.

Since aboriginal occupation, there hunting / burning habits and, more importantly, European man's impact, many species have disappeared or become endangered. It is conceivable that many of these forever-lost species may have had the potential to solve current problems, contribute to the welfare of humanity and had considerable commercial potential. It is therefore important to recognise what we have now and to value it, by utilising it, without overexploitation or to the point of loss or serious depletion. Indeed, recognising a commercial value of a rare or threatened species may be the first and best step to protecting it. This submission is aimed at showing the potential of Bioprospecting from a limited "one-man" perspective, my own.

New products continue to be discovered from nature's vast array of possibilities. Some have been 'tried and tested' *in situ* over millennia yet may remain undiscovered and part of lost folklore. The benefits from bioprospecting, for the Australian community and the environment, will result from the high potential that exists in Australia for discovery, research and business opportunities, product or process development, commercialisation and ultimately exports.

Taxol, from the Yew tree, is effective as an anti-cancer drug but is difficult to synthesise. Many other plants and biologically derived chemicals are cheaper and better to grow and extract than to produce synthetically. The valuable range of opiates is one such example. This means that there will continue to be market opportunities for plant-derived products. Such products may be sophisticated and high value materials like craftwoods.

The ebonies, rosewoods and other musical instrument woods of the world are fast disappearing from their markets due to over-exploitation. As a consequence, these markets are seeking alternative woods. But have we explored the

replacement potential for such craft or musical instrument woods in Australia? I think not, at least not with any enthusiasm.

As a scientist with academic training in plant chemistry, I provide professional advice on plant use for fundamental research or commercial benefit. My focus is typically on species selection and collection, testing and R&D, estimating market potential and other commercial matters. This role has been served in a practical (applied), academic-business, and commercial / consulting environments. Most recently my effort has been directed at identifying the potential that our flora and fauna (and even fungi) may have in addressing regional and international problems and opportunities. Such benefits or opportunities can include:

- Bio-chemicals / pharmaceuticals, including active substances (antibiotics, drugs etc)
- Vitamins and cosmetic ingredients from plants and mycoflora,
- New essential oils (not only from leaves, but other parts)
- New bush foods and food additives (condiments, spices etc)
- Food processing aids (thickeners, sweeteners etc)
- Woods (especially high value craftwoods, musical instrument woods)
- Bark extracts for various uses (eg rutin for strengthening blood capillaries)
- Special processed / modified forms (eg charcoals, fibres, etc.)
- Enzymes for chemical and industrial products and processes
- Wood chars for oximetry (medical application)

These products are embodied in the words BIOPOTENTIAL and BIOPROSPECTING and are explored further in this submission.

My function is identifying which plants have commercial potential to a wide range of clients, especially those with an interest in arid zone regions and to those with an interest and ability to develop them into viable products. Many arid zone plants have been underestimated for their value often because of their small size or slow growth. (The smokebush from WA has anti-viral properties yet is small.) I currently supply information and wood samples to small-scale specialty users and researchers around the world. In my written papers on Australian flora, my aim has been to educate international readers about the potential of our plants and their products.

Identifying suitable species for their chemical extractives has been a favoured, long-term exercise for academics and researchers both here and in other countries for many decades. Such extractives can include, volatile or non-volatile essential oils, pharmaceutically active materials, food additives (sweeteners, thickeners, preservatives, bleaching agents, detoxifying agents, etc). In a similar capacity I have worked with consultants on identifying craftwood markets,

selecting native species, for Universities in Australia and US. Similarly, with state government officers for agroforestry planting trials, working with inventors and discoverers of plant extracts on ways to maximise their commercial potential, assisted with patents and intellectual property (IP) matters. This has led to varying degrees of success, but the time lag and high cost for commercial rewards and returns has always been a problem for further investment. The issue of IP has been raised more recently in dealings with institutions doing research based on ethnobotany.

Many species have demonstrated their potential as sources of fine timber. It is a common misperception that these timbers must be from large, straight-stemmed trees and that can be grown as plantation species. Many of the higher value species are relatively unknown, growing in arid areas as small trees and even shrubs. The value of their woody parts for small crafts, musical instruments, hand-made furniture, turning woods etc is considerable and overlooked, especially with current land clearing practices. The Australian market for craftwoods is probably around \$60 - \$70M pa and may approach \$1B worldwide (my estimates). We have not begun the scratch the surface of the potential of this export market.

Most recently, I have demonstrated to NSW farmers the potential of their native trees for craftwoods and how these existing resources can be sustainably harvested and utilised for the maximum benefit to the outback farming community, The same can be done in other states, especially in Queensland and Western Australia. As a consultant I am always eager to assist in any such programs.

Plantations of Sandalwood in WA have shown that persistence pays off. This age-old industry is about to blossom again through large-scale commercial plantations of sandalwood. This opportunity resulted from new knowledge that came from understanding the nature of the tree, how it can be grown and addressing the nature and potential to value-add in this market. The sandalwood products (oils, incense sticks, wood etc) have long term (historic), markets. Such a market offers high demand with dwindling world supplies, high product prices, high degrees of value-adding with unique and sophisticated products, offering benefits to regional and outback communities. There is additionally the potential to diversify into other similar extractives.

As I write this, plans are in progress in 2001 to participate in a plant collection expedition to the Kimberly and nearby arid zones to collect seed and botanical information on trees and shrubs, considered to have commercial potential in plantations for their wood or their useful extractives. The commercial potential of plants, especially from arid Queensland and tropical North Queensland, is

considered especially high and must be evaluated every few years as knowledge and needs change. Some examples are shown below to illustrate such recent changes and the opportunities they present.

A tropical cypress pine is producing a novel essential oil. It is coloured blue, which gives it novelty in a high-value, perception-sensitive market place. It does seem to have some medicinal properties, possibly ascribed to the blue azulenic compound, and is therefore in high demand. White Cypress Pine oils, from both foliage and wood offcuts, waste products of sawn timber production, have commercial potential and are currently being evaluated.

Our many Myrtaceous plants (eg the melaleucas, eucalypts, kunzea etc) will all contain leaf oils, some of which will most likely have materials of commercial value in markets where natural products are preferred to synthetics. A large scale screening of these is probably being done but needs coordinating so commercial opportunities are not missed from a too narrow a viewpoint.

For many years I have been involved in wood exports. Most woods are sold in small volumes at high prices, as I believe that we must capture this “high ground” first, where margins and opportunities are high. The opportunities are here and now, our products stand alone (offering unique attributes), present import substitution possibilities, look great and function as well as other high value wood products. I am fettered somewhat by my limited resources, by availability of quality supplies (some due to resource limitations) and a market with buyers being unfamiliar with our products and their often strange names. My publications have attempted to educate the user groups in the beauty and potential of our woods but this is slow process and better done through marketing and education through finished products and educational advertising.

Collaboration with Universities has been ongoing for many years but their difficulty in dealing on commercial terms with developers has been a cause of personal frustration to me especially when I was a business manager commercialising research outcomes at Monash University.

The usual “staged” approach to innovation and commercialisation must be taken. This can be done two ways. The preferred approach is:

- One can seek products with known commercial value or potential that can be found in the flora or fauna of Australia. (Ie a “market-led” approach, which is commercially less risky, providing faster returns). Examples of this can include the essential oils for aromatherapy, fragrances, etc. This is a very large market constantly looking for new natural products and materials to use. Other products can be seen as import replacements / substitutes eg

musical instrument woods. Some product markets may be mature and slow growing yet still secure (eg musical instrument woods), while others may be growing rapidly, dynamic and innovative. A stepwise process may involve the following approach:

- Identify prospective high value high products
  - Seek such products in native flora, using all skills available
  - Collect field samples and test extracts / products in a lab / market / buyer
  - Conduct first pass cost estimates of processing, extraction etc
  - Conduct larger extraction trials and market tests, review IP status
  - Conduct environmental impact and social impact / benefits surveys
  - Evaluate the production or collection of materials (is it sustainable or threat?)
  - Confirm financial estimates of set-up and production costs
- The alternative, more conventional technology-led approach is one that Australia has followed for many years. It is based on fundamental academic (blue-sky) research from which a new product / extract / discovery with some commercial potential is largely fortuitous, and often based on a “latent hope” and not a principal objective of the research. Often, the researcher is unfamiliar with the commercial potential of the materials he is working with and unwilling or unable to exploit the commercial potential of any discovery. These may be seen as the “accidental by-products of their research”. More often than not, their discoveries are seen as products or processes which are “looking for” markets! A type of retrofitting challenge that is often too difficult but is occasionally very rewarding. Academic interest is often very focussed on a narrow outcome, use or function. It rarely includes the broader commercial or social vision necessitating a broader perspective eg engineering, costing, timing and market development. More recently, this has been changing but reluctantly in most cases, even where commercial funding is used to pay for applied research. (Where ethnobotany and other leads are followed, the likely-hood of discovery is increased markedly as the risks of failure are reduced by years of aboriginal knowledge and application over often millennia.)

It is unlikely that bioprospecting will in itself be of significant environmental benefit in retaining species diversity or reducing land salinisation. It will be essential to first establish those native or (exotic) species with potential for returns to landholders. When the land-holders are made aware of the opportunities to diversify from conventional income sources to alternatives,



based on existing plants on their land, they will value such species as sources of income. This attitude should provide a means to protect and preserve valuable species, associated species / types and the ecologies, reducing the need for woodland clearing for grassland and grazing.

The WA government has taken a leading role in assisting in the identification of species and assisting with early plant trials. The Qld government has identified a range of arid zone species with craftwood potential and continues to do further research on these. The Victorian government is doing dryland planting trails to repair earlier woodland damage and are field-testing species with **commercial agroforestry potential**.

Regional benefits would come from conventional plantations, harvesting and processing being done in areas remote from down stream re-processing and markets. The high costs of transport make this a sensible path. The sandalwood and craftwood markets are good examples (though still very formative) of this. The benefits (in the form of income, research funds, employment etc) of gene and high-tech research and outcomes from bioprospecting lie mostly in the cities which such research institutes are mostly based.

It is interesting to note that some exotic (ie non-native) species may have considerable commercial potential if grown in Australia. One example is St John's wort with antidepressant activity that appeals to overseas markets, which may focus on non-synthetic (ie natural) products for treatment of depression etc. There are many other species that have adapted or will do well with the climatic conditions and long growing seasons of Australia. The camphor laurel (sold as camphorwood) mesquite and prickly acacia in Queensland are two such examples with craftwood and other use potential. Their exploitation may be seen as a mechanism to control their spread and growth. The "clean and green" and "all natural", sunny climate and image we have in our favour should be protected and developed for our commercial advantage.

Another interesting example is where a by-product from edible oil industry can have high value, perhaps higher than the primary oil product. In this case the natural mustard essence from mustard oil production in NSW is cited as an example. The oil recovered from the meal is of very high value, especially in Japanese markets, as a hot and spicy additive in sauces and dips, even if not of high chemical complexity.

Other bioprocessing opportunities exist if we look at purifying / extracting and then chemically modifying existing products from natural sources eg sugars, sweetening agents, orange oils, eucalyptus oils, waste crustacean shells (for chitin), but these require large scale and long-term, fundamental and applied research funding and expensive processing. These costs can be often justified if the products meet market needs.

One final example I cite involves the 'discovery' of a fragrant dryland grass when camping inland in 1979 with my wife. I have examined the constituents of the essential oil from this grass. It is appealing to the senses, 'it smells nice', being similar in composition to the spicy oil from cloves and also from that most durable of woods, huon pine. One constituent of the grass is a powerful synergist useful in insect sprays (eg making pyrethrins more toxic to insects). This grass oil has potential as a low toxicity, pleasant smelling ('all-natural') wood preservative, as an antiseptic, fly spray additive etc. However, even though commercial annual cultivation would appear to be relatively easy, I have not been able to attract commercial interest or funding.

The creation of such bio-prospecting and bioprocessing industries in Australia, wether they are small or large-scale, would assist in reducing "the brain drain" and loss of IP overseas. They would create some job opportunities in rural areas and benefit those who arguably, need it most, the landholders and farmers.

We DO have the advantage of species and genetic diversity with our endemic species. We CAN find ways of retaining these to our advantage. Protection by patents and copyright may be possible but is an expensive and may be of dubious benefit. Being the first to exploit and product or process followed up by constantly improving, through R&D or investment into bioproduct or bioprocess, is another way of staying in front of competitors.

What is standing in our way? Perhaps it is our traditional approach, with an inability of multi-disciplinary groups to work together as they have successfully done in some parts of the world, notably the US. Is it the lack of recognition that we live with such fantastic resources and with so much potential? Many investors and governments expect to be shown "a commercial opportunity" and expect that this is not valuable information. It is very valuable and the search and **the search and finding** should be rewarded.

Is it because we need to be told or shown by others what we have or have lost? We are often told that we look to others for leads and inspiration but Australian researchers, entrepreneurs and innovators can be as "smart" as any in the world.

Is it lack of risk capital and the often-quoted comment that Aussie investors are always looking for "quick return"? Unlike others who are more patient ie "in it for the long-term"? This is a problem. We must attract risk capital and preferably from Australian investors so the benefits can remain within the nation. One source can be Superannuation fund managers who can invest small proportions or their large and very conservative portfolios into high-risk capital for such ventures. It will appeal to many "green" (environmentally conscious) investors,

more so than the “bluegum plantations” have! Government incentives (eg tax reductions, tax incentives, R&D offsets etc) can greatly improve the appeal of such high-risk ventures and are also strongly suggested.

New discoveries can come from the least likely source and support for diversity of opportunity in finding new bioproducts and processes must be encouraged; diverse products, diverse sources diverse project teams, diverse and overlapping technologies.

The protection of intellectual (biologically derived) property, recognition of knowledge, its source and rewards for, and environmental impacts of exploitation needs to be given more government attention and possibly legislation.

The National Strategy for the Conservation of Australia’s Biological diversity needs to be viewed realistically viz the benefits to the environment, the benefits our biological diversity can provide to mankind and the important sustainability by controlled exploitation or use of all species. A Code of Ethics needs to be created and agreed on by the parties involved.

My brief history and background is provided (see Appendix1).

Respectfully Submitted by:

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