NATIONAL SURVEY OF RESEARCH COMMERCIALISATION

YEAR 2000

Australian Research Council
Commonwealth Scientific and Industrial Research Organisation
National Health and Medical Research Council

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September 2002

ARC AUSTRALIAN RESEARCH COUNCIL

CSIRO

NHMRC *National Health & Medical Research Council*

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FOREWORD

This report presents findings from the National Survey of Research Commercialisation. It is the culmination of a partnership, entered into in 2001, between the Australian Research Council (ARC), the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the National Health and Medical Research Council (NHMRC).

The objectives of that partnership were to establish a methodology for measuring aspects of the commercial return on the public investment in research in Australia, to establish baselines against which to measure future performance and to compare that performance with similar activities occurring overseas, in particular within Canada and the USA.

The survey collected information about patenting and licensing of intellectual property arising from research being conducted within Australian universities, publicly funded medical research institutes and CSIRO. It also collected information about the formation of start-up companies on the basis of that intellectual property.

The information collected from universities and medical research institutes was then compared with information collected by the Association of University Technology Managers (AUTM) Licensing Survey of technology licensing and related performance for US and Canadian academic and non-profit institutions and patent-management firms that is conducted annually by AUTM in North America.

This comparison shows that in some key areas we are performing as well as or better than Canada and the US, while in other areas we lag.

We are on track to generate from the public investment in Australian research at least 250 new companies over the five-year period 2000 to 2004. Most of these companies can be expected to make their headquarters in Australia.

There has been an enhanced commitment to Australia's innovation capability in recent years, most notably under the Government's innovation statement, *Backing Australia's Ability*, which announced an additional investment of $2.9 billion over five years to support innovation and enhance Australia's international competitiveness, economic prosperity and social wellbeing. *Backing Australia's Ability* builds on the Government's investment in health and medical research of $614 million over six years, announced in the 1999–2000 Budget.

With that commitment of public funds comes a responsibility on the part of research-funding agencies, universities and research institutes to demonstrate the returns to the community in the form of economic, social, environmental and cultural benefits. This report is one contribution towards meeting that responsibility.

It is our hope that this report will open for the reader a window onto the magnitude and nature of the exciting new technologies that are being created from the discoveries made by researchers around the country, and the impact that these can be expected to have on the economic prosperity and quality of life of current and future generations.

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CEO, ARC

Professor Alan Pettigrew
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ACKNOWLEDGMENTS

The National Survey of Research Commercialisation was commissioned by the Australian Research Council (ARC) in partnership with the National Health and Medical Research Council (NHMRC) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO).

A steering committee was established to oversee the survey. Members of the steering committee were:

Dr Claire Baxter	steering committee Chair and Director, Business Liaison Office, The University of Sydney
Professor Michael Barber	former Council member of the ARC and Pro-Vice Chancellor (Research), The University of Western Australia
Mr John Grace	ARC Board member and CEO, Nextec Biosciences
Mr Greg Harper	Deputy CEO, ARC
Dr Michael Hirshorn	Investment Manager, Nanyang Ventures
Professor Alan Pettigrew	CEO, NHMRC
Dr Andrew Pik	Corporate Executive, Commercial and Investment Planning, CSIRO
Professor Peter Robinson	former Council member (as Deputy Chair) of the ARC and Corporate Adviser, Innovation and Research, University of Wollongong
Professor Fred Smith	Pro-Vice Chancellor (Research), La Trobe University
Ms Clare White	Executive Director, Policy & Planning Coordination, ARC

The steering committee was supported by staff in the ARC, who were responsible for day-to-day liaison with the consultants and management of the project. This staff team comprised (variously during 2001 and 2002) Simon Sedgley, Penny Knox, Melissa Schubert, Dennis Grube and Andrew Raynor. At the NHMRC, support was provided at various times by Wei Shi and Greg Ash. At CSIRO, support was provided at various times by Stephan Wellink, Garrett Upstill, Graham Thompson and Nathan Peterson.

The Association of University Technology Managers (AUTM) and Patentlink provided technical assistance to the survey. ARC project management acknowledges the contribution of Janet Scholz and Dan Massing in particular.

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The Year 2000 National Survey of Research Commercialisation would not have been possible without the enthusiastic, committed and diligent participation of staff in the respondent universities and medical research institutes and in CSIRO. The ARC, NHMRC and CSIRO acknowledge the considerable time and effort expended by these staff.

EXECUTIVE SUMMARY

Throughout Australia, in our universities and research institutes, researchers are generating new ideas. In partnership with commercial and investment managers, legal professionals and companies, they are turning those ideas into new products and services that are finding success in the market, generating and sustaining new industries, and enhancing the quality of life in many spheres.

In November 2001, the Australian Research Council (ARC), the National Health and Medical Research Council (NHMRC) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) undertook the National Survey of Research Commercialisation. The survey collected, for the first time in Australia, comprehensive information about the commercial activities that are occurring as the result of research conducted in universities, medical research institutes and CSIRO.

The ARC and NHMRC also commissioned work to establish international benchmarks of research commercialisation based on data from the licensing survey conducted in North America by the Association of University Technology Managers (AUTM), against which the data collected in the National Survey of Research Commercialisation in Australia could be compared.

The National Survey of Research Commercialisation collected information about invention disclosures, patents and plant-breeder rights, licensing activity and income, and start-up company formation.

A total of 34 universities, 15 medical research institutes and all 21 research divisions in CSIRO responded to the survey — response rates of 87%, 60% and 100%, respectively. The survey collected information about research commercialisation activities that occurred in what is referred to as "Year 2000" — the calendar year 2000 or the financial year 2000–01.

The Year 2000 information collected by the National Survey of Research Commercialisation establishes a baseline against which performance in subsequent years can be measured. The ARC, NHMRC and CSIRO intend to undertake the survey annually.

KEY FINDINGS FROM THE SURVEY

The following is a summary of the key findings from the survey. Each finding refers to the level of activity, in aggregate, by institutions that responded to the survey — universities, medical research institutes and CSIRO.

Patents (encompassing patents and plant-breeder rights)

- Respondent institutions filed 834 patent applications in Australia and the USA in Year 2000 — these included 469 new applications in Australia and 102 new applications in the USA.
- In total, 498 patents worldwide were issued to respondent institutions in Year 2000 — these included 143 Australian patents and 115 US patents.
- In total, 548 inventions were disclosed to respondent institutions in Year 2000 — for assessment of their patenting and commercial potential.

Licences (encompassing licences, options and assignments)

- Respondent institutions executed a total of 417 licences in Year 2000.
- Of these, 18% were with start-up companies, 19% were with small companies, 12% were with medium-size companies and 51% were with large companies.
- Of the licences executed with start-up companies in Year 2000, 86% were exclusive and 14% were non-exclusive.
- Of the licences executed with small companies in Year 2000, 48% were exclusive and 52% were non-exclusive.
- Of the licences executed with medium-size companies in Year 2000, 54% were exclusive and 46% were non-exclusive.
- Of the licences executed with large companies in Year 2000, 29% were exclusive and 71% were non-exclusive.

A significant proportion of licensing activity was focused on small companies — 47% of medical research institute licences, 41% of university licences and 27% of CSIRO licences were executed to start-up or small companies.

A very high proportion of licences executed to start-up companies were exclusive. This suggests that the ability to grant exclusive licences is important to company start-up activity, a key contribution to the overall economic impact of licensing by universities, medical research institutes and CSIRO.

Licence Income

- A total of 491 licences yielded income to respondent institutions in Year 2000.
- Respondent institutions' adjusted gross income from licences was $99 million in Year 2000.

There appears to be a positive relationship between an institution's income from licences and the length of its experience in managing commercial licensing activities:

- Four of the five licensing programs of respondent institutions that yielded income of more than $3 million in Year 2000 had been in operation for ten or more years.
- Of the licensing programs of respondent institutions that yielded income of less than $1 million in Year 2000, 68% had been in operation for less than ten years.

Inventor involvement in licensing

Inventor involvement appears to be an important element of strategies employed by universities, medical research institutes and CSIRO to manage their commercial licensing activities:

- In 73% of cases, inventors were either extremely involved or very involved in licensing activities.
- In only 5% of cases were inventors uninvolved in licensing activities.

Start-up companies

- In total, 47 new start-up companies were formed in Year 2000 as a result of research conducted within the respondent institutions — of these, 91% had their headquarters in Australia.
- Of the 102 start-up companies that were reported to have been formed at any time as the result of research conducted within the respondent institutions, 101 were still operational at the end of Year 2000.
- Respondent institutions held equity in 63% of their start-up companies at the end of Year 2000.

COUNTRY COMPARISONS

The National Survey of Research Commercialisation generated information about the extent of research commercialisation activity occurring in universities and medical research institutes in Australia.

An analysis was undertaken to compare that information with information about commercial activities occurring in similar institutions in the USA and Canada.

The indicators that were used to undertake the country comparisons were:

- number of US patents issued in Year 2000;
- number of licences executed in Year 2000;
- amount of adjusted gross income from licences in Year 2000; and
- number of start-up companies that were formed in Year 2000.

Comparisons were made on the basis of ratios that express the value of each of these indicators relative to research expenditure and to gross domestic product (GDP), respectively.

All financial amounts used in the calculation of these ratios are expressed in US$, on the basis of adjustments that were made to ensure purchasing power parity between amounts for the three countries.

The amounts of GDP were also adjusted to account for differences in response rates of institutions in the three countries. This was not necessary in the case of research expenditure, since the expenditure used in the calculation of ratios for the comparisons was only that of the respondent institutions in the three countries.

Key findings: commercialisation activity relative to research expenditure

In Year 2000, for every $US1 billion in research expenditure:

- 34.3 US patents were issued to institutions in Australia;
- 127.9 US patents were issued to institutions in the USA; and
- 86.1 US patents were issued to institutions in Canada.

- 115.4 licences were executed by institutions in Australia;
- 143.0 licences were executed by institutions in the USA; and
- 183.4 licences were executed by institutions in Canada.

- US$31.6 million in adjusted gross income from licences was received by institutions in Australia;
- US$44.9 million in adjusted gross income from licences was received by institutions in the USA; and
- US$17.2 million in adjusted gross income from licences was received by institutions in Canada.

- 16.2 start-up companies were formed by institutions in Australia;
- 13.8 start-up companies were formed by institutions in the USA; and
- 37.5 start-up companies were formed by institutions in Canada.

Key findings: commercialisation activity relative to GDP

In Year 2000, for every $US100 billion in GDP:

- 11.2 US patents were issued to institutions in Australia;
- 36.7 US patents were issued to institutions in the USA; and
- 23.3 US patents were issued to institutions in Canada.

- 37.7 licences were executed by institutions in Australia;
- 41.0 licences were executed by institutions in the USA; and
- 49.5 licences were executed by institutions in Canada.

- US$10.3 million in adjusted gross income from licences was received by institutions in Australia;
- US$12.9 million in adjusted gross income from licences was received by institutions in the USA; and
- US$4.7 million in adjusted gross income from licences was received by institutions in Canada.

- 5.2 start-up companies were formed by institutions in Australia;
- 4.0 start-up companies were formed by institutions in the USA; and
- 10.1 start-up companies were formed by institutions in Canada.

CONCLUSIONS

The National Survey of Research Commercialisation, conducted jointly by the ARC, NHMRC and CSIRO, has delivered baseline data that can be used not only to make international comparisons but that can also be built on in future surveys, to enable Australia to track its progress and set realistic targets to improve its performance over time.

Australia now has a firm basis on which to compare its performance in commercialising the research results of its universities and research institutes with that of institutions elsewhere in the world.

Overall, and in an international context, Australia's performance at commercialising this research is mixed. In some areas, for example income from licences and start-up company formation, our performance is above that of either the USA or Canada, relative to expenditure on research and the size of the national economy[1]. In other areas, for example number of licences executed and, in particular, US patents issued, our performance is below that of both the USA and Canada.

Australia's relative position in securing US patent protection, as revealed in this report, is consistent with results from previous studies, which showed that the number of Australian-invented US patents grew slowly over the period 1979–1997 and that, calculated relative to GDP, Australia's share of US patents is low relative to a number of other countries.

The results from the National Survey of Research Commercialisation provide an empirical basis for a debate about the balance between the various elements of our commercialisation activity in Australia, and about the most appropriate strategies that our publicly funded research organisations might pursue in order to maximise future returns on investment.

In this context, it is noteworthy that the country comparisons in this report indicate a research commercialisation strategy in Canada that appears to be focused on the formation of start-up companies.

The findings from the survey suggest that:

- Australia is on track to generate 250 start-up companies from its publicly funded research organisations over the five years to 2004 — a five year target proposed by a working group of the Prime Minister's Science, Engineering and Innovation Council (PMSEIC) in 2001;
- the ability to grant exclusive licenses is important to company start-up activity by publicly funded research organisations in Australia;
- inventor involvement is an important element in the strategies employed by Australia's publicly funded research organisations to manage their commercial licensing activities;
- there is a positive relationship between the length of an institution's experience in

[1] Although, in relation to income from licences, Australia's performance in Year 2000 was dominated heavily by the sale of Melbourne IT.

managing commercial licensing activities and the level of that institution's income from licences; and

- there is room for improvement in the management of invention disclosures in Australia's publicly funded research organisations, according to uniform and higher standards of practice.

The Year 2000 National Survey of Research Commercialisation has demonstrated, for the first time, that there is a substantial contribution to the commercialisation of research in Australia being made by universities, medical research institutes and CSIRO, relative to the resources at their disposal.

Future surveys will establish the direction of trends in the level of commercialisation of research in Australia. Comparison of the data from those surveys with data from other countries will inform us about the degree to which our international competitiveness in this area is being maintained, improving or declining.

1. INTRODUCTION

Throughout Australia, in our universities and research institutes, researchers are generating new ideas. In partnership with commercial and investment managers, legal professionals and companies, they are turning those ideas into new products and services that are finding success in the market and generating and sustaining new industries.

These products and services are enhancing the quality of life in many spheres. They are contributing to better health outcomes for individuals, providing superior consumer items, offering more powerful means of manipulating and communicating information and supporting environmentally sustainable energy production.

This report presents, for the first time in Australia, a comprehensive survey of patenting, licensing and start-up company formation associated with these commercial activities. It also compares the extent of these activities in Australia with that of activities occurring in Canada and the USA.

The report presents detailed statistical findings from the National Survey of Research Commercialisation conducted by the Australian Research Council (ARC), the National Health and Medical Research Council (NHMRC) and the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in 2001. The methodology used is based on the annual licensing survey conducted in the USA and Canada by the Association of University Technology Managers (AUTM).

The report also presents product success stories that highlight the impact that a sample of the commercial activities is having, or will have, on our daily lives.

It is important to note that the ARC and the NHMRC, unlike CSIRO, are funding bodies, and do not hold the intellectual property rights arising from the research they co-sponsor with universities and medical research institutes. These rights are held by the universities and medical research institutes, which operate according to national guidelines for managing intellectual property.

THE POLICY CONTEXT

In December 1998, the Health and Medical Research Strategic Review concluded that the future of health and medical research in Australia will require the establishment of a "virtuous cycle" of Government investment, links between publicly funded research organisations and the commercialisation of findings through industry. The Review report (Commonwealth Department of Health and Aged Care, 1999) noted that Australia can point to a number of successful commercial ventures, such as Biota and ResMed, arising from health and medical research, but also a number of missed opportunities, such as colony stimulating factors and haemachromatosis genes, discoveries from which the value was not captured for Australia.

In February 1999, the then Minister for Education, Training and Youth Affairs, Dr David Kemp, asked the ARC to provide him with advice on the range of incentive and culture factors associated with effective university research commercialisation practices.

The ARC's advice to the Minister was published in July 2000 in a report entitled *Research in the National Interest: Commercialising University Research in Australia* (Australian Research Council, 2000). The report examined the structural and cultural barriers to commercialising university research in Australia and, in order to overcome these, canvassed a range of commercialisation mechanisms and issues.

The report highlighted the fact that there were virtually no published data on the activities of research commercialisation entities in Australia that would indicate their business performance. The absence of Australian data stood in contrast to those provided through the annual Association of University Technology Managers (AUTM) Licensing Survey in North America, a survey of technology licensing and related performance for US and Canadian academic and non-profit institutions and patent-management firms.

In February 2000, 500 leaders from the business, government and research sectors came together for the National Innovation Summit. The report of the Summit, *Innovation: Unlocking the Future*, provided an analysis of the strengths and weaknesses of Australia's capacity for innovation (Commonwealth Department of Industry, Science and Resources, 2000a).

The report noted that, as a nation, while some of our enterprises are up with the best in the world, our overall performance in translating ideas and knowledge into commercial and economic gain needs to be enhanced. In addition to advocating the establishment of more start-up companies, the report emphasised the importance of technology transfer from research organisations to existing businesses. The report also commented that many public sector research ideas follow the licensing route to commercialisation, which, in the long run, rarely delivers substantial returns. By contrast, it suggested, the creation of spin-off firms delivers far greater benefits in the long term.

In November 2000, the Chief Scientist, Dr Robin Batterham, presented the report of his review of Australian science capability, *The Chance to Change* (Commonwealth Department of Industry, Science and Resources, 2000b). The report made a number of recommendations for enhancing the Australian science, engineering and technology (SET) base. The Chief Scientist made a direct link between any additional public investment that might be made in response to those recommendations and the need for greater accountability, through a clearer demonstration of the relationships between funding of the SET base and outcomes, which include the commercialisation of research and its impact within the community. One of the key recommendations to emerge from the review was that universities must introduce strategies to stimulate and facilitate increased transfer of knowledge to business and society. Examples from the report, of relevant metrics for measuring the success of investment in the SET base are:

- the number of patents received or pending over time; and
- the number of spin-offs from research institutions — for example, per $100 million research budget per year.

In January 2001, the Prime Minister, John Howard, released his government's statement on innovation, *Backing Australia's Ability: An Innovation Action Plan for the Future*, which outlined the government's strategy to encourage and support innovation, and enhance Australia's international competitiveness, economic prosperity and social well being (Commonwealth of Australia, 2001). The statement announced a range of initiatives focusing on key elements of innovation, including:

- strengthening our ability to generate ideas and undertake research;
- accelerating the commercial application of ideas; and
- developing and retaining Australian skills.

The initiatives in the statement are being funded by a government investment of $2.9 billion over the five-year period 2001–02 to 2005–06 that will support business and research organisation expenditure of approximately $6 billion. Amongst the initiatives, and to help commercialise public sector research, the government is providing $79 million in pre-seed funding to take proposals to venture-capital-ready stage.

As part of an ongoing commitment to improving Australia's innovative capacity in the longer term, the government also undertook to examine the barriers to, and the effectiveness of, current incentives for the commercialisation of government-funded research in Australia to, for example, increase the development of patents from scientific research by publicly funded institutions.

Under the Prime Minister's chairmanship, his Science, Engineering and Innovation Council (PMSEIC) has also prepared a series of working papers and reports on priority issues to improve Australia's innovation performance. In June 2001, a PMSEIC report, *Commercialising Public Sector Research*, highlighted the need to improve Australia's ability to turn great concepts into commercial success stories, so we all benefit from the returns on our research investment (Prime Minister's Science, Engeineering and Innovation council, 2001). The report proposed that, if we can grow 200–250 more Australian research-based companies over the next five years, the prize could be around $20 billion added to our annual export earnings. The report urged that:

> Australia should aim for the world's best practice in commercialisation. To do this we need to get serious about tracking our performance against the 'best of the best'. We need to stretch upward and set high targets for increasing the current number of licenses generated and spin-off companies created.

The data contained in this report enable Australia, for the first time, to benchmark its performance against the 'best of the best' and, on that basis, to set targets for future performance which are not only aspirational, but realistic.

THE SURVEY

The objectives of the survey were to establish a methodology for measuring the commercial return on the public investment in research in Australia and to establish baselines against which to measure future performance and compare that performance with comparable activities overseas.

In November 2001, the ARC, CSIRO and the NHMRC undertook a comprehensive national survey of commercial activity occurring as the result of research conducted in universities, CSIRO and medical research institutes. The ARC and NHMRC also commissioned work to establish international benchmarks of research commercialisation based on data from the AUTM survey, against which data for Australia could be compared.

The survey collected information about the following:

Invention disclosures — an invention disclosure occurs when a device, substance, method or process that is apparently new, useful and involves an inventive step is made known to personnel within an institution who have responsibility for managing the institution's patenting and research commercialisation activities.

Patents — patents establish legally enforceable protection of rights over intellectual property associated with inventions.

Plant-breeder rights — a plant-breeder right is a temporary monopoly granted to a plant breeder seeking registration of a new plant variety. It gives the breeder the exclusive right to produce and reproduce the propagating material of the variety and to stock, sell, import or export the propagating material. In order for a plant-breeder right to be granted, the variety must be novel, distinct, uniform and stable.

Licences — a licence agreement formalises the transfer of technology between two parties, where the owner of the technology (the licensor) permits the other party (the licensee) to share the rights to use the technology.

Options — an option agreement grants the potential licensee a time period during which it may evaluate the technology and negotiate the terms of a licence agreement.

Assignments — an assignment agreement conveys all right, title and interest in and to the licensed subject matter to the named assignee.

Start-up companies — the term 'start-up companies', as used in this report, refers to companies engaged in businesses that were dependent, for their formation, upon licensing or assignment of technology by the institutions that were the subject of this survey.

The explanatory notes and definitions that were used in the survey are listed in full at Appendix 3.

The survey was not designed to capture the information that would be required to undertake a comprehensive assessment of the impact of research on the wider economy. Neither was it designed to capture information about the entire range of commercial activities associated with research. No information was collected about contract services (for example, research services, specialised consulting and technical testing and accreditation), co-investment in research (for example, involving public–private partnerships) and exchanges of information that occur via mechanisms such as staff interchanges, seminars and workshops, as well as through training and informal contacts. CSIRO did collect contract research information for internal reporting purposes.

Nor did the survey capture information about commercial activity occurring in all research organisations in Australia. A number of publicly funded research institutes that make a significant contribution to innovation through their research and commercial activities were not surveyed. These include the Australian Institute of Marine Science (AIMS), the Australian Nuclear Science and Technology Organisation (ANSTO) and the Defence Science and Technology Organisation (DSTO). In addition, no fully privately funded research organisations were surveyed.

The survey population consisted of 65 institutions. Survey questionnaires were sent to all 39 universities in Australia, to the 25 medical research institutes that receive funding from the NHMRC and to CSIRO. The institutions surveyed were asked to provide a best estimate in response to each question if an exact response was not known.

Extensive follow-up resulted in an overall response rate for the survey of 77%. There was an 87% response rate for universities and a 60% response rate for medical research institutes. All 21 CSIRO research divisions responded to the survey.

The reporting period for the survey is termed Year 2000. For all respondent universities and nine medical research institutes, this is the calendar year 2000. For five medical research institutes, it is the financial year from 1 July 2000 to 30 June 2001. For one medical research institute, it is the financial year from 1 July 1999 to 30 June 2000. For CSIRO, the reporting period is the financial year from 1 July 2000 to 30 June 2001.

The ARC, NHMRC and CSIRO intend to make the National Survey of Research Commercialisation in Australia an annual undertaking.

THIS REPORT

This report presents, for the first time, comprehensive information about the commercial outputs being generated from research conducted in Australian universities and publicly funded research institutes.

It is the second in a series of reports that examine aspects of Australia's performance in research and research commercialisation. The first report, *Inventing Our Future*, was commissioned jointly by the ARC and CSIRO and published in 2000 (Narin et al., 2000). It examined the link between Australian patenting and basic research, and compared Australian performance against that of a number of other countries.

Inventing Our Future demonstrated that there is a critical nexus between publicly funded research and the development of new technologies in Australia. It revealed, for example, that of all the citations to Australian scientific research papers in Australian-invented US patents, 97% were to papers of high quality, authored at publicly funded institutions. It also established that Australian patenting, notwithstanding the relatively low level overall, is highly science-linked, a signal that Australia is well positioned to develop new technologies in leading-edge areas of high market value.

In this report, information is presented in the areas of invention disclosures, patents, licences and start-up company formation, providing benchmarks against which information collected in future surveys can be compared.

The report also compares research commercialisation activity in Australia's universities and publicly funded medical research institutes with comparable activity occurring in Canada and the USA. To our knowledge, no such comprehensive country comparisons have been published previously.

The statistical findings from the survey are presented in section 2 of this report, in a sequence consistent with that of the process of research commercialisation. Following a presentation of findings on the numbers of personnel employed in research commercialisation activities, findings are presented in relation to:

- financial expenditure in support of research;
- invention disclosures;
- patent applications and issued patents;
- licensing activity and income;
- start-up company formation; and
- institutional equity.

In section 3, country comparisons are presented that indicate the extent of research commercialisation activities occurring in Australia relative to that in Canada and the USA.

In section 4, conclusions from the survey findings are presented.

In section 5, the report looks behind the statistics, at some of the people and activities around Australia generating new ideas from research and, from those ideas, placing new products and services into the market. The product success stories presented in this section highlight the return on investment from research — economic returns through, for example, the formation of new companies and the creation of jobs, and social returns in the form of, for example, new and better products that enhance quality of life.

The survey respondents are listed at Appendix 1.

The survey questionnaire is included at Appendix 2.

The explanatory notes and definitions for the survey are included at Appendix 3. These notes and definitions are important to the interpretation of reported data and, in general, provide a glossary of terms recognised by the research commercialisation community.

Tables of findings from the survey, for each university and medical research institute and CSIRO, are included at Appendix 4. These findings are not directly comparable from one institution to another, in light of the autonomous stature of each institution, differences in their income and expenditure on research, the unique mission of each[2] and their proximity and access to the infrastructure that supports research commercialisation.

The start-up companies formed in Year 2000 that are the subject of this report are listed at Appendix 5.

[2] For example, with universities playing a dominant role in conducting research training.

The findings presented in this report are derived from information provided by the institutions that responded to the survey. No independent verification of that information has been performed, except through routine follow-up of respondents where anomalies were apparent in information provided in questionnaire responses.

2. COMMERCIAL ACTIVITY — THE SURVEY FINDINGS

RESEARCH COMMERCIALISATION PERSONNEL

For the purposes of the survey, research commercialisation activities included those activities associated with the identification, documentation, evaluation, protection, marketing and licensing of technology (including trademarks) and intellectual property management in general. They encompassed activities such as assisting with the negotiation of research agreements and reporting inventions to sponsors.

The survey sought information from institutions about the numbers of personnel involved in commercialisation activities — that is, those employees whose duties are specifically involved with the licensing and patenting processes in either a full-time or fractional full-time equivalent (FTE) capacity. Licensing activity includes licensee solicitation, technology valuation, marketing of technology, licence agreement negotiation and drafting, and company start-up activites.

The survey also sought information about the numbers of other personnel whose duties are to provide professional, administrative or staff support to commercialisation activities. These duties include management, compliance reporting, licence maintenance, contract management, accounting and general office activity.

Commercialisation and support staff may be employed within an office dedicated to commercialisation activities, a commercialisation company or within other functional units within the institution, including those dedicated primarily to research or teaching and research. A commercialisation company is a company that is wholly owned by an institution and established to undertake the commercialisation activities of the institution.

Table 1: Research commercialisation personnel, Year 2000 (FTE)

	Universities	Medical Research Institutes	CSIRO	Total
Employed in commercialisation	89.3	6.9	96.6	192.8
Employed in commercialisation support	53.1	2.1	39.0	94.2
Total employees	142.4	9.0	135.6	287.0

UNIVERSITIES

In Year 2000, universities employed 142.4 personnel (FTE) in commercialisation and support activities[3]. Twenty-seven universities employed some personnel in

[3] Among universities, the University of New England reported the highest number of research commercialisation personnel. Of the total of 30 FTE that it reported were employed in commercialisation, 27 FTE were located within the Agricultural Business Research Institute and the remaining 3 FTE elsewhere within the university.

commercialisation and support activities. Seven universities employed no personnel in commercialisation and support activities.

Across all universities, 57.5 commercialisation and support personnel (FTE) were employed in a dedicated commercialisation office and the same number were employed in a commercialisation company.

MEDICAL RESEARCH INSTITUTES

In Year 2000, medical research institutes employed 9.0 personnel (FTE) in commercialisation and support activities. Twelve institutes employed some personnel in commercialisation and support activities. Three institutes employed no personnel in commercialisation and support activities.

Across all medical research institutes, 2.6 commercialisation and support personnel (FTE) were employed in a dedicated commercialisation office and none were employed in a commercialisation company.

CSIRO

In Year 2000, CSIRO employed 135.6 personnel (FTE) in commercialisation and support activities, of which 96.5 were fully dedicated commercial personnel. The number of personnel employed in commercialisation and support activities ranged from fewer than one to over 11 across CSIRO's 21 research divisions. In total, 19.4 corporate staff were involved in commercialisation and support.

RESEARCH EXPENDITURE

The investment by government and from private sector sources that supports expenditures on research by universities and research institutes lays the foundation for the discoveries that are the source of the commercial activities examined in this report.

The survey sought information about the expenditures made by institutions in Year 2000 in support of their research activities. Information was sought for:

- total research expenditures — funded from all sources, including Commonwealth, state and local government, industry, foundations and other non-profit organisations;
- research expenditures from Commonwealth government sources;
- research expenditures from state and local government sources; and
- research expenditures from industry sources — funded by for-profit corporations.

Institutions were asked to report information about research expenditure according to the reporting guidelines for the Australian Bureau of Statistics (ABS) survey of research and experimental development. The ABS survey is conducted in accordance with guidelines promulgated by the Organisation for Economic Cooperation and Development and forms the basis of international comparisons of R&D expenditure for higher education (HERD), government research organisations (GOVERD) and business organisations (BERD).

UNIVERSITIES

In Year 2000, total research expenditure within the higher education sector amounted to $2,775 million. The universities that responded to the survey accounted for 97% of this expenditure ($2,703 million)[4].

Table 2: Higher education — research expenditure by source of funds, Year 2000 ($'000)[a]

National Competitive Research Grants		Other Australian Sources						Total
Commonwealth Schemes	Non Commonwealth Schemes	State and Local Government	Other Commonwealth Government	Business Enterprises	General University Funds[b]	Other	Overseas	
483,416	12,065	87,859	166,504	136,221	1,745,693	82,154	60,652	2,774,564

[a] Source: Research Expenditure, 2000: Selected Higher Education Statistics (Department of Education, Science and Training).
[b] General University Funds includes operating grants and block grants.

[4] Due to inconsistencies in reporting by universities, research expenditure data for 2000 for individual universities and for the higher education sector as a whole were sourced from the Commonwealth Department of Education, Science and Training.

MEDICAL RESEARCH INSTITUTES

In Year 2000, total research expenditure reported in the survey by medical research institutes amounted to $145.6 million.

Table 3: Medical research institutes — research expenditure by source of funds, Year 2000 ($'000)

Commonwealth Government	State and Local Government	Industry	Other	Total
48,935	21,375	14,673	60,632	145,616

CSIRO

In Year 2000, total research expenditure by CSIRO amounted to $754.5 million.

Table 4: CSIRO — research expenditure by source of funds, Year 2000 ($'000)

Appropriations[a]	Other Sources						Total
Commonwealth Government	Commonwealth, State and Local Government	Business Enterprises	Overseas	Cooperative Research Centres	Research and Development Corporations	Other	Total
506,200	66,800	75,200	32,700	27,600	40,800	5,200	754,500

[a] Excludes the $104.9 million Capital Use Charge which is paid back to the Commonwealth Government.

INVENTION DISCLOSURES AND PATENTS

A) INVENTION DISCLOSURES

An invention disclosure occurs when a device, substance, method or process that is apparently new, useful and involves an inventive step is made known to personnel within an institution who have responsibility for managing the institution's research commercialisation activities. The purpose of disclosure is to place inventions under assessment for their commercial potential, as a precursor, on many occasions, to seeking protection of any intellectual property that might be considered to exist.

The survey sought information from institutions about all invention disclosures, no matter how comprehensive, that were made in Year 2000 and were counted by the institutions[5].

In Year 2000, 548 invention disclosures were received by universities, medical research institutes and CSIRO.

Table 5: Invention disclosures received, Year 2000

	Universities	Medical Research Institutes	CSIRO	Total
Number	445	41	62	548

Universities

In Year 2000, universities received a total of 445 invention disclosures. Four universities recorded 59% of all disclosures received by universities — these universities accounted for 31% of research expenditure by universities in the survey. The highest number of disclosures received by a single university was 123, which represents 28% of all disclosures received by universities. Eleven universities each received more than 10 invention disclosures. Twenty-two universities each received at least one invention disclosure. Nine universities received no invention disclosures. Information was not available from three universities.

Medical Research Institutes

In Year 2000, medical research institutes received a total of 41 invention disclosures. Two institutes accounted for 63% of these disclosures — these institutes accounted for 23% of research expenditure by medical research institutes in the survey. The highest number of disclosures received by a single institute was 16, which represents 39% of all disclosures by institutes. Two institutes each received more than 10 invention disclosures. Six institutes each received at least one invention disclosure. Eight institutes received no invention disclosures. Information was not available from one institute.

[5] Anecdotal evidence suggests that the standard of record keeping associated with invention disclosures is not uniform across all institutions, nor is it carried out as a centralised function in all cases. Hence, it is likely that invention disclosures are under-reported.

CSIRO

In Year 2000, 62 invention disclosures were reported by 16 research divisions within CSIRO. Information about invention disclosures was not collected systematically across all divisions in Year 2000.

B) PATENTS

Patents establish legally enforceable protection of rights over intellectual property associated with inventions. They provide surety and security of ownership as a basis for any investment in commercialising the inventions. For an invention to be patented, it must be judged to be new and useful, involve an inventive step and be a 'manner of manufacture' (a legal term used to distinguish inventions that are patentable from those that are not).

A patent application may be made in a year different from that of the relevant invention disclosure and not all inventions disclosed are patented.

The survey sought information from institutions about the number of patent applications they filed and the numbers of patents that were issued to them in Year 2000.

Patent applications filed included provisional applications, provisional applications that were converted to regular applications and applications for certificates of plant variety. Patents issued included patents issued or reissued and plant-breeder rights.

Patent applications filed

In Year 2000, universities, medical research institutes and CSIRO filed a total of 834 patent applications in Australia and the USA, including 469 new patent applications in Australia and 102 new patent applications in the USA. These institutions also filed a total of 201 Patent Cooperation Treaty (PCT) applications.

Table 6: Patent applications filed, Year 2000

	New — Australia	New — USA	New and continuing — Australia and the USA	PCT Applications Filed
Universities	301	87	586	120
Medical Research Institutes	42	14	70	19
CSIRO[a]	126	1[b]	178	62
Total	469	102	834	201

[a] Figures for CSIRO exclude 65 national and 17 international (filed and registered) plant breeder rights cases.
[b] CSIRO treated 'New' as provisional patent applications and generally files these only in Australia.

Universities

In Year 2000, universities filed 586 patent applications in Australia and the USA. Six universities accounted for 73% of these applications — these universities accounted for 53% of research expenditure by universities in the survey. The highest number of patent

applications filed by a single university was 115, which represents 20% of all applications filed by universities. Thirteen universities each filed 10 or more patent applications. Twenty-seven universities each filed at least one patent application. Six universities filed no patent applications. Information was not available from one university.

Medical Research Institutes

In Year 2000, medical research institutes filed 70 patent applications in Australia and the USA. Two institutes accounted for 53% of these applications — these institutes accounted for 28% of research expenditure by medical research institutes in the survey. The highest number of patent applications filed by a single institute was 24, which represents 34% of all applications filed by medical research institutes. Two institutes each filed 10 or more patent applications. Eleven institutes each filed at least one patent application. Three institutes filed no patent applications. Information was not available from one institute.

CSIRO

In Year 2000, CSIRO filed 178 patent applications in Australia and the USA. Four divisions accounted for 50% of these applications and 30% of research expenditure.

Patents issued

In Year 2000, universities, medical research institutes and CSIRO were issued a total of 498 patents worldwide — including 143 in Australia and 115 in the USA.

Table 7: Patents issued, Year 2000

	Australia	USA	Worldwide
Universities	96	67	219
Medical Research Institutes	7	7	22
CSIRO[a]	40	41	257
Total	143	115	498

[a] Figures for CSIRO exclude 65 national and 17 international (filed and registered) plant-breeder rights cases.

Universities

In Year 2000, universities were issued 219 new patents worldwide. Five universities accounted for 67% of these patents issued — these universities accounted for 48% of research expenditure by universities in the survey. The highest number of patents issued worldwide to a single university was 50, which represents 23% of all patents issued worldwide to universities. Eight universities were each issued 10 or more patents worldwide. Twenty-one universities were each issued at least one patent. Twelve universities were issued no patents. Information was not available from one university.

Medical Research Institutes

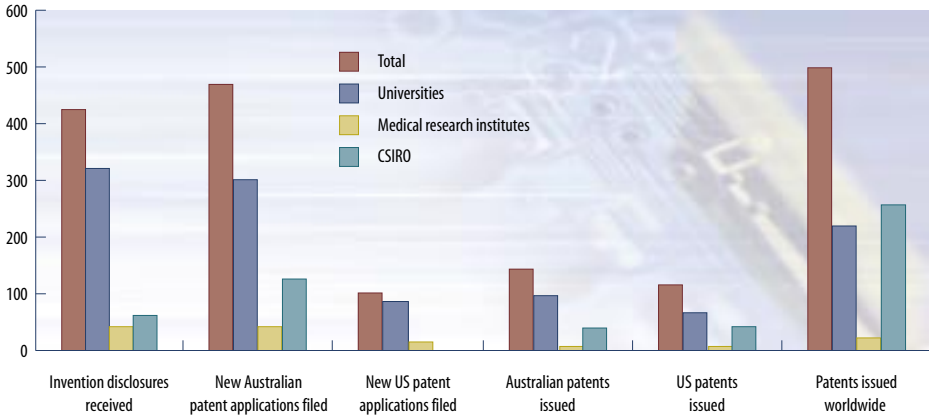
In Year 2000, medical research institutes were issued 22 new patents worldwide. The highest number of patents issued worldwide to a single institute was nine, which represents 41% of all patents issued worldwide to Australian medical research institutes.

Seven institutes were each issued at least one patent. Seven institutes were issued no patents. Information was not available from one institute.

CSIRO

In Year 2000, CSIRO was issued 257 new patents worldwide. Three divisions accounted for 53% of these patents issued — these divisions accounted for 22% of research expenditure by CSIRO. The highest number of patents issued to a single division was 70.

Invention disclosures, patent applications[6] and patents issued, Year 2000



C) PATENT FEES EXPENDITURES AND REIMBURSEMENTS

The survey sought information from institutions about the legal fees expended and reimbursed in Year 2000 associated with the management of statutory protection of intellectual property under patents and copyright.

Legal fees expenditures include all amounts spent by an institution in external legal fees in relation to patent and copyright prosecution, maintenance and interference, as well as minor litigation expenses that are included in everyday office expenditures.

Legal fees reimbursements include all amounts reimbursed by licensees to an institution for legal fees expenditures.

In Year 2000, universities, medical research institutes and CSIRO made legal fees expenditures of $11.2 million in total. This was offset by a total of $3.4 million in legal fees reimbursed to these institutions.

Table 8: Legal fees, Year 2000 ($'000)

	Universities	Medical Research Institutes	CSIRO	Total
Expenditures	5,845	656	4,720	11,221
Reimbursements	2,367	271	739	3,376

[6] Patent applications filed by CSIRO are provisional patent applications only.

LICENCES

The term 'licensed technology' refers to a technology that becomes a product to be sold or to a technology that is a process that is put into commercial use.

For the purposes of this survey, licence, option and assignment agreements were defined as follows:

- A licence agreement formalises the transfer of technology between two parties, where the owner of the technology (the licensor) permits the other party (the licensee) to share the rights to use the technology.
- An option agreement grants the potential licensee a time period during which it may evaluate the technology and negotiate the terms of a licence agreement. An option agreement is not constituted by an option clause in a research agreement that grants rights to future inventions, until an actual invention has occurred that is subject to that option.
- An assignment agreement conveys all right, title and interest in and to the licensed subject matter to the named assignee.

Licence, option and assignment agreements are hereafter referred to collectively as licence agreements or licences.

In Year 2000, 417 licences were executed by universities, medical research institutes and CSIRO.

Table 9: Licences executed, Year 2000

	Universities	Medical Research Institutes	CSIRO	Total
Number of licences	234	15	168	417

Universities

In Year 2000, universities executed 234 licence agreements. Three universities accounted for 51% of these licences — these universities accounted for 30% of research expenditure by universities in the survey. The highest number of licences executed by a single university was 63, which represents 27% of all licences executed by universities. Seven universities each executed 10 or more licences. Twenty-three universities each executed at least one licence. Ten universities executed no licences. Information was not available from one university.

Medical Research Institutes

In Year 2000, medical research institutes executed 15 licence agreements. The highest number of licences executed by a single institute was four, which represents 27% of all licences executed by institutes. Seven institutes each executed at least one licence. Seven institutes executed no licences. Information was not available from one institute.

CSIRO

In Year 2000, CSIRO executed 168 licences. Two divisions accounted for 51% of these licences, which were largely for licensing of software. Two divisions executed no licences.

A) EXCLUSIVITY PATTERNS

The survey sought information from institutions about:

- the numbers of licences executed in Year 2000 that were either exclusive or non-exclusive; and
- the numbers of licences executed in Year 2000 that were executed with start-up, small, medium or large companies.

For the purposes of this survey, companies were defined as follows:

- Start-up companies were companies engaged in businesses that were dependent, for their formation, upon licensing or assignment of technology by the institutions that were the subject of this survey.
- Small companies were companies that had 1 to 19 employees at the time of entering into licence agreements with institutions that were the subject of this survey — small companies did not include start-up companies.
- Medium companies were companies that had 20 to 199 employees at the time of entering into a licence agreement with institutions that were the subject of this survey.
- Large companies were companies that had 200 or more employees at the time of entering into a licence agreement with institutions that were the subject of this survey.

Of the 417 licences executed by universities, medical research institutes and CSIRO in Year 2000, 391 (94%) were reported as either exclusive or non-exclusive. Of these 391 licences, 40% were exclusive and 60% were non-exclusive.

Table 10: Licences executed — exclusive and non-exclusive, Year 2000 (for respondents that provided data)

	Total Licences Executed	Exclusive	Percent of Total	Non-Exclusive	Percent of Total
Universities	208	103	50	105	50
Medical Research Institutes	15	14	93	1	7
CSIRO	168	41	24	127	76
Total	391	158	40	233	60

Of the 417 licences executed by universities, medical research institutes and CSIRO in Year 2000, 336 (81%) were reported as being executed to start-up, small, medium or large companies. Of these 336 licences, 18% were executed to start-up companies, 19% to small companies, 12% to medium companies and 51% to large companies.

Table 11: Licences executed — to start-up, small, medium or large companies, Year 2000 (for respondents that provided data)

	Total Licences Executed	Start-up Companies	Percent of Total	Small Companies	Percent of Total	Medium Companies	Percent of Total	Large Companies	Percent of Total
Universities	204	35	17	48	24	22	11	99	49
Medical Research Institutes	15	6	40	1	7	5	33	3	20
CSIRO	117	18	15	14	12	14	12	71	61
Total	336	59	18	63	19	41	12	173	51

A significant proportion of licensing activity is focused on small companies, with 47% of medical research institute licences, 41% of university licences and 27% of CSIRO licences executed to start-up or small companies.

Of the 417 licences executed by universities, medical research institutes and CSIRO in Year 2000, 335 (80%) were reported as either exclusive or non-exclusive and as being executed to start-up, small, medium or large companies:

- of the licences executed to start-up companies, 86% were exclusive and 14% were non-exclusive.
- of the licences executed to small companies, 48% were exclusive and 52% were non-exclusive.
- of the licences executed to medium companies, 54% were exclusive and 46% were non-exclusive.
- of the licences executed to large companies, 29% were exclusive and 71% were non-exclusive.

The very high proportion of exclusive licences executed to start-up companies suggests that the ability to grant exclusive licences is important to company start-up activity, an important contribution to the overall economic impact of licensing by universities, medical research institutes and CSIRO.

B) INCOME PATTERNS

The survey sought information from institutions about the number of licences that yielded income in Year 2000 and the amount of income they received from these licences in that year, in the form of running royalties, cashed-in equity and all other types of income.

Income from licences

The 491 licences that were executed by universities, medical research institutes and CSIRO and which yielded income in Year 2000, yielded gross income amounting to $103.6 million and adjusted gross income[7] amounting to $99.4 million in Year 2000.

[7] Adjusted gross income from licences is gross income from licences minus licence income paid to other institutions. The subtraction of licence income paid to other institutions from gross income from licences removes a possible double count in the licence income data that may occur from the reporting of the same income by more than one institution.

Table 12: Income from licences, Year 2000 ($'000)

	Universities	Medical Research Institutes	CSIRO	Total
Gross Income from Licences	83,878	8,071	11,620	103,569
Licence Income Paid to Other Institutions	537	1,446	2,180	4,163
Adjusted Gross Income from Licences	83,341	6,624	9,440	99,405
Number of Licences Yielding Income	252	19	220	491

Universities

In Year 2000, universities received adjusted gross income from licences amounting to $83.3 million. Five universities accounted for 88% of this income — these universities accounted for 32% of research expenditure by universities in the survey. The highest level of adjusted gross income received from licences by a single university[8] was $52.0 million, which represents 62% of all adjusted gross income received from licences by universities. Ten universities each received adjusted gross income from licences of more than $1 million. Twenty-three universities received some adjusted gross income from licences. Ten universities received no income from licences. Information was not available from one university.

Medical Research Institutes

In Year 2000, medical research institutes received adjusted gross income from licences amounting to $6.6 million. Two institutes accounted for 61% of this income — these institutes accounted for 10% of research expenditure by medical research institutes in the survey. The highest level of adjusted gross income received from licences by a single institute was $2.4 million, which represents 36% of all adjusted gross income received from licences by institutes. Two institutes each received adjusted gross income of more than $1 million from licences. Nine institutes received some adjusted gross income from licences. Five institutes received no income from licences. Information was not available from one institute.

CSIRO

In Year 2000, CSIRO received adjusted gross income from licences amounting to $9.4 million. Two divisions accounted for 48% of this income and five divisions accounted for 65%. Some 30% of the total income was attributable to licences for plant-breeder rights. Two divisions received no income from licences.

Income type

For 96% of gross income received from licences in Year 2000, institutions identified whether the income was in the form of running royalties, cashed-in equity or all other types of income.

[8] In November 1999, it was announced that Melbourne IT, a commercial operation of the University of Melbourne, was to be listed on the Australian Stock Exchange. Melbourne IT opened its public offer of 42.5 million shares at $2.20 per share, which valued the company at $110 million. Through MEI Ltd, the university received a return of $79 million from the float and retained a 15% stake. In 2000, $50 million was paid to the university. The balance of the sale proceeds was retained by MEI Ltd for strategic purposes. The university subsequently sold its 15% stake.

Table 13: Gross income from licences — running royalties, cashed-in equity and all other income, Year 2000 ($'000) (for respondents that provided data)

	Total Gross Income	Running Royalties	Percent of Total	Cashed-In Equity	Percent of Total	All Other Income	Percent of Total
Universities	79,834	8,702	11	52,342	66	18,790	24
Medical Research Institutes	8,071	4,002	50	2,200	27	1,869	23
CSIRO	11,620	5,455	47	600	5	5,565	48
Total	99,525	18,159	18	55,142	55	26,224	26

CSIRO reported that, of the 220 of its licences which yielded income in Year 2000, 170 yielded income in the form of running royalties and one yielded income in the form of cashed-in equity. All others yielded income from other sources, such as licence-issue fees, payments under options and termination payments.

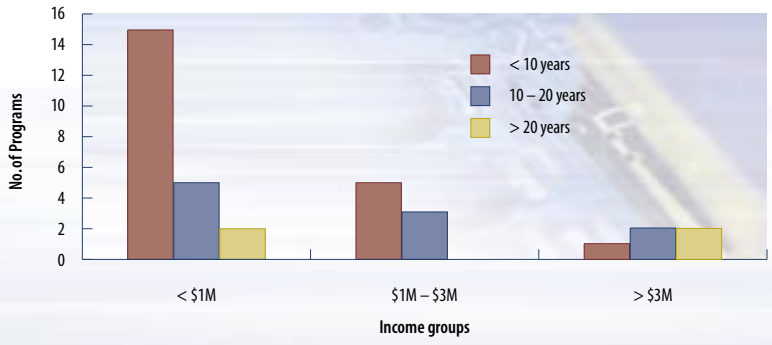
Of CSIRO's 220 income producing-licences, six accounted for 55% of total gross income from licences — 21% of income-producing licences accounted for almost 90% of total gross income from licences. Some 38% ($4.4 million) of gross income from licences was from overseas.

C) INCOME FROM LICENCES VERSUS PROGRAM AGE

The survey sought information about the year in which institutions first dedicated at least one half-time personnel to commercialisation activities. This information allows an examination to be made of the degree of correlation between an institution's income from licences and that institution's length of experience managing commercial licensing activities.

The graph below groups the licensing programs of individual universities and medical research institutes according to the income they yielded in Year 2000 and their age (which indicates length of experience managing commercial licences). An institution's licensing program is the set of all of the commercialisation activities associated with its licences.

Number of programs by income and program age



There appears to be a positive relationship between an institution's income from licences and that institution's length of experience managing commercial licensing activities:

- Four of the five licensing programs that yielded income of more than $3 million in Year 2000 had been in operation for ten or more years.
- Of the licensing programs that yielded income of less than $1 million in Year 2000, 68% had been in operation for less than ten years.

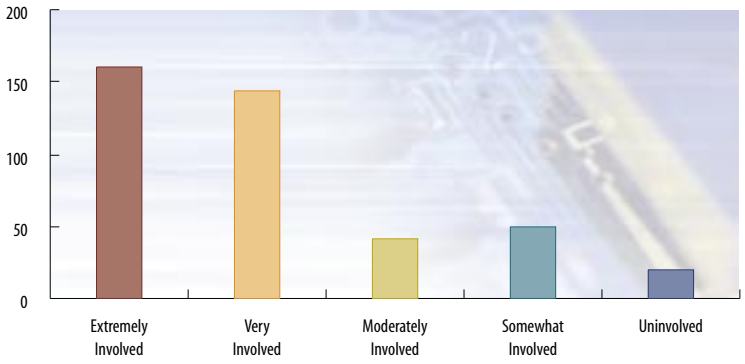
D) INVENTOR INVOLVEMENT IN LICENSING

The survey sought information from institutions about the degree of inventor involvement in the commercialisation of each of their licences.

Table 14: Inventor involvement in licensing, Year 2000 (for respondents that provided data)

	Total Number of Licences	Inventor Extremely Involved	Inventor Very Involved	Inventor Moderately Involved	Inventor Somewhat Involved	Inventor Uninvolved
Universities	232	87	90	24	24	7
Medical Research Institutes	15	11	3	1	0	0
CSIRO	168	62	51	16	26	13
Total	415	160	144	41	50	20

Inventor involvement in licensing



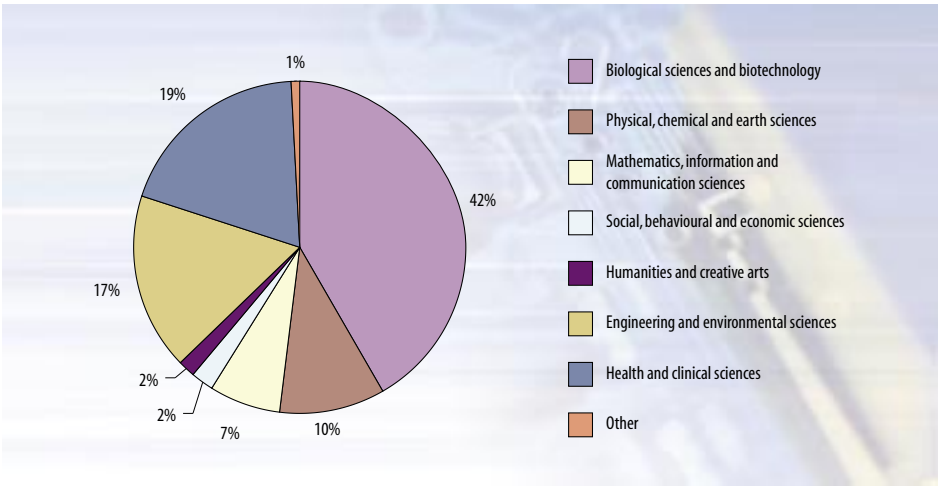
Inventor involvement appears to be an important element of the strategies employed by universities, medical research institutes and CSIRO to manage their commercial licensing activities:

- In 73% of cases, inventors were either extremely involved or very involved in licensing activities.
- In only 5% of cases were inventors uninvolved in licensing activities.

E) RESEARCH AREAS FROM WHICH LICENCES ORIGINATED

The survey sought information about the areas of research from which licences originated. Respondents were able to assign a research area to a total of 58 licences that were executed to Year 2000. The graph below shows the distribution of these licences by area of research.

Licences—distribution by originating area of research



START-UP COMPANIES

As used in this survey, the term 'start-up companies' refers to companies engaged in businesses that were dependent, for their formation, upon licensing or assignment of technology by the institutions that were the subject of this survey.

A) COMPANIES FORMED

The survey sought information from institutions about:

- the numbers of start-up companies that were formed during Year 2000; and
- how many of these start-up companies had their headquarters in Australia.

In Year 2000, 47 start-up companies were formed as the result of licensing of technology by universities, medical research institutes and CSIRO. Of these, 43 had their headquarters in Australia.

Table 15: Start-up companies formed in Year 2000

	Universities	Medical Research Institutes	CSIRO	Total
Number of Companies Formed	32	2	13	47
Headquartered in Australia	30	2	11	43

Universities

In Year 2000, 32 start-up companies were formed as the result of licensing of technology by universities. The highest number of start-up companies formed by a single university was six, which represents 19% of all start-up companies formed by universities. Fifteen universities each reported that at least one start-up company was formed as the result of licensing of their technology. Nineteen universities reported no start-up companies formed.

Medical Research Institutes

In Year 2000, two start-up companies were formed as the result of licensing of technology by medical research institutes. Two institutes each reported that one start-up company was formed as the result of licensing of their technology. Twelve institutes reported no start-up companies formed. Information was not available from one institute.

CSIRO

In Year 2000, 13 start-up companies were formed as the result of licensing of technology by CSIRO. Nine CSIRO divisions were involved in generating these start-up companies.

B) OPERATIONAL STATUS

The survey sought information from institutions about:

- the number of start-up companies (formed at any time) that were operational as of the last day in Year 2000;
- the number of start-up companies (formed at any time) that had become non-operational as of the last day in Year 2000.

A start-up company is considered to be 'operational' if it possesses sufficient financial resources and expends those resources to make progress toward stated business goals. The company must also be diligent in its efforts to achieve these goals.

As of the last day in Year 2000, there were 88 operational start-up companies formed as the result of licensing or assignment of technology by universities or medical research institutes.

As of the last day in Year 2000, one start-up company that was formed as the result of licensing or assignment of technology by a university had become non-operational.

Table 16: Start-up companies — operational status as at the end of Year 2000

	Universities	Medical Research Institutes	Total
Operational	82	6	88
Non-operational	1	0	1

CSIRO sought information about the number of its start-up companies formed in Year 2000 that were operational as of the last day in Year 2000. All 13 of the start-up companies formed by CSIRO in Year 2000 were operational as at the end of that year.

CSIRO sought information about start-up companies formed since 1990 as the result of licensing or assignment of its technology. The 13 of its research divisions that responded reported a total of 35 start-up companies formed since that time (excluding those formed in Year 2000). As at the last day in Year 2000, CSIRO held equity in nine of those companies.

CSIRO also sought information about companies other than start-up companies that were formed on the basis of its research. These included companies formed by personnel leaving CSIRO and drawing on contacts and experience to create new companies. Four such companies — New Zealand PAC, Optical Engineering Associates, Human Genetic Signatures Pty Ltd and Sierra Park Ltd — were formed in Year 2000. Thirty other such companies were formed in the period since 1990.

C) EQUITY

For the purposes of this survey, equity was defined as having an ownership interest in a company acquired by an institution — for example, through stock and rights to receive stock.

The survey sought information from institutions about their involvement in starting new companies and taking equity in those companies.

The Association of University Technology Managers in North America has observed (Association of University Technology Managers, 2002) that:

> A willingness on the part of academic institutions to foster creation of new companies and to license their inventions to such new companies is important because it is frequently the only way to develop very forward-looking ideas…Start-ups rarely have a positive cash flow during their first years of operation; therefore, taking equity in such start-ups partially in lieu of cash fees is an important technique to conserve the company's cash for investment in product development.

Specifically, the survey sought information from institutions about the number of start-up companies in which the institution held equity that were operational as of the last day in Year 2000.

Table 17: Start-up companies — equity held as of the end of Year 2000

	Universities	Medical Research Institutes	CSIRO	Total
A) Number of start-up companies	82	6	35	123
B) Number of start-up companies with equity	65	4	9	78
C) B/A[a]	0.79	0.67	0.26	0.63

[a] B/A = the ratio of start-up companies with equity to total start-up companies

The values for these ratios indicate that universities, medical research institutes and CSIRO, taken together, held equity in just over 6 of every 10 start-up companies formed as the result of licensing or assignment of their technology:

- universities held equity in almost 8 of every 10 of their start-up companies;
- medical research institutes held equity in almost 7 of every 10 of their start-up companies; and
- CSIRO held equity in almost 3 of every 10 of its start-up companies.

INSTITUTIONAL EQUITY

The survey sought information from institutions about the value of all equity holdings as at the end of Year 2000. The term 'equity' refers to the ownership interest in a company acquired by an institution — for example, through stock and rights to receive stock.

Table 18: Value of all equity holdings as at the end of Year 2000 ($'000)

	Universities	Medical Research Institutes	CSIRO	Total
Value of equity holdings	71,774	17,435	29,808	119,018

3. COUNTRY COMPARISONS

INTRODUCTION

The National Survey of Research Commercialisation generated information about the extent of research commercialisation activity occurring in universities, medical research institutes and CSIRO in Australia.

An analysis was undertaken to compare that information with information about commercial activities occurring in similar institutions in the USA and Canada. Data from CSIRO were excluded from this analysis.

The data presented in Section 2 of this report were collected using a questionnaire that was based on the questionnaire used in the Association of University Technology Managers (AUTM) Licensing Survey of technology licensing and related performance for US and Canadian academic and non-profit institutions and patent management firms.

This was to enable Year 2000 data collected from Australian institutions in the National Survey of Research Commercialisation to be compared directly with that for US and Canadian institutions collected in the AUTM Licensing Survey: Fiscal Year 2000.

For the purposes of this comparative analysis, data for Australia comprised that from all universities and medical research institutes that responded to the National Survey of Research Commercialisation. Data for the USA and Canada comprised that for all institutions that responded to the AUTM Licensing Survey: Fiscal Year 2000 — a list of respondent institutions can be found in the full report for that survey (Association of University Technology Managers, 2002).

The indicators that were used to undertake the country comparisons were:

- number of US patents issued in Year 2000;
- number of licences executed in Year 2000;
- amount of adjusted gross income from licences in Year 2000; and
- number of start-up companies that were formed in Year 2000.

Country comparisons were made on the basis of ratios of each of these indicators to research expenditure, as a way of adjusting absolute levels of commercialisation activity in these four areas in the three countries relative to the magnitude of expenditures on research in those countries.

For each country, research expenditure was the sum of the research expenditures of institutions in that country that responded to the relevant survey.

For each country, research expenditure expressed in local currency was converted to US dollars by dividing that expenditure by the purchasing power parities (PPPs) developed

by the Organisation for Economic Cooperation and Development (OECD). The PPPs used were:

Australia	1.320
Canada	1.208
USA	1.000

The reader should note that there are some variations in the scope of research expenditure reported by institutions in the three countries. For a summary of those variations, the reader is referred to the OECD publication, *Main Science and Technology Indicators 2002/1* (OECD, 2002). In particular, the scope of research expenditure data reported by institutions in Australia and Canada appears to be wider than that for data reported by institutions in the USA.

Country comparisons were made also on the basis of ratios of each of the four indicators to gross domestic product (GDP), as a way of adjusting absolute levels of commercialisation activity in the four areas in the three countries relative to the magnitude of overall economic output in those countries.

Figures for GDP in 2000 for the three countries were sourced from the OECD's *Main Science and Technology Indicators 2002/1*(OECD, 2002). For each country, the figure for GDP that was used for comparative purposes was that expressed in US dollars on the basis of the purchasing power parities referred to above.

To account for the fact that, in each country, the four indicators of commercialisation reflect only samples of the overall level of activity, and that these samples vary in size from country to country, GDP was, in each case, multiplied by a factor that embodied the response rate of institutions in each country relative to the response rate of US institutions, as follows:

	Respondents	Response rate	Adjustment factor
Australia	49	78% (A)	0.77 (=B/A)
USA	167	60% (B)	1.00 (=B/B)
Canada	22	44% (C)	1.36 (=B/C)

This adjustment was not necessary in the case of research expenditure, since the expenditures used in the calculation of ratios for the comparisons was only that of the respondent institutions in each of the three countries.

The reader should note that the assumption that underlies the adjustment made to GDP is that the samples of institutions for the three countries are equally representative of the level of commercial activity of institutions that were the subject of the surveys. This might not be the case.

For the comparisons of adjusted gross income from licences, amounts of income were adjusted using the PPPs and are expressed in US dollars.

FINDINGS FROM THE COUNTRY COMPARISONS

Commercial activity relative to research expenditure

In Year 2000, for every $US1 billion in research expenditure:

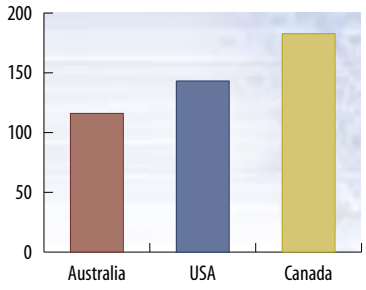
- 34.3 US patents were issued to institutions in Australia;
- 127.9 US patents were issued to institutions in the USA; and
- 86.1 US patents were issued to institutions in Canada.

- 115.4 licences were executed by institutions in Australia;
- 143.0 licences were executed by institutions in the USA; and
- 183.4 licences were executed by institutions in Canada.

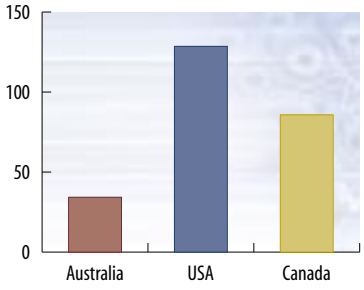
- US$31.6 million in adjusted gross income from licences was received by institutions in Australia;
- US$44.9 million in adjusted gross income from licences was received by institutions in the USA; and
- US$17.2 million in adjusted gross income from licences was received by institutions in Canada.

- 16.2 start-up companies were formed by institutions in Australia;
- 13.8 start-up companies were formed by institutions in the USA; and
- 37.5 start-up companies were formed by institutions in Canada.

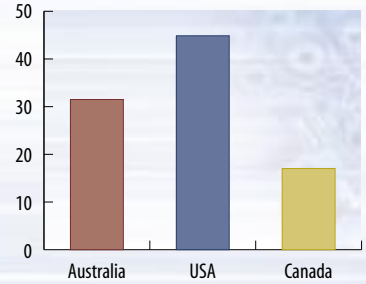
Number of licences executed in Year 2000
per US$1 billion research expenditure



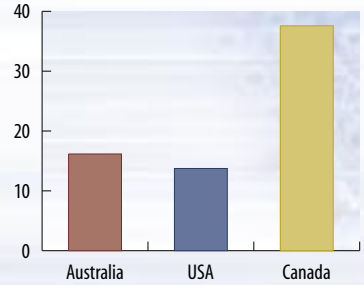
Number of US Patents Issued in Year 2000
per US$1 billion research expenditure



Adjusted gross income (US$1 million) from licences in Year 2000
per US$1 billion research expenditure



Number of start-up companies formed in Year 2000
per US$1 billion research expenditure



Commercial activity relative to GDP

In Year 2000, for every $US100 billion in GDP:

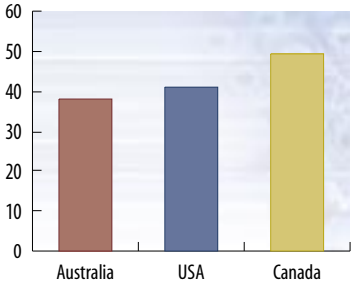
- 11.2 US patents were issued to institutions in Australia;
- 36.7 US patents were issued to institutions in the USA; and
- 23.3 US patents were issued to institutions in Canada.

- 37.7 licences were executed by institutions in Australia;
- 41.0 licences were executed by institutions in the USA; and
- 49.5 licences were executed by institutions in Canada.

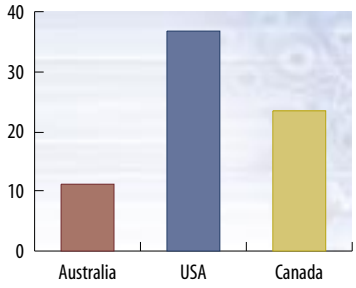
- US$10.3 million in adjusted gross income from licences was received by institutions in Australia;
- US$12.9 million in adjusted gross income from licences was received by institutions in the USA; and
- US$4.7 million in adjusted gross income from licences was received by institutions in Canada.

- 5.2 start-up companies were formed by institutions in Australia;
- 4.0 start-up companies were formed by institutions in the USA; and
- 10.1 start-up companies were formed by institutions in Canada.

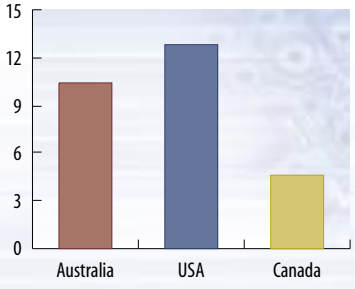
Number of licences executed in Year 2000
per US$100 billion GDP (adjusted for response rate)



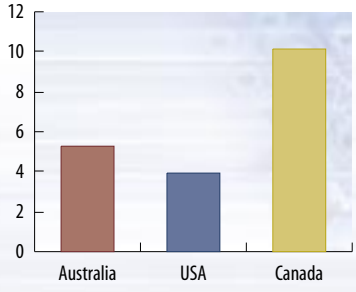
Number of US patents issued in Year 2000
per US$100 billion GDP (adjusted for response rate)



Adjusted gross income (US$1 million) from licences in Year 2000
per US$100 billion GDP (adjusted for response rate)



Number of start-up companies formed in Year 2000
per US$100 billion GDP (adjusted for response rate)



4. CONCLUSIONS

There is a long-held view in Australia that as a nation we perform high quality internationally respected research, but that our performance in converting that research into commercial outcomes falls short of that in other countries. Such a pattern is regarded as a recipe for irrelevance in the knowledge-based economy of the future.

Several government reports in recent years have encouraged our publicly funded research organisations to focus on improving their performance in commercialising the outputs from their research. Millions of dollars have been directed at new programs and at improving existing ones, to stimulate this important aspect of our economy.

Arising from the first survey of its kind to be conducted in this country, Australia now has a firm basis on which to compare its performance in commercialising the research results of its universities and research institutes with that of institutions in other countries.

The National Survey of Research Commercialisation, conducted jointly by the ARC, NHMRC and CSIRO, has delivered baseline data that can be used not only to make international comparisons but also can be built on in future surveys to enable Australia to track its progress and set realistic targets to improve its performance over time. As with any major international study conducted for the first time, methodological issues have arisen which will be addressed through refinements in subsequent surveys, enhancing the reliability of some aspects of the data and, therefore, their future utility.

It may be expected that this report will lead to independent studies by others interested in publishing scholarly works which depend on sources of reliable data. Data from the AUTM licensing survey in North America has been used extensively in economic studies and best practice analyses.

There is a need to build a reliable set of data over time that can be used not only to produce a detailed picture of this aspect of our research effort, but also to compare our performance with some of the leading research nations of the world and to set realistic targets. To provide a more comprehensive picture of Australia's research commercialisation activity, consideration should be given to participation in surveys in future years by research organisations such as AIMS, ANSTO, Geoscience Australia and DSTO.

Overall and in an international context, Australia's performance at commercialising research is mixed. In some areas, for example income from licences and start-up company formation, our performance is above that of either the USA or Canada, relative to expenditure on research and the size of the national economy[9]. In other areas,

[9] Although, in relation to income from licences, Australia's performance in Year 2000 was dominated heavily by the sale of Melbourne IT.

for example number of licences executed and, in particular, US patents issued, our performance is below that of both the USA and Canada.

While this latter finding may reflect, in part, differences in patenting strategies that have been adopted by organisations in different countries, it remains the case that Australia should aspire to a competitive position among nations that seek patent protection for their inventions in the USA.

Australia's relative position in securing US patent protection, as revealed in this report, is consistent with results from a previous study of the links between Australian patenting and basic scientific research which was commissioned jointly by the ARC and CSIRO. The report of that study, *Inventing our Future*, noted that the number of Australian-invented US patents had grown slowly over the period 1979–1997, accounting for about 0.45% of all US patents at the start of the period and about 0.50% of those patents at the end of the period. Over the same period, the share of US patents accounted for by a number of other countries grew much more rapidly. The study found that, calculated relative to GDP, Australia's share of US patents was low relative to a number of other countries (Narin et al., 2000).

The report of the National Innovation Summit held in February 2001 suggested that, in the long run, the licensing route to commercialisation rarely delivers substantial returns and, by contrast, the creation of spin-off companies is likely to deliver far greater benefits in the longer term (Commonwealth Department of Industry, Science and Resources, 2000). While there are opposing views on this, it is noteworthy that the country comparisons in this report indicate a research commercialisation strategy in Canada that appears to be focused on the formation of start-up companies.

The results from the National Survey of Research Commercialisation provide an empirical basis for a debate about the balance between the various elements of our commercialisation activity in Australia, and about the most appropriate strategies that our publicly funded research organisations might pursue in order to maximise future returns on investment.

The survey results indicate that, in Australia, a very high proportion of licences executed to start-up companies are exclusive. This suggests that the ability to grant exclusive licences is important to company start-up activity, which makes a significant contribution to the overall economic impact of licensing by universities, medical research institutes and CSIRO.

Of the start-up companies reported in the survey, 91% had their headquarters in Australia. The survey revealed apparent differences in the pattern of equity holdings between research sectors — universities held equity in 79% of start-up companies formed as the result of licensing or assignment of their intellectual property, medical research institutes held equity in 67% of their start-up companies and CSIRO held equity in 26% of its start-up companies.

The results of the survey indicate that Australia is on track to generate 250 start-up companies from its publicly funded research organisations over the five years to 2004, a five year target proposed by a working group of the Prime Minister's Science, Engineering

and Innovation Council (PMSEIC) in 2001 (Prime Minister's Science, Engineering and Innovation Council, 2001).

The survey results suggest that inventor involvement is an important element in the strategies employed by research organisations to manage their commercial licensing activities. In 73% of cases, inventors were either highly or very involved in licensing activities.

The survey results also indicate a positive relationship between the length of an institution's experience in managing commercial licensing activities and the level of that institution's income from licences. Four of the five licensing programs of institutions that yielded income of more than $3 million in Year 2000 had been in operation for 10 or more years while, conversely, of the licensing programs of institutions that yielded income of less than $1 million in Year 2000, 68% had been in operation for less than 10 years.

There are lessons in the data, not only at the national level but also for the institutional management of research commercialisation. For example, the management of invention disclosures does not appear to occur according to uniform and high standards of practice in Australia's research organisations. In both the USA and Canada, there are policies which require universities to disclose inventions to federal governments within a reasonable time period.

The Year 2000 National Survey of Research Commercialisation has demonstrated, for the first time, that there is a substantial contribution to the commercialisation of research in Australia being made by universities, medical research institutes and CSIRO, relative to the resources at their disposal. Within the university sector, a small number of institutions appears to account for a relatively large proportion of commercialisation activity, although the institutions are not the same in each specific area of activity. In addition, the overall contribution of the university sector to research commercialisation does rely on activity occurring in a wide range of institutions, including not only the long-established universities in our major capital cities, but also younger and smaller universities in regional Australia.

Future surveys will establish the direction of trends in the level of commercialisation of research in Australia. Comparison of the data from those surveys with data from other countries will inform us about the degree to which our international competitiveness in this area is being maintained, improving or declining.

5. PRODUCT SUCCESS STORIES

ADVANCED NANO TECHNOLOGIES

Advanced Nano Technologies (ANT) is producing industrial powders that are almost unimaginably small, for commercial applications that are potentially vast.

To grasp the dimensions of the ANT NanoPowders is to split hairs — its NanoPowders can be 2 nanometers, equivalent to about 1/15,000th of a human hair.

Produced using its patented Mechanochemical Processing (MCP) technology, the properties of such microscopically fine powders make them invaluable for products as diverse as coatings for computer components, paint pigments and cosmetics.

Depending on the application, NanoPowders can reduce weight, increase strength, lower costs and revolutionise everyday products.

In 2000, ANT was created as a $A12 million joint venture between the University of Western Australia's spin-off, Advanced Powder Technology (APT), and Korea's electronic materials giant, Samsung Corning. APT develops the products while ANT commercially produces the NanoPowders.

The ARC contributed about $250,000 to the research behind APT from 1990–1999 through its support of the Special Research Centre for Advanced Mineral and Materials Processing. More recently, ANT was awarded an R&D Start grant of $2.7 million.

Samsung Corning's investment was used to construct a pilot plant as a crucial step in the commercialisation of MCP NanoPowders. The pilot plant revealed that MCP technology was even cheaper and more efficient than anticipated and, within months of start-up in May 2002, the plant was operating commercially.

Samsung Corning's interest in the technology is growing: in September 2001 ANT signed a $US1 million licence agreement with the Korean company to produce cerium oxide in Korea. ANT will also receive production royalties.

ANT's CEO, and a co-inventor of MCP, Dr Paul McCormack, says cerium oxide NanoPowder slurries are expected to be extensively used for the manufacture of the next generation of silicone chips, of which Asia is expected to be the major supplier.

Samsung Corning plans to begin commercial production of these NanoPowders in 2003 and is aiming for sales of cerium oxide worth US$23 million in 2005.

ANT's target is to win more than 15% of the estimated $1 billion world market for NanoPowders, building on the low-cost, high-quality advantages of its MCP technology. ANT says MCP uses lower temperatures and shorter milling times than competing technologies, and produces highly uniform powders that can be tailored from a range of raw materials to a client's required size and shape.

APT continues to develop new products from ANT's NanoPowders, achieving early success with zinc oxide in applications that require UV protection and transparency. Its ZinClear, a transparent zinc oxide base for use as a UV absorber in sunscreens and cosmetics, is being marketed internationally and is expected to generate annual revenue

of $20 million within about five years. Also in the pipeline for 2002 is a transparent, UV-resistant paint, also based on zinc oxide, for protecting fabrics and wood from fading caused by ultra-violet radiation.

AUSPIG

A computer system for maximising pig production has increased pig industry profits in Australia by more than $30 million since it was released commercially in 1989.

More than 50% of Australian pig production is benefitting from AUSPIG, the computer decision-support system that creates a simulation model of growth, production and financial returns, under different pig genetics, nutritional, environmental and market conditions.

AUSPIG is recognised internationally as the best technology of its type in the world. The system incorporates a profit-maximisation model for pig production, an expert system for interpreting simulation results, and interfaces with the major feed formulation software systems used by industry.

Australian licencees for AUSPIG include QAF Industries (Australia's largest pig producer) and Ridley Agriproducts, as well as other individual pig producers, pig industry consultants, state departments of agriculture, and educational institutions.

For much of the 1990s, AUSPIG was licensed exclusively to two of the world's major pig-feed companies, Purina Mills Inc. in the Americas and Nutreco Nederlands in western Europe.

AUSPIG was developed by CSIRO with support from Australian Pork Limited (APL) (through one of its predecessors, the Pig Research and Development Corporation), the Victorian Department of Natural Resources and Environment (previously Victorian Department of Agriculture) and other Australian research and extension agencies and pig-production businesses.

APL's General Manager for R&D, Dr Ian Johnsson, said APL considers AUSPIG to be an extremely important vehicle for adopting research findings.

'AUSPIG offers Australian pig producers a valuable competitive advantage and represents a very worthwhile, long-term investment for APL,'he said.

Under a $1.5 million agreement, APL now funds around 50% of the costs of further development and delivery of AUSPIG in an alliance with CSIRO for the benefit of the Australian pig industry.

Since its commercial release in 1989, the licensing and support of AUSPIG has generated more than $4 million in revenue to CSIRO and its partners.

BIOTRON

Biotron has identified a novel treatment for HIV, based on disrupting the virus's life cycle and thus preventing it from turning into full-blown AIDS.

The treatment, known as Virion, is based on a compound, BIT009, which prevents HIV from replicating by blocking the ion channel activity of one of the HIV proteins. BIT009's effectiveness was confirmed by independent tests conducted by the Centre for Virus Research at the Westmead Millenium Research Institute.

The Managing Director of Biotron, a small Canberra-based biotechnology company, Dr Michelle Miller, says Virion is also uniquely capable of overcoming HIV's growing drug resistance.

'Virion has a better than usual chance of attracting commercial interest, and proving efficacious, because similar treatments for other viruses have been successful,' says Dr Miller. 'This is the first such treatment targeting HIV.'

Biotron is currently seeking an ARC linkage grant, an international patent and an alliance with a multinational pharmaceutical company to further develop and trial the HIV treatment, which resulted from research at the Australian National University's John Curtin School of Medical Research.

Biotron was founded by scientists from the ANU and incorporated in 1999 to fund, manage and commercialise existing biomedical projects at the John Curtin School. The company lodged its prospectus with the Stock Exchange in 2000, and raised $12 million when it listed in 2001. It is now worth some $27 million, with a share price of around 38 cents.

It employs fifteen staff and maintains links with ANU scientists, many of whom are Biotron consultants, and rents office and laboratory space from the ANU on its campus.

Forty million people are living with HIV/AIDS, over 12,000 of them in Australia. Last year, HIV/AIDS-associated illnesses caused the deaths of about three million people worldwide, with the heaviest toll in Africa, followed by South and South-East Asia.

Yet, unlike other big Third World killers such as malaria, HIV's prevalence in wealthy nations means that potential cures for it attract a lot of research and development money.

Dr Miller says Virion may be eligible to be fast-tracked through the US Food and Drug Administration approval process as it is targeted at a serious illness with an unmet medical need. This would reduce the time to market and cost.

'New drugs can take up to $300 million and from five to 10 years to get onto the market,' says Dr Miller. 'But the returns are potentially huge, and not just for the multinational drug company involved.

'In our case, revenue and royalties would also flow to Biotron, the ANU, which is one of our shareholders, and our other, mostly man-in-the-street investors. Ultimately, the whole country would benefit financially.'

But the main incentive is to eradicate HIV. 'To come up with a possible cure and not get it onto the shelves would be a tragedy,' says Dr Miller.

CHIROGEN

The quest for cheaper and safer pharmaceuticals has been given a fillip through the invention of a process that can control the formation of chiral molecules — and if necessary eliminate unwanted isomers — when chemical compounds are synthesised for drug manufacturing.

The process, dubbed 'Chirotechnology', has become the basis for a new Melbourne-based company, Chirogen, which is in the final stages of scaling up its technology to be of use commercially.

Chiral molecules can exist as mirror images, similar to a person's left and right hands, but while they have identical physical and chemical properties, chiral molecules can behave very differently when interacting with biological organisms or with other chiral molecules.

This was the cause of the thalidomide tragedy in the 1960s when the potentially-life-saving drug caused deformities in unborn children.

Since then, regulators have required drug manufacturers to market single chiral molecules — a process involving separation techniques or the use of bio-organisms and enzymes during synthesis. Often these routes are not cost effective.

However, in the 1990s researchers at the University of Melbourne and Deakin University invented a new method to control chirality during some free-radical reactions and have applied this to the preparation of a wide cross-section of molecules of interest. In effect, the new technology prevents the formation of the unwanted molecules in the first place.

The work resulted from collaboration between Deakin's Professor Dainis Dakternieks, a 'main group' chemist and Melbourne University's Professor Carl Schiesser, a 'free radical' chemist.

The pair received an ARC grant of $60,000 a year for three years and set out to try and control chirality in the synthesis of molecular compounds.

Although they made significant progress, their second application for ARC funding was knocked back, which slowed the work until a later application secured a three-year $270,000 grant, which finishes in 2003.

As a result of this research, Schiesser and Dakternieks established a company, Chirogen, which, in July 2000, became the first spin-off company under the University of Melbourne's new policy of assigning intellectual property rights to inventors rather than just the university.

Chirogen's prime investors are Uniseed (part-owned by Melbourne University Private), Deakin University, and a private investor.

Its prime commercial targets are the chemical intermediate supply companies that provide pharmaceutical manufacturers with their base 'ingredients'.

Professor Schiesser said the next stage of research was to bring some newer technology up to the same level as the original core technology, and to transfer the proof-of-concept to molecules of commercial relevance.

The original research concentrated on proving the concept worked, but now the company's emphasis is on demonstrating the technology's use for molecules used in pharmaceutical products.

FOCUS NIGHT AND DAY CONTACT LENS

Contact-lens wearers now have the option of leaving their lenses in for up to 30 days, thanks to a revolutionary material that allows the eye to 'breathe'.

The material used for the CIBA Vision Focus Night and Day lens allows six times more oxygen to reach the eye than the ordinary soft lenses still used by most of the 70 million contact-lens wearers worldwide.

The challenge to create the first-generation, continuous-wear lens was twofold: first it required the invention of a novel, highly oxygen-permeable formulation (silicone hydrogel) that had the right material properties for the manufacture of the lens. Then a suitable coating that maintained the oxygen permeability and made the lens comfortable for continuous wear had to be developed.

An international team led by CIBA Vision, the eye care unit of Novartis AG, with CSIRO Molecular Science and the University of New South Wales as part of the Cooperative Research Centre (CRC) for Eye Research and Technology, developed the polymers and surfaces needed to allow the eye to 'breathe' through the contact lens.

The product was launched in Mexico in 1998, in Europe in 1999, and received United States Federal Drug Administration approval in October last year. The partners in the CRC for Eye Research and Technology, which was first established in 1991, have now received their first royalty payments from sales in the US.

The market for contact lenses and solutions is estimated at $US4 billion, and is expected to double in the next seven years. It is hoped the market for extended wear usage will reach $US500 million in the next few years.

Work on a second-generation contact lens with improved biocompatibility is now in progress, with scientists at CSIRO Molecular Science playing a leading role in producing surface-modified contact lenses that are assessed clinically by collaborators within the CRC for Eye Research and Technology. The primary goal of this research is to generate contact lenses whose surface characteristics are highly compatible with the environment encountered in the eye, maximising safety and comfort for the wearer over prolonged periods.

GELLED FOOD PRODUCT

The choices at the deli are changing as a unique fat substitute is allowing consumers to buy processed products — such as pâtés and cold meats — that are healthier and tasty.

Researchers at Food Science Australia have developed the solid fat replacer technology, called gelled food product (GFP), which can also be used to produce reduced-fat seafood, bakery and dairy products.

Food-processing companies have been keen to adopt the technology, which can reduce fat levels in foods by 50% or more. GFP gives these companies a powerful advantage in developing products for the reduced-fat food market, which, for processed meats, is worth more than $150 million in retail sales in Australia and is growing at 8% per year.

In food products, GFP feels and tastes just like fat, according to senior food technologist at Food Science Australia, Ms Aarti Tobin.

Hans Continental Smallgoods (Hans) was the first company to realise the possible applications of GFP. Hans has used the fat replacer to expand its product range to include nutritious reduced-fat smallgoods such as low-fat Strassburg and hot dog products.

Jean Pierre Gourmet Pty Ltd, a manufacturer of premium quality pâté, has developed a range of low-fat pâtés using the GFP gel, and tackled the marketing challenge of convincing customers that low fat does not mean low taste.

Importantly, both Hans and Jean Pierre Gourmet have found that the introduction of low-fat products in Australia has increased overall sales of their product ranges.

GFP is a whey protein gel of controllable appearance, texture, flavour and "mouth feel". In 2000, Food Science Australia licensed the solid fat replacer technology to a company called Gelled Foods Australia, which was set up to commercialise the technology in Australia and New Zealand.

Conventional meat-processing facilities and procedures are used to manufacture the GFP products. The GFP gel can be chopped or minced and added to the meat in the same way that animal fat is added.

Commercial use of the technology has shown that GFP can replace some, if not all, of the non-functional fat in processed meats without loss of mouth feel or texture.

Two other major manufacturers of pâté have successfully completed trials using GFP gel and launched their products nationally, and trials are underway to investigate the use of GFP in low-fat hamburger patties, poultry products and sweet baked goods.

It is expected the technology will be licensed in most world markets by the end of 2002.

HIGH SPEED WIRELESS LOCAL AREA NETWORKING

The world standard for high-speed wireless local area networks, known as IEEE 802.11a and 802.11g, is based on CSIRO's US Patent 5,487,609.

In 1992, CSIRO commenced a Program for Local Area Networks and Services. Led by Dr John O'Sullivan, who now runs Cisco's Wireless Networking R&D group in Sydney, up to 20 staff investigated the features and system design requirements for high-speed wireless local area networks.

CSIRO contracted Macquarie University to investigate, develop and do the detailed design of several key elements of the system including error coding and medium access control algorithms. In 1995 CSIRO subcontracted Macquarie University to design and build a prototype OFDM wireless modem chipset.

When the chipset was near completion, Dr David Skellern and Dr Neil Weste, then with Macquarie University, established Radiata Pty Ltd., which licensed CSIRO's Wireless LAN patent, OFDM modem design and 'Parrot' medium access controller under a non-exclusive license. A number of CSIRO staff joined the company, which was accommodated at the CSIRO Radiophysics laboratory in Marsfield, Sydney.

Radiata attracted industry funding to further develop the chipset. In November 2001, Cisco acquired Radiata Pty Ltd for $US295 million — $A567 million in Cisco stock.

The technology, which is embedded in silicon chips, can connect users within range of their wireless network to almost anything, from television to business information. It can be used with almost any electronic device, from a laptop computer to a mobile phone to a video recorder or a household security system, all without expensive cabling. It can run at a blistering 54Mb per second, fast enough to even transmit video.

Wireless technology currently has a range of about 100 metres. In a corporate setting, bases are set up on each floor at 100 metre distances to cover the whole office, connecting desktop and laptop computers, security devices, handheld organisers etc to the company network.

The high speed wireless local area networking story is one that exemplifies the sort of results that can be achieved when CSIRO, and universities supported by the ARC, work together on research that is crucial to Australia's future role in the important ICT industry.

HORTICAL

The last time you bought melons, nectarines, peaches or plums, you probably examined them, perhaps felt them for firmness, and dropped them in the plastic bag hoping the taste would live up to the appearance. It's hit and miss.

Now there is a way for producers to measure the sugar content of fruit without taking a chunk out of it, and to be able to guarantee sweetness. This is the result of a test

developed by a company called Hortical, a joint effort between Central Queensland University and Victorian company Color Vision Systems.

Their non-invasive sugar measurement system is based on near-infrared spectroscopy, and it enables fruit to be graded on sweetness at the packing shed stage. It means that now, consumers have science to back up eye and feel.

Project leader Kerry Walsh, Associate Professor of Plant Sciences at Central Queensland University, said that previously, technology had always gone into grading on external appearance. 'For farmers, all their effort has gone into growing good-looking fruit, but there was no index of what's inside.'

Previously, a French-based company had marketed a system that removed a small core of fruit, squashed the flesh to measure sugar content, and replaced the skin before marketing the fruit. It was clearly 'not a goer', said Dr Walsh.

'We run the fruit under the light, it penetrates, and we look at how it is absorbed by the fruit, and that relates to sugar,' he said. 'In many fruits, the higher the sugar content the better the taste.'

It had to be developed to a point where it could be used under harsh packing shed conditions, where speed and capacity would be important factors.

The Australian Research Council awarded the university an initial grant of $50,000 in 1997, then continued its support under its collaborative system, whereby research bodies working with commercial units qualify for funding. Over three years this amounted to just over $200,000.

Dr Walsh said that although the ARC's contribution was small in the overall development cost of roughly $3 million, it was critical in getting the research up and running. By the turn of the millennium, the system was ready for the marketplace.

'The year 2000 was the break point between straight R&D and commercialisation,' he said.

Fruit sorted by Hortical's system is already used by Australian fruit packhouses through The Harvest Company, with fruit marketed through Woolworths and Coles, and Dr Walsh is in the process of examining the viability of exporting the technology.

IMPEDIMED

A Brisbane-based company, Impedimed Pty Ltd, has developed a non-invasive diagnostic and monitoring instrument for lymphoedema which is four times more sensitive than any previous test for the condition.

Lymphoedema, which involves a build-up of lymphatic fluid in the body, can be unsightly and incapacitating. It affects about 30% of women — 1.5 million worldwide — who undergo breast cancer surgery: in all, about 400,000 Australians suffer from some form of lymphoedema.

Impedimed, formed in 1999 as a spin-off from the University of Queensland, received a Queensland government innovation grant in 2000, and, with the university and Royal Women's Hospital, has applied for a NHMRC grant for continuing research. In 1992–93, the ARC provided funding for the original research which led to Impedimed's 'Lymphometer', the most accurate instrument in existence for measuring lymphoedema.

So far, sales of the Lymphometer, released in 2002, have earned $32,000, and the company's sales of bioimpedance instruments have already reached just under $1 million.

The company has received government grants in excess of $120,000. Its founder and Managing Director, Lucille Bridges, says: 'ARC funding was a great help in the early stages, and obtaining the Innovation Start-Up Scheme (ISUS) grant enabled us to move from low-tech to high-tech research and development in one giant leap!

'Lymphoedema has been widely ignored and is not well understood. It hasn't been taken as seriously as it should. There is still no cure for Lymphoedema, but early and accurate diagnosis makes for far better management and much improved quality of life.'

Before the Lymphometer, she says, 'one of the more common ways to determine the degree of fluid build-up was by using a tape measure, or imprecise procedures such as prodding, pinching the skin, or water displacement, which involves placing the affected part of the body into a bath and noting how much water was displaced. Too often, the lymphoedema had to be quite severe before it could even be detected'.

Although Impedimed is small, it is about to increase the number of people it employs in line with its goal of becoming the world leader in medical applications for bioelectrical impedance.

'This exciting, emerging technology lends itself to the monitoring and management of such procedures as drug dosing and renal dialysis, and a wide range of medical conditions, including oedema (fluid build-up), cardiac disease, obesity, diabetes and wasting disorders such as AIDS and anorexia,' says Mrs Bridges.

'Impedimed is implementing plans to launch its range of three bioimpedance devices worldwide, and, as part of this, we're in the process of obtaining approval to sell them in the US through the Federal Drug Administration.'

INNER VISION BIOMETRICS

A physicist's curiosity about the relationships between metals and biological processes has led to a new multi-million dollar pathology service that improves the management of serious liver diseases and eliminates the need for painful, invasive biopsies.

The technology and service arose from Dr Tim St Pierre's research into the behaviour of magnetic materials in biological systems, and has led to a new non-invasive method of analysing iron build-up in the liver, which can lead to potentially fatal diseases.

The spin-off company, Inner Vision Biometrics, incorporated in 2000 to commercialise the science, has predicted annual earnings of $5.3 million by 2005.

The development, by St Pierre and his team at the University of Western Australia's Faculty of Life and Physical Sciences, allows a doctor to more accurately measure iron concentrations in human tissue. Its main application is the management of iron metabolism disorders such as hereditary haemochromatosis and thalassaemia which can cause increased iron levels leading to tissue damage. Over time fibrosis and cirrhosis can set in, which can be fatal.

Until now the only way a doctor has been able to measure the iron build up in the liver is by taking a core sample with a large millimetre-wide needle in a procedure considered so unpleasant that some patients refuse it.

This sample is also often unreliable because the iron build-up is not uniform throughout the liver.

However, the technology developed by the UWA team creates a liver map, showing accurately how much iron is in the liver and how it is distributed through the organ. There's no patient discomfort, and the quality of information on which a doctor has to base his or her management of the disease is vastly improved.

The development arose after St Pierre and his team realised the magnetic properties of particles in tissue could produce information on their size and structure. He immediately started looking for practical ways to apply this discovery, especially for iron-overload diseases.

An inter-disciplinary collaboration was formed — St Pierre, a medical chemist Dr Wanida Chua-Anusorn, and mature-age PhD student, Paul Clark, a specialist in electronics and electrical engineering who had previously been with the CSIRO Division of Radiophysics.

The physicist, the chemist and the electronics engineer brought together just the right set of skills, with Clark able to write the sophisticated software required to measure and interpret the iron concentrations.

'To make the measurements we had to understand the relationship between the physics of water molecules diffusing through iron-loaded tissue, and the general magnetic properties so we could work out how to drive a magnetic resonance imager to gather the data from which iron concentrations could be calculated,' St Pierre explained.

Once the team had the basic set-up it was tested on rats, then 'phantoms' (magnetic particles in a gel to simulate an iron-loaded liver) and finally in clinical trials with patients.

A provisional patent was issued in 2000 and with a $400,000 equity investment by a Perth radiology provider, SKG Radiology, a spin-off company, Inner Vision Biometrics was formed.

Word-of-mouth saw the technology quickly picked up in New Zealand, Thailand (where there is a high incidence of thalassaemia), Indonesia, Portugal, Italy, Greece and the United States. However, in 2002, the NHMRC provided a grant to put the final touches on the research, and help the company to begin promoting the technology.

The commercial model has two parts — a software program which allows laboratories to use existing magnetic resonance imaging machines to collect the base data, and then just a handful of specialist centres equipped with the more sophisticated software needed to analyse the data.

From here, St Pierre and his team plan to use the technology to further improve the study of the liver and liver diseases: 'We've only opened a window. Now it's time to look inside,' he said.

KAKADU SOFTWARE

Sometimes a development should not just be measured by its dollars-and-cents commercial success but also by the advances it makes possible.

In the field of digital imaging, a major limitation in fields such as aerial photography, mapping and medical diagnostics, has been the capacity of desktop computers to handle very high resolution images that can be several gigabytes in size.

Photographs and images can be compressed, but compression comes at a cost. Information has to be stripped from the image, and this can affect the reliability of images used in sensitive areas such as medicine or military surveillance.

The international standardisation of digital image compression was established by the Joint Photographic Experts Group committee, and the subsequent ISO standard became popularly known as JPEG.

In the late 1990s when it was time to improve the JPEG technology that is imbedded into almost all imaging software, a final upgrade was in its revision stage when Dr David Taubman, a senior lecturer in telecommunications, joined the University of New South Wales after a period with Hewlett Packard in the US.

Taubman, who had been watching the debate as some 70 organisations from 30 countries jostled to have their technology accepted as the new standard, believed he could open up opportunities for interactive use of high-resolution imagery while also improving compression performance.

Subsequently, the international standards committee decided to adopt Dr. Taubman's proposal, which meant a radical change in the development of the new standard. Taubman implemented the first working model of the new standard which became a test bed for the technological development, known as the Verification Model. Working with a US colleague, Michael Marcellin, they produced a book on the new standard, which has also been adopted as a text book on the foundations of modern image compression for a number of postgraduate courses offered overseas.

Further to this, Taubman developed his own independent implementation of the standard, Kakadu Software. Apple (Quick Time for the Macintosh) and Yahoo (Video capability in the new Messenger software) have been the first widely used products to offer JPEG2000 functionality, both using Kakadu. Another 32 major software manufacturers have bought licences — worth about US$500,000 — to use Kakadu in new

software products. Some of these products are currently in the testing phase for release in the near future.

The technology is essentially a set of very flexible tools that not only compresses images, but also offers a new framework for interacting with images.

For example, a high-resolution aerial map might be far too large for the average desktop computer user. However, with Kakadu Software and JPEG 2000, a user can navigate around the image, needing only enough computer resources to handle the section of the image being viewed.

This immediately opens up the opportunity to interact with large images over the Internet because the whole image no longer has to be downloaded.

Aside from immediate interest from the world's military surveillance industries, Dr Taubman believes the technology opens up important new importunities for medicine.

'You might have a remote physician trying to navigate within a large medical image, perhaps looking for signs of cancer. It could be an X ray or even a three-dimensional volumetric data reconstruction of part of the body — but it can be navigated on the basis of the physician's interest, using a standard computer and internet connection. In addition to recovering only the information of interest from the source image, the physician can be confident of receiving the original data, without loss of any form, relevant to this region of interest. When interactively browsing the image over an internet connection, the quality of the recovered image improves progressively within the region of interest, and more slowly in the local neighbourhood, until the original data is recovered exactly,' Dr Taubman explained.

In addition to JPEG 2000, Dr Taubman has been working on new video compression technology, work which is being supported by the ARC.

KNOWLEDGE MANAGEMENT FOR THE PETROLEUM INDUSTRY

A software package designed specifically for oil drilling is helping to slash costs and boost the success of this high-risk venture.

The Genesis 2000 knowledge-management technology draws on information from previous operations, to reduce failures and increase productivity. It yields savings of 4–5% in rig days, with each rig day valued around $300,000.

The software gives drilling engineers, rig personnel, managers and financial controllers the ability to assess risk, cost wells and modify well plans by capturing technical and financial knowledge from previous wells to plan and execute more productive wells in similar areas.

Genesis 2000 was developed in a $12 million project by CSIRO Petroleum with six major international oil companies, consultants and an international collaboration of scientists.

The Genesis software consists of two elements: the Analyzer, which explores all available

data about previous wells in the area, and the Designer, which uses that information to optimise the design of the new well and to evaluate its time and cost uncertainties.

CSIRO Petroleum's Dr Edson Nakagawa, a Genesis project leader, says the advantage of this approach is its ability to take advantage of all the historical experience gathered in drilling previous wells to minimise the risks and costs in the new well. He says Genesis not only gives fast answers, it also keeps a "memory" of different drilling areas alive over long time spans, saving companies from having to "reinvent the wheel" by learning how best to drill a particular area all over again.

Noble Engineering and Development Ltd, one of the world's largest offshore drilling contractors, is commercialising the technology in an alliance that sees CSIRO retain intellectual property for further development. The benefits to Australia include the creation of two new Perth-based companies — Spektl, which will maintain the software, and an agency involved with the commercialisation — as well as a stream of royalties to CSIRO through technology exports.

Over the next two years, Completion and Workover modules will be added to Genesis to offer oil companies a complete system for enhancing well quality over the life span of a well. This new arm of the software is being developed by CSIRO, Noble Drilling, Brazilian oil giant Petrobras and US company Anadarko.

OBEL AND XCELL DIAGNOSTICS

In a few short years, GPs could be diagnosing skin cancer on the spot using a pen light probe that employs Diffuse Reflectance Spectroscopy (DSR).

The seemingly simple 'point and click' procedure — using a fibre-optic probe that both beams light and collects it for analysis — promises certainty in an area still fraught with inaccurate diagnoses.

The probe's inventor, Professor David Sampson, says that for every melanoma detected, 30 harmless moles are removed at an overallcost of about $75 million per year. This is in addition to the impact on patients who have undergone unnecessary surgery that can sometimes be disfiguring.

With deadly melanomas, early, accurate diagnosis can mean the difference between life and death — more than 1000 Australians die every year from melanomas but early detection gives melanoma patients a 100% five-year survival rate.

Professor Sampson is project director at OBEL, the Optical and Biomedical Engineering Laboratory at the University of Western Australia. The DSR skin cancer probe is being developed in a joint venture between the university and Xcell Diagnostics.

ARC funding of $220,000 over three years helped to develop a related technology that contributed to this project, which also received $40,000 from the Cancer Foundation of Western Australia.

Professor Sampson says the DSR probe measures the absorption of light by certain types of tissue. A melanoma, with its dark pigmentation, will absorb more light. More important, however, is the characteristic 'signature' it reveals in scattering the white light, produced by the larger nucleus size of the cancer cells. In a GP's surgery, the scattered light is fed into a spectrometer that will feed an LCD reading to the GP immediately.

The whole device is expected to be no larger than a lunchbox and affordable for all GPs. The potential market is vast, encompassing North America, Western Europe and the United Kingdom. Its commercialisation could take between three and five years.

'Unlike competing technologies, no imaging is required. Initially the probe will be a diagnostic aid but ultimately it could become a screening tool', Professor Sampson says. Patients could be spared the present delays and possible surgery and 'you will get a diagnosis and have confidence in that diagnosis'.

OBJECTIVISION™

The accurate diagnosis of eye disease is no longer at the mercy of the communication gap that often separates patient and physician, with the development and commercial release of a new objective vision test.

The technology, packaged and marketed as the AccuMap, is expected to significantly improve the prevention of blindness, by detecting what the brain actually sees, rather than what a patient thinks he or she is seeing.

AccuMap's 'objective visual field test' assesses a person's visual field without the need for questions and answers, which often have frustrated attempts to make an accurate and timely diagnosis of serious eye diseases.

Instead, the new technology measures the electrical signals that pass between the eye and the brain. By detecting even the subtlest changes in these signals it improves the chances of early diagnosis, and the prevention of blindness through diseases such as glaucoma.

The technology was developed by researchers at the University of Sydney's Save Sight Institute in the late 1990s with NHMRC funding, and the first commercial AccuMap sales were made in May 2002. Just a month earlier it won two Australian Design Awards in the Engineering Design and Software-Electronic Design categories. The developers expect sales of AccuMap to start in the United States during the first quarter of 2003.

The research behind AccuMap was driven by the Institute's director, Professor Frank Billson, and colleagues Dr Alex Klistorner and Dr Stuart Graham.

The commercial development started in late 1999 with the establishment of ObjectiVision™ as a medical technology company for designing, patenting and marketing vision-related products. In early 2000 ObjectiVision™ attracted $2 million in venture capital from the Perth-based pharmaceutical and medical R&D firm, Medical Corporation Australasia Limited, to commercialise the product.

The venture capital has also been supported by a $1.3 million AusIndustry R&D Start Grant, a COMET grant, EMDG (Export Market Development Grant) registration, plus assistance from the NSW Department of State and Regional Development.

Professor Billson said an important advance in the technology was that it could identify normally difficult-to-find defects in the early stages of diseases like glaucoma.

Because of this degree of sensitivity, he said the instrument also looked promising for detecting unsuspected tumours in children: 'We know that some tumours in the visual path within a child's brain can spontaneously stop growing and shrink, and the AccuMap may allow us to monitor this process,' he said.

QPM

A Melbourne physicist's exploration of the fundamental properties of light has led to a new form of microscopy and a rapidly growing start-up company to manufacture and market the technological spin-offs.

The new technology, developed by University of Melbourne physicist and ARC Federation Fellow, Professor Keith Nugent and his team, is called Quantitative Phase Microscopy (QPm).

It not only enables a standard optical microscope to perform like a specialised phase microscope, but its accompanying software allows, for the first time, quantitative measurements.

For example, a researcher studying cells in the normal, two-dimensional view, can now also measure the volume of the cells — in other words, gain access to three-dimensional information.

Conventional phase microscopy was developed in the late 1940s and allows the viewing of unstained specimens by using the light phase amplitude differences within microscopic objects. When an unstained biological specimen is observed in a normal 'brightfield' microscope, it is often difficult to see because most biological material is uncoloured and transparent. A phase microscope picks up the differences in refractive index between the object and the background; created when light passing through an object is deviated.

Quantitative phase microscopy adds a new dimension to this by allowing users to make, as the name implies, quantitative measurements.

A small unit is attached to the top of a conventional microscope and this is connected to a camera. The device is driven by software which acquires the information and processes it into a phase image.

QPm has given researchers a new tool and Professor Nugent said one of the exciting unknowns was what new science might come from this new capability. The company formed to commercialise the technology, IATIA, is now using an ARC linkage grant to study new ways in which the QPm can be applied.

Professor Nugent began developing his concept six years ago, using ARC funding, and in 1999 took out a patent and under a licence from the University of Melbourne, a private investor, Mr Vincent Thiang, established IATIA.

The company began operating in 2000, hiring staff, setting up manufacturing facilities, and marketing QPm worldwide.

To this point, ARC grants funding this and related ideas amount to $765,600. In April 2002, the company was floated with a market capitalisation of around $30 million, and employing 30 staff.

QSR

The initiative to write a computer program when none existed at the time of a major qualitative social research project by La Trobe University in 1982 was the starting point for one of Australia's most successful export software companies, QSR International Pty Ltd.

It is today the recognised world leader in qualitative research software and services. QSR develops and markets a suite of products for analysing text and other non-numerical data.

QSR has its origins at La Trobe University, where the first commercial product, NUD*IST software, was created by Tom Richards to support a social research project by Lyn Richards.

NUD*IST draws its name from the program they developed for handling 'Non-numerical Unstructured Data by techniques of Indexing Searching and Theorizing'. It quickly became the front-line innovator in the qualitative computing field and was being used in 20 countries before it was ever advertised.

Before this development, in the 1980s, computers simply couldn't handle non-numeric data, so qualitative research still required pen and paper.

In May 1994, QSR was formed and became part of an incubator centre at the La Trobe University Technology Park. In 1995, the company was restructured in a management buy-out. It also eventually outgrew its university location and moved to premises in the Melbourne light-industrial suburb of Doncaster.

During this time, the program continued to evolve and, in 1999, QSR released a second product, NVivo, which pioneered new methods of accessing and linking data. It was widely regarded at the time as ushering in a new generation in qualitative software. By the year 2000 both NUD*IST (by now Version 6) and NVivo were selling as first-choice research tools in 80 countries.

QSR products are used by researchers and managers in academic, business, government and non-government organisations undertaking health and medical research, social science, education, evaluation, market research, counselling, software engineering, criminology, management studies, economics and many other fields of study and work.

The company now employs 25 staff in Melbourne and 2 in North America, and uses a network of trainers and consultants around the world.

In October 2001, QSR was announced as the winner of the 'Information and Communication Technology Award' in the Governor of Victoria Export Awards for 2001, Victoria's most prestigious export award. The award cited the company's international focus and its ability to provide leading edge QDA software solutions.

QSR itself has been the sole funder of its R&D; its founders are still with the company — Tom Richards as its chief scientist and Lyn Richards as Director of Research Services.

QUANTM

A technology that charts the best route for road and rail construction has delivered millions of dollars of savings to Australian road and rail agencies.

The Quantm system calculates such key issues as when to tunnel or when to cut, and the height at which constructing a viaduct is less expensive than filling — with a dollar sign attached to each of its deductions. For major overseas projects, the potential savings run into billions of dollars.

It enables engineers to determine "best option" road and rail routes in a matter of hours, taking account of economic, environmental and social constraints, as well as the geography of the terrain.

Quantm Ltd was formed to commercialise the CSIRO technology used to determine the most cost-effective route for the proposed $3.7 billion Canberra–Sydney Very High Speed Train Service Project (VHST Project).

Changes to the original alignment identified ways to significantly reduce earthworks for the railway and offered alignment construction cost savings of up to 42%. The system allows planners to optimise whole-of-life costs by evaluating the impact of particular options on both construction and ongoing costs.

The company now employs 17 people after completing a capital raising last year. With CSIRO, it won the Australian Technology Award for the best public sector new technology in 2001.

Its system has been widely adopted in Australia and New Zealand and is being applied on a third US project. It has been used on both high-speed rail and highway projects in Europe, and a contract has been signed for an expressway project in China, due to begin later this year.

Leading German firm, Dorsch Consulting, describes the technology as 'the missing link' in road and rail construction. It helps cut project planning time by up to a third, but even more important are the alignment construction cost savings, which can be 20% or higher.

For example, the California High Speed Rail Authority has stated that its study team was able to deliver potential savings of US$4.8 billion dollars using the Quantm system.

And there are other benefits. The system's use can improve a project's community relations by providing a quick response to new constraints arising from the consultation process, and it can also factor in issues that produce better environmental outcomes.

SEEING MACHINES

Your car will soon be able to warn you if you've dozed off at the wheel, not only saving you and your passengers, but also the thousands of other people killed or injured by sleeping or inattentive drivers around the world each year. Not to mention saving some of the $3 billion each year in costs directly attributable to fatigue-related road accidents in Australia alone.

The installation of fatigue warning systems in cars is now only three to five years away thanks to an eye-tracking system called 'faceLAB', which was developed by a commercial spin-off from the Australian National University, Seeing Machines Pty Ltd. The Canberra-based company has been operating only since 2000, yet the automotive and electronics giants that have already bought 'faceLAB' include Bosch, DaimlerChrysler, Mitsubishi, Motorola, Nissan, Toyota and Volvo. Some have bought several, even though each unit costs up to $80,000.

The original research at the ANU which produced 'faceLAB' was supported by an ARC grant in 1995 and 1996. Indeed, 'ARC funding was vital to the early development of this technology at the ANU — "faceLAB" would not exist without it', says the company's International Market Developer, Gavin Longhurst.

Seeing Machines, which was recently awarded the 2002 Eureka Prize for Information and Communications Technology Innovation, was founded by its CEO, Alex Zelinsky, a former Professor of Robotics in the ANU's Faculty of Engineering, and now employs 20 people. 'Our two main investors are the ANU and Volvo, which collaborated on the original research,' says Mr Longhurst.

In the past, observation of driver behaviour was subjective, laborious and frequently imprecise, with analysis prone to error. By contrast, 'faceLAB' is a computer vision research tool that allows driver behaviour to be objectively observed, measured and recorded. It is capable of registering even the tiniest of eye movements that betray driver fatigue or distraction. It is being used not only to develop driver warning systems, but also to intercept car design problems before they reach the road, and to supply evidence for legislative decision processes.

In addition to this, and generating revenue for Seeing Machines and its investors, 'faceLAB' has another important use — stopping the brain drain. As Mr Longhurst says: 'We've shown that it's not just places like MIT or Stanford that can spin off commercially successful enterprises — Australian universities can too.'

XENOME

The same chemical compounds that enable some animals to stun and capture prey may provide human medicine with a new source of pain-killing drugs.

Researchers at Xenome Ltd have completed successful animal trials of a new pain-killing compound derived from the venom of cone shells, common to many reef environments. The animals, members of the Conidae family of molluscs, prey on other marine organisms, immobilising them with unique venoms.

In January 2000, the promising results of seven years' research conducted at the University of Queensland led to the formation of Xenome Ltd to begin commercialising new pain-killers and sedatives for humans.

The research has concentrated on the components of the venom conotoxins that act by preventing neuronal communication.

The cone shell research was initiated by the Venoms Research Group at the University of Queensland in 1993, lead by Dr Richard Lewis and Professor Paul Alewood. The team found that while the venom as a whole was potentially fatal, individual molecules within the venom had unique and potentially beneficial effects.

It was found that these molecules were able to bind with receptors in the nervous system in a similar manner to drugs like morphine, but without the same side-effects such as nausea and addiction. This became the basis for further investigating the potential use of these natural compounds as new therapeutics.

Initial funding was supplied by the ARC and NHMRC to the Venoms Research Group and subsequently via an R&D Start Grant to Xenome Ltd of $1.75 million.

The ongoing commercialisation of the science at Xenome has also been supported by Medical Holdings Limited, a pooled development fund which has invested $3 million in the venture, plus $3.5 million from another specialist investment fund, BioTech Capital.

The compound that has been developed has been tipped to be the leader in a new class of pain-killing drugs for the treatment of chronic pain conditions.

Xenome's Operations Manager, Joanne Schrauwen, also said that while cone shells had been the initial focus of the research, work was now progressing to investigating the venom of other animals such as spiders.

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APPENDIXES

1. SURVEY RESPONDENTS

2. SURVEY QUESTIONNAIRE

3. EXPLANATORY MEMORANDUM TO THE SURVEY

4. TABLES

5. START-UP COMPANIES FORMED IN YEAR 2000

APPENDIX 1—SURVEY RESPONDENTS

Australian Catholic University
Centenary Institute of Cancer Medicine and Cell Biology
Central Queensland University
Charles Sturt University
Child Health Research Institute
Commonwealth Scientific and Industrial Research Organisation
Deakin University
Edith Cowan University
Griffith University
Howard Florey Institute of Experimental Physiology and Medicine
Institute of Respiratory Medicine
James Cook University
La Trobe University
Macfarlane Burnet Institute for Medical Research and Public Health
Macquarie University
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)
Menzies School of Health Research
Monash University
Murdoch Childrens Research Institute
Murdoch University
Northern Territory University
Peter MacCallum Cancer Institute
Prince Henry's Institute of Medical Research
Queensland Institute of Medical Research
Queensland University of Technology
Royal North Shore Hospital
Swinburne University of Technology
Southern Cross University
The Australian National University
The Flinders University of South Australia
The Royal Melbourne Institute of Technology
The University of Adelaide
The University of Melbourne
The University of Newcastle
The University of New England
The University of New South Wales
The University of Notre Dame, Australia
The University of Queensland
The University of Sydney
The University of Western Australia
The Walter and Eliza Hall Institute of Medical Research
TVW Telethon Institute for Child Health Research
University of Ballarat
University of South Australia
University of Tasmania
University of Technology, Sydney
University of Western Sydney
University of Wollongong
Victor Chang Cardiac Research Institute
Victoria University of Technology

APPENDIX 2—SURVEY QUESTIONNAIRE

The following questionnaire was used by the ARC and NHMRC to survey universities and medical research institutes in Australia about their patenting, licensing and start-up company formation activities.

The same instrument, with supplementary questions to capture additional information about other aspects of commercialisation not presented in this report, was used by CSIRO.

NATIONAL SURVEY OF RESEARCH COMMERCIALISATION

Year 2000

Please read the enclosed EXPLANATORY MEMORANDUM before completing this Questionnaire

For instructions and definitions, please refer to the National Survey of Research Commercialisation Explanatory Memorandum that accompanies this Questionnaire.

Please note that this survey asks for data for the **Year 2000**. The reporting period may be your institution's fiscal or calendar year, for which the beginning and end dates are to be entered on this form. Throughout this Questionnaire, the term "Year 2000" means the reporting period for the named institution. Please make allowances for this when referring to the Explanatory Memorandum.

Note that institutional figures should refer to the institution or the commercialisation company of that institution as appropriate. It is assumed that the commercialisation company is wholly-owned by the institution for the purpose of assessing benefits of commercialisation. For example, if income from licensing or equity in a start-up entity is held by a university commercialisation company, then this should be included as institutional benefits. If commercialisation activities take place in both a commercialisation company and the institution itself use the sum of all activities.

If you are not able to provide an exact response to a question, please provide your *best estimate* to each question, instead of no answer at all.

This questionnaire has been developed using as a guide a survey performed by the Association of University Technology Managers (AUTM) in North America. Reference to AUTM appears for reference purposes only and is not intended to reflect any endorsement or sponsorship of the ARC & NHMRC survey by AUTM.

Cooperative Research Centres (CRC) data are requested in some sections of this Questionnaire. It is assumed that, although the respondent institution may play some role in CRC patenting and commercialisation, in most cases CRCs would have their own staff to manage commercialisation. Do not include CRCs except where specific data for CRCs are requested.

Name of institution:	

Due Date
Please complete this form and return it in the reply paid envelope to the Australian Research Council by **30 November 2001**.

Help Available
If you have any difficulties completing this Questionnaire, or feel that you may not meet the due date for its return, please contact **Simon Sedgley** at the Australian Research Council.

Telephone 02 6284 6630
Fax 02 6284 6601
Email simon.sedgley@arc.gov.au

1. Does your institution have a medical school? Yes ☐ No ☐

2a) Contact details for clarification of data entered in this Questionnaire

The following should reflect the appropriate individual to be contacted should clarification of the data entered in this Questionnaire be required.

Name:			
Title:			
Office:			
City:		**Postcode:**	
Telephone:			
Facsimile:			
Email:			

2b) What is the reporting period for data entered in this Questionnaire?

Calendar Year:_____ or

Fiscal Year: Starting ___/___/___ Ending___/__ /___

3. PROGRAM START DATE

In what year did your institution first dedicate at least one half-time commercialisation staff (0.5 FTE) to commercialisation activities? _____

4. COMMERCIALISATION FTE STAFF

4a) How many commercialisation FTEs were employed in your institution in year 2000?_____

4b) How many "other FTE's" (see definition in the Explanatory Memorandum) were employed in your institution in year 2000 to support commercialisation activities?_____

4c) How many of the FTEs listed at 4a and 4b were employed in either a dedicated commercialisation office _____or a commercialisation company_____ in year 2000?

5. RESEARCH EXPENDITURES

What was the annual amount of research expenditure (include both direct and indirect costs) in Year 2000 for your institution for the following categories:

RESEARCH EXPENDITURE			
Total*	**Commonwealth Government sources**	**State Government sources**	**Industry sources**
$	$	$	$

*Note: the sum of Research Expenditures from Commonwealth Government, State Government and Industry sources may not equal Total Research Expenditures.

6. LICENCE/OPTION/ASSIGNMENT AGREEMENTS

6a) How many Licences/ Options/ Assignments did your institution execute in the year 2000?
How many Licences/ Options/ Assignments executed in the year 2000 included equity?
How many Licences/ Options/ Assignments were active as of the last day in the year 2000?

	Number of Licences/ Options/ Assignments		
	Executed (6.a.i)	**Executed with Equity (6.a.ii)**	**Active (6.a.iii)**
Year 2000 only			
Cumulative to Year 2000 **(6.a.iv),** **counting from year 19____**			
For the cumulative figure **(6.a.iv)** estimate the percentage which originated from each of these research areas:			
Biological Sciences and Biotechnology			
Physical, Chemical and Earth Sciences			
Mathematics, Information and Communication Sciences			
Social, Behavioural and Economic Sciences			
Humanities and Creative Arts			
Engineering and Environmental Sciences			
Health and Clinical Sciences			
Other			

2000 CRC data (attach information for more CRCs)			
CRC 1 % equity at 31 December 2000: _____%			
CRC 2 % equity at 31 December 2000: _____%			
CRC 3 % equity at 31 December 2000: _____%			
CRC 4 % equity at 31 December 2000: _____%			
CRC 5 % equity at 31 December 2000: _____%			
CRC 6 % equity at 31 December 2000: _____%			

Using the Total number of Licences/ Options/ Assignments reported in **6.a.i** for **year 2000**, allocate the appropriate numbers of Licences/ Options / Assignments in each of the categories below reflecting inventor involvement in the commercialisation process. The Total Counts should be the same as in **6.a.i** above.

Inventor Involvement	**Number of Licences/ Options/ Assignments**
Extremely Involved	
Very Involved	
Moderately Involved	
Somewhat Involved	
Uninvolved	
Total	

6b) How many of the Licences/ Options/ Assignments executed in the year 2000 reported in **6.a.i** above were exclusive Licences/ Options/ Assignments and how many were non-exclusive? *Do not include CRC data.*

Year	**Number of Licences/ Options/ Assignments Executed**		
2000	Total **(same figure as 6.a.i)**	**Exclusive**	**Non-Exclusive**

6c) How many of the Licences/ Options/ Assignments executed in the year 2000 were licences to Start-Up companies, Small companies (1-19 employees), Medium companies (20-199 employees) or Large companies (200 or more employees)? *Do not include CRC data*

Year	**Number of Licences/ Options/ Assignments Executed**				
2000	**Total (same figure as 6.a.i)**	**To Start-Ups**	**To Small Companies**	**To Medium Companies**	**To Large Companies**

6d) How many of the Licences/ Options/ Assignments executed in the year 2000 in **6c** above to Start-Up, Small, Medium or Large companies were exclusive and how many were non-exclusive?

Year	**Number of Licences/ Options/ Assignments Executed**							
	To Start-Up Companies		**To Small Companies**		**To Medium Companies**		**To Large Companies**	
	Exclusive	**Non-Exclusive**	**Exclusive**	**Non-Exclusive**	**Exclusive**	**Non-Exclusive**	**Exclusive**	**Non-Exclusive**
2000								

Note: The total number of exclusive and non-exclusive Licences/ Options/ Assignments for each category will cross-check to the number of Licences/ Options/ Assignments reported in 6b by licences type and in 6c by company type.

7. RESEARCH FUNDING RELATED TO LICENSING

(See definition for research funding). *Do not include CRC data.*

How much research funding was committed to your institution by licensees/assignees in the year 2000 (includes multi-year commitments) as a consequence of Licences or Option agreements or Assignments executed in the year 2000 *or* as a consequence of Licences or Option agreements or Assignments executed in a prior year.

Year	Research funding related to Licences/ Options/ Assignments
2000	$

8. INCOME FROM LICENCES, OPTIONS AND ASSIGNMENTS

8a) What was the amount of Licence/ Option/ Assignment income received at your institution and the total number of Licences/ Options/ Assignments yielding income in the year 2000? How much of the income reported in **8.a.i** was paid to other institutions or commercial entities?

Year	Licence/ Option/ Assignment income received (8.a.i)	Total number of Licences/ Options/ Assignments yielding licences income	Licences/ Options/ Assignments income paid to other institutions
2000	$		$
2000 CRCs	$		$

8b) How much of the Licence/ Option/ Assignment income received can be attributed to running royalties, cashed-in equity and licence income all other types? How many licences yielded the amount of running royalties?

Year	Licence/ Option/ Assignment income received				Number of licences yielding running royalties
	Total (same figure as 8.a.i)	running royalties (8.b.i)	cashed-in equity (8.b.ii)	all other types (8.b.iii)	
2000	$	$	$	$	

9. PATENT FEES EXPENDITURES AND REIMBURSEMENTS (costs expended for statutory protection of intellectual property) (See the definition of Legal Fees etc in the Explanatory Memorandum – note that, under the definition, Legal Fees are related only to patents etc – not to contract drafting or advice)

How much did your institution spend in external patent fees (Patent Fees Expenditures) for patents and/or copyrights? How much did your institution receive in reimbursements for these fees from licences (Patent Fees Reimbursements)?

Year	Amount spent in external patent fees (9a)	Amount reimbursed by licensees/assignees (include reimbursements from CRCs if CRC patent costs have been included in 9a)
2000	$	$

10. EQUITY

How much cash did your institution receive from cashed-in equity? What was the value of all equity holdings at the end of the year 2000?

Year	Amount of cashed-in equity (same figure as 8.b.ii)	At end of Year 2000, the value of all equity holdings
2000	$	$
2000 CRCs	$	$

11. PATENT-RELATED ACTIVITY

How many invention disclosures were received, patent applications filed, and patents issued to your institution in the year 2000? Of the total patent applications filed, how many of these filings were new patent applications filed?

Invention disclosures received	Total patent applications filed	Number of New patent applications filed		Number of New patents issued		Number of PCT applications filed	Number of patents issued (total worldwide including US)
		Australia	US	Australia	US		

12. START-UP COMPANIES

12a) How many Start-Up companies were formed during the year 2000 that were dependent upon the licensing or assignment of your institution's technology for initiation? _____

12b) How many of the Start-Up companies in 12a) have:

Their place of business operating in Australia?
_____

Their headquarters in Australia?
_____

12c) How many Start-Up companies that were dependent upon the Licensing/ Assignment of your institution's technology for initiation became non-operational as of the last day in the year 2000?
_____

12d) How many Start-Up companies that were dependent upon the Licensing/ Assignment of your institution's technology for initiation were operational as of the last day in the year 2000?
_____

12e) In how many of the operational Start-Up companies reported in 12d) above does your institution hold equity?
_____

NOTE: FOR THIS QUESTION PLEASE COMPLETE AN ADDENDUM (SEE ATTACHED) WITH THE NAME OF EACH OF THE COMPANIES REPORTED ABOVE, TO ALLOW FOR SURVEY FOLLOW-UP IF REQUIRED.

13. LICENCES, TECHNOLOGIES, POST-LICENSING ACTIVITIES

Did one or more of your institution's licensed or assigned technologies become available for consumer (public) or commercial use in the year 2000?

Yes ☐ how many? _____

No ☐

9. 14. PRODUCT SALES-RELATED SUCCESS STORIES

Describe, for as many technologies as you wish to highlight, important licensing milestones that occurred in the year 2000. See below for examples of milestones. (A form is attached for your convenience and use in response.)

For each technology please provide the following information:

a. Name of product/process/service
b. Significant milestone
c. Description of product/process/service
d. Licensee (if the ARC and NHMRC may use the name in publications)
e. Licensee (generic description, for example small biotech firm, large pharmaceutical company, etc.)
f. Description of the public benefit and/or economic impact (*)
g. What was the main source of funding for the research that underpinned the development of the subject technology? (ARC, NHMRC, other government, foundation, institution discretionary funding, industrial sponsor/consortium, etc.)
h. From which academic/ research discipline did the product/service/process originate? (see overleaf):

14. (CONTINUED)

1. Biological Sciences & Biotechnology
2. Physical, Chemical and Earth Sciences
3. Mathematics, Information and Communication Sciences
4. Social, Behavioural and Economic Sciences
5. Humanities and Creative Arts
6. Engineering and Environmental Sciences
7. Health & Clinical Sciences
8. Other

Sample licence-related milestones:

- the product became available for sale to the public in the year 2000;
- the product received regulatory approval in the year 2000;
- the product reached an earned royalty milestone in the year 2000, for example $100,000/year;
- other (please explain).

(*) Please send any articles or publications about the product, process or service to the ARC or NHMRC.

15. TIME TAKEN TO COMPLETE THE QUESTIONNAIRE

Please provide an estimate of the time taken to complete this Questionnaire. **Include:**

The time actually spent reading the instructions, working on the questions and obtaining the information.

The time spent by all employees in collecting and providing this information.

☐ Hours ☐ Minutes

16. COMMENTS ON THE QUESTIONNAIRE

Please provide comments:

- On any of the information you have supplied in this Questionnaire
- On any questions which caused problems
- If you would like to suggest improvements to this Questionnaire

_____

_____

_____

_____

Thank you for your participation in the National Survey of Research Commercialisation
Please return the completed Survey material to:

Simon Sedgley,
Australian Research Council
GPO Box 2702 Canberra ACT 2601

The completed Survey material should comprise:

1. Questionnaire
2. Addendum: Information for more CRCs (see Question 6a)
3. Addendum: Names of Start-Up companies (see Question 12)
4. Addendum: Description of important licensing milestones (see Question 14)
5. Addendum: Articles and/or publications (see Question 14)

Question 6a Addendum

CRCs (if insufficient room at 6a)

	Number of Licences/ Options/ Assignments		
	Executed **(6.a.i)**	**Executed with Equity** **(6.a.ii)**	**Active** **(6.a.iii)**
CRC 7 % equity at 31 December 2000: _____%			
CRC 8 % equity at 31 December 2000: _____%			
CRC 9 % equity at 31 December 2000: _____%			
CRC 10 % equity at 31 December 2000: _____%			
CRC 11 % equity at 31 December 2000: _____%			
CRC 12 % equity at 31 December 2000: _____%			

Question 12 Addendum

Names and Contact Details of Start-Up Companies

(Please attach extra sheets as necessary.)

1.

Name of Company			
Address			
City:		**Postcode:**	
Telephone:			
Facsimile:			
Email:			

2.

Name of Company			
Address			
City:		**Postcode:**	
Telephone:			
Facsimile:			
Email:			

3.

Name of Company			
Address			
City:		**Postcode:**	
Telephone:			
Facsimile:			
Email:			

4.

Name of Company			
Address			
City:		**Postcode:**	
Telephone:			
Facsimile:			
Email:			

Question 14 Addendum

Product Related Success Stories.

a) Name of product/process/service_____

b) Significant milestone_____

c) Description of product/process/service_____

_____

d) Licensee (if ARC/NHMRC may use the name in publications)

_____

e) Describe the nature of the Licensee (e.g. small biotech firm, large pharmaceutical company)

_____

f) Please describe the public benefit and/or economic impact of the product/process/service

_____

_____

_____

_____

g) What was the main source of funding for the research that underpinned the development of the subject technology (e.g. ARC, NHMRC, industry, Commonwealth institutional operating grants, State government)?

_____

h) From which academic/research discipline did the product/service/process primarily originate? (Please circle one)

1. Biological Sciences & Biotechnology
2. Physical, Chemical and Earth Sciences
3. Mathematics, Information and Communication Sciences
4. Social, Behavioural and Economic Sciences
5. Humanities and Creative Arts
6. Engineering and Environmental Sciences
7. Health & Clinical Sciences
8. Other

Thankyou for taking the time to provide this information. Please ensure it is attached to the completed questionnaire.

APPENDIX 3— EXPLANATORY MEMORANDUM TO THE SURVEY

EXPLANATORY MEMORANDUM
NATIONAL SURVEY OF RESEARCH COMMERCIALISATION

Year 2000

1. NOTES:

These notes and definitions will clarify the questions and terms and will facilitate completion of the subject Questionnaire. If you are not able to provide an exact response to a question, please provide your *best estimate* to each question, instead of no answer at all. Recognising that misinterpretations may still occur, you are encouraged to contact **Simon Sedgley** at **The Australian Research Council** (Ph. 02 6284 6630; Email: simon.sedgley@arc.gov.au) if clarification is required. The Questionnaire requests data for a complete year regardless of whether your reporting period is a fiscal or calendar year.

Please Note: Capitalised words are defined in the **Definitions.**

2. INSTRUCTIONS:

Currency amounts should be submitted in Australian dollars. Conversion to other currencies for comparison purposes will be completed at the time of data entry, using a recognised published exchange rate. Research Expenditures: Federal Govt. and State Govt. sources refers to research expenditures that were supported by respective Australian government sources; this amount does *not* include expenditures funded by regional government sources. Total and New Australian and U.S. Patent Applications Filed refer to applications filed in the respective countries. Australian and U.S. Patents Issued refers to patents issued and in force in the respective countries.

3. DISCUSSION OF THE QUESTIONS:

Do not leave any questions blank and do not use a hyphen to respond. If the data are not available, note "N.A." If the data are zero, be sure to note "0".

A discussion of the questions follows to aid in an accurate interpretation of the question for which data are requested.

Question 1: Self-explanatory.

Question 2: Indicate whether the reporting period for Year 2000 is a calendar or fiscal year including the beginning and end dates for the latter.

Question 3: Enter the year in which your institution assigned at least one half-time (0.5 full time equivalents (FTE)) commercialisation staff in support of COMMERCIALISATION ACTIVITIES. The reported year will be used as the start of COMMERCIALISATION ACTIVITY at your institution. The individual assigned to COMMERCIALISATION ACTIVITIES may or may not have had a formal commercialisation or similar job title and may or may not have been in an organisational unit with "commercialisation" or “technology transfer” in its title, i.e., a commercialisation office or company. Examples of commercialisation FTEs include: full time equivalents of staff working on commercialisation through licensing, sale of IP or formation of start-up companies. Do not include administrative assistance or in-house or external legal counsel, unless they are playing a direct commercialisation role. Do not include people working on contracts for research (other than as part of licensing), course delivery, consulting or other activities.

Question 4: See definitions for COMMERCIALISATION FTE when responding to this question. You are requested to report the COMMERCIALISATION FTEs in your institution by full or fractional FTEs for COMMERCIALISATION (as defined in COMMERCIALISATION FTE). The inclusion of activity in COMMERCIALISATION FTE will be used to correlate the data collected in this Survey with other similar measures.

Question 5: This question asks for the reporting of research expenditure data in Year 2000. Refer to the relevant definitions when responding to this question. Use ABS data, or equivalent internal data if ABS data are not submitted in a particular year. Include your institution’s research expenditure in CRCs if this is included in the ABS data. University commercialisation companies should use parent university data. Please ensure that indirect cost calculations are consistent with those used for ABS data. If it is not possible to provide a breakdown of research

expenditure by source, research expenditure can be apportioned to reflect research income. For example, if 30% of your institution's research income was derived from state government sources, you can allocate 30% of your institution's research expenditure as having been derived from state government sources.

Question 6: The first portion of this question, 6.a, should include software technologies but not trade secrets. For the "Cumulative to year 2000" question included in the table at 6a, please indicate the year from which your cumulative count begins. Sections 6.b, 6.c, and 6.d request additional detailed data. Specifically, in 6.b, the sum of LICENCES/OPTIONS/ASSIGNMENTS (L/O/A) negotiated as EXCLUSIVE and NON-EXCLUSIVE LICENCES will equal the number of L/O/A executed in Year 2000 (same as 6.a.i). In 6.c, the sum of L/O/A executed with START-UPS, SMALL COMPANIES, MEDIUM COMPANIES and LARGE COMPANIES will equal the number of L/O/A executed in Year 2000 (same as 6.a.i). Finally, in 6.d, the sum of L/O/A negotiated as EXCLUSIVE and NON-EXCLUSIVE will equal the sum of L/O/A executed with START-UPS, SMALL COMPANIES, MEDIUM COMPANIES and LARGE COMPANIES reported in 6.c, respectively. The sums in 6.d will also correspond to the data in 6.b for exclusive and non-exclusive licences/options, respectively. In 6.c and 6.d include any licensee/assignee entity as a "company", including, for example, public agencies. After completing the table in 6(a), you are asked to allocate the L/O/A counts into categories reflecting inventor involvement in the commercialisation process. See definition of LICENCE/OPTION but include assignments to a company as part of the commercialisation process where assignment has been negotiated rather than a licence. Treat an "active" assignment as one with on-going financial benefits to the institution (e.g. milestone payments).

Do not report names of CRCs but report data for any CRC for which an employee of your institution has been an inventor/copyright creator for which licences/assignments have been executed through the CRC. Report total numbers. The survey analysis will take into account your institution's percentage equity. For each CRC in which your institution holds equity, please indicate the percentage of equity held as at 31 December 2000. If 31 December 2000 information is not available, 30 June 2000 may be used.

Question 7: This question requires reporting of research funding committed to the institution in YEAR 2000 that is related to LICENCE/OPTION/ASSIGNMENT (L/O/A) AGREEMENTS signed either in YEAR 2000 or in an earlier year. Specifically, it allows for the reporting of research funding that is a result of a renewal of a research agreement and linked to a L/O/A AGREEMENT signed in an earlier year. To respond to this question, you should review the L/O/A AGREEMENTS reported as executed in Question 6.a.i of the Questionnaire and report the amount of RESEARCH FUNDING (even if multi-year) committed to the institution that was related to these L/O/A. Please note that the amount being sought is the totality of RESEARCH FUNDING before disbursements for any costs associated with the Licences/Options/Assignments. In addition, you may also consider research agreements that were renewed in YEAR 2000. If the renewed research agreement was related to a L/O/A AGREEMENT signed in a prior year you may include the amount of funding committed through the renewal of the research agreement in your response.

Question 8: The first portion of this question, 8.a, is self-explanatory. Include income to your institution's income from distributions of CRC licences. CRC data are required for Year 2000. Use total figures from CRCs (do not take into account your percentage equity). Section 8.b requests additional detailed data. In 8.b, the sum of LICENCE/OPTION/ASSIGMENT INCOME RECEIVED apportioned to RUNNING ROYALTIES, CASHED-IN EQUITY, and all other types, that is all forms not classified as the foregoing including milestone payments, annual licence fees and termination fees, will equal LICENCE/OPTION/ASSIGNMENT INCOME RECEIVED for Year 2000 (same as 8.a.i). In 8.b, you are also asked to provide the number of LICENCES/OPTIONS/ASSIGNMENTS that yielded the amount of RUNNING ROYALTIES reported.

Question 9: Please provide the amount of costs/reimbursements for external legal fees and reimbursements (see definitions below for LEGAL FEES EXPENDITURES and LEGAL FEES REIMBURSEMENTS). Please include all costs and reimbursements in 2000, even if the reimbursements relate to licences from previous years. Omit significant litigation expense because legal fees are defined to include patent and copyright prosecution, maintenance, and interference costs, as well as minor litigation expenses that are included in everyday commercialisation office expenditures (an example of a minor litigation expense might be the cost of an initial letter to a potential infringer written by counsel), and to exclude significant litigation expense, e.g. any individual litigation expense that exceeds 5% of total LEGAL FEES EXPENDITURES. The refinement to litigation expense is intended to eliminate skews in the data as a result of significant litigation. It is also required to obtain more accurate results in copyright and patent maintenance and prosecution costs as well as to provide meaningful comparisons of these data across institutions.

Question 10: This question asks for the amount of cashed-in equity received by the institution and the value of current equity holdings. It is not intended to capture the proceeds of universities' capital investments in companies, or general investments in the share market. Start-up companies are captured elsewhere in the survey. Value, in some cases, may be difficult to determine. The following guidelines are given: Value of all equity holdings refers to equity that is related to licensing/IP assignment activity of the institution. If your institution holds equity in a publicly-traded/listed company, use the market price of your institution's holdings on the closing day of the period for which you are reporting. If your institution holds equity in a private company use the price established in the most recent transaction as the fair market price. For example, if you formed a company with an investor in 1998 and they put in $3 million for 60% of the company and there have been no more investments since, then your value for all three years (1998-2000) will be $2 million (i.e. the institution's 40% share value). If there have been no transactions, treat value as 0.

Question 11: This question asks for annual data for INVENTION DISCLOSURES, Australian and U.S. PATENTS ISSUED, and TOTAL and NEW Australian and U.S. PATENT APPLICATIONS FILED. Of the TOTAL PATENT APPLICATIONS FILED in YEAR 2000, it asks for the number of applications filed that were NEW Australian and U.S. PATENT APPLICATIONS FILED in that year. See related definitions for TOTAL PATENT APPLICATIONS FILED and NEW PATENT APPLICATIONS FILED (a subset of TOTAL) to respond to this portion of the question.

Question 12: This question asks for information for START-UP COMPANIES in YEAR 2000. The first part of this question, 12.a, is self-explanatory. The second part, 12.b, asks for the number of START-UP COMPANIES initiated in YEAR 2000 that have their primary place of business operating in Australia. Question 12.c asks how many START-UP COMPANIES became *non*-OPERATIONAL in Year 2000. Question 12.d asks how many START-UP COMPANIES, including those reported in YEAR 2000 were OPERATIONAL as of the last day of the surveyed fiscal year. When responding to 12.c and 12.d, it may be useful to ask yourself if the LICENCE/OPTION/ASSIGNMENT with the START-UP is in force. (See also definition, OPERATIONAL.) Finally, question 12.e asks in how many of your OPERATIONAL START-UP companies does your institution or your institution's commercialisation company hold EQUITY.

Question 13: Question 13 requests LICENSED/ASSIGNED TECHNOLOGIES made AVAILABLE in Year 2000 and will be used as sample data to describe benefits derived in the Survey year. To answer this question, review your ACTIVE LICENCES through Year 2000 (6.a.iii) and determine the LICENSED/ASSIGNED TECHNOLOGIES that became AVAILABLE in Year 2000. (See related definitions for LICENSED TECHNOLOGIES and AVAILABLE.) Include CRCs if CRC patents with your inventors were filed through your institution.

Question 14: This question asks for product sales-related success stories. To consider your response, it might be useful to review the product stories published in the AUTM FY 1998 and 1999 *Survey Summary Reports,* and the product stories highlighted in the AUTM FY 1999 press release (available at www.autm.net). It is important that the reporting of the numbers be combined with a sharing of the benefits of licensed technologies. The additional effort to respond to question 14 is recognized and appreciated.

4. DEFINITIONS:

0.5 COMMERCIALISATION FTE: 0.5 COMMERCIALISATION FTE means a position with duties included as support of COMMERCIALISATION ACTIVITIES at least 50% of the time. This person may or may not have been located in a formally established COMMERCIALISATION OFFICE at that time. (See Question 3.)

ACTIVE LICENCES/OPTIONS/ASSIGNMENTS (L/O/A): The cumulative number of L/O/A over all years that had not terminated by the end of the Survey's reporting year . (See Question 6.a.iii.)

AVAILABLE: LICENSED TECHNOLOGIES (see definition) that are sold as a product to the public or are placed into commercial use by a company, for example, as part of a manufacturing process. (See Question 13.) A LICENSED TECHNOLOGY is considered AVAILABLE in Year 2000 if the technology was placed into use in that year, i.e., evidenced by royalties generated for the first time or licensee diligence reporting. (See Question 13.)

CASHED-IN EQUITY: This includes the amount received from cashing in equity holdings, resulting in a cash transfer to the institution (or its commercialisation company). *The amount reported should be reduced by the cost basis, if any, on which the equity was acquired*. Excluded from this amount is any type of analysis or process whereby a value for the equity holdings is determined but a cash transaction does not take place through the sale of these holdings. (See Question 8.b.ii.)

COMMERCIALISATION ACTIVITIES: COMMERCIALISATION ACTIVITIES include those activities associated with the identification, documentation, evaluation, protection, marketing, and licensing of technology (including trademarks but not university's insignia) and intellectual property management, in general. It encompasses activities such as assisting with the negotiation of research agreements, Material transfer Agreements (MTA)s, reporting of inventions to sponsors, and all other duties performed by the office. (See Questions 3 & 4.b.)

COMMERCIALISATION COMPANY: A company wholly-owned by an institution that undertakes commercialisation activities for the institution.

COMMERCIALISATION FTE: Person(s) employed in the institution whose duties are specifically involved with the licensing *and* patenting processes in either full or fractional FTE allocation. Licensing examples include licensee solicitation, technology valuation, marketing of technology, licence agreement drafting and negotiation, and start-up activity efforts. (See Question 4.)

COMMERCIALISATION OFFICE: The office(s) that manages and performs the COMMERCIALISATION ACTIVITIES. (See Question 4.)

EQUITY: EQUITY, for the purposes of this Survey, is defined as an institution (or its commercialisation company) acquiring an ownership interest in a company (e.g., stock and rights to receiving stock).

EXCLUSIVE LICENCE: The assignment of a licence as exclusive or non-exclusive should adhere to the terms of the licence agreement. If a licence is designated as exclusive in the licence agreement, it should be assigned to exclusive licences under this Survey, including licences that are designated as exclusive by field of use, territory, or otherwise. (See Questions 6.b and 6.d.)

FTE (Full-Time Equivalent): See COMMERCIALISATION FTEs and OTHER FTEs.

INVENTION DISCLOSURES: INVENTION DISCLOSURES include the number of disclosures, no matter how comprehensive, that are made in the year requested and are counted by the institution. (See Question 11.)

LARGE COMPANIES: Companies that had more than 200 employees at the time the Licence/Option/Assignment was signed. (See Question 6.c and 6.d.)

LEGAL FEES EXPENDITURES: LEGAL FEES EXPENDITURES include the amount spent by an institution in external legal fees for patents and/or copyrights. These costs include patent and copyright prosecution, maintenance, and interference costs, as well as minor litigation expenses that are included in everyday office expenditures (an example of a minor litigation expense might be the cost of an initial letter to a potential infringer written by counsel). Excluded from these fees is significant litigation expense, e.g., any individual litigation expense that exceeds 5% of total **LEGAL FEES EXPENDITURES**. They also do not include direct payment of any of these costs by licensees. (See Question 9.)

LEGAL FEES REIMBURSEMENTS: LEGAL FEES REIMBURSEMENTS include the amount reimbursed by licensees to the institution for LEGAL FEES EXPENDITURES (see definition for LEGAL FEES EXPENDITURES). (See Question 9.)

LICENCE/OPTION/ASSIGNMENT INCOME PAID TO OTHER INSTITUTIONS: LICENCE/OPTION/ASSIGNMENT INCOME PAID TO OTHER INSTITUTIONS is a subset of LICENCE INCOME RECEIVED and should not be subtracted from the total. This number will be used to better define the double-count of LICENCE INCOME reported under this Survey. It includes the amounts paid to other institutions under inter-institutional agreements. (See Question 8.a.)

LICENCE/OPTION/ASSIGNMENT INCOME RECEIVED: LICENCE/OPTION/ASSIGNMENT INCOME RECEIVED includes the gross amount (before deduction of service fees, if any) of: licence issue fees, payments under options, annual minimums, running royalties, termination payments, the amount of equity received when cashed-in, and software and biological material end-user licence fees equal to $1,000 or more, but not research funding, patent expense reimbursement, a valuation of equity not cashed-in, software and biological material end-user licence fees less than $1,000, or trademark licensing royalties from university insignia. Licence/Option/Assignment Income also does not include income received in support of the cost to make and transfer materials under Material Transfer Agreements. (See Questions 8.a and 8.b.)

LICENSED/ASSIGNED TECHNOLOGIES: Refers to licensed/assigned technologies that became a product that was sold either to the public or to industry. It also refers to a licensed/assigned technology that is a process that was put into commercial use as opposed to developmental use by a company. A licensed/assigned technology may be considered AVAILABLE if it is bundled with other technologies when made available to the end-user. (See Question 13.)

L/O/A: Count the number of LICENCE, OPTION or ASSIGNMENT AGREEMENTS that were executed in the year indicated for all technologies. Each agreement, exclusive or non-exclusive, should be counted separately. Licences/assignments to software or biological material end-users of $1,000 or more may be counted per licence, or as one licence, or one-each for each major software or biological material product (at manager's discretion) if the total number of end-user licences would unreasonably skew the institution's data. Licences/assignments for technology protected under or plant breeder's rights may be counted in a similar manner to software or biological material products as described above, at manager's discretion. Material Transfer Agreements are not to be counted as Licences/Options/Assignments in this Survey. (See Questions 6.a-6.d, 8.a, and 8.b.ii.)

LICENCES/OPTIONS/ASSIGNMENTS AGREEMENTS: A LICENCE AGREEMENT formalises the transfer of technology between two parties, where the owner of the technology (licensor) permits the other party (licensee) to share the rights to use the technology. An OPTION AGREEMENT grants the potential licensee a time period during which it may evaluate the technology and negotiate the terms of a LICENCE AGREEMENT. An OPTION AGREEMENT is *not* constituted by an Option clause in a research agreement that grants rights to future inventions, until an actual invention has occurred that is subject to that Option. (See Questions 6.a-6.d, 8.a, and 8.b.ii.). An ASSIGNMENT AGREEMENT conveys all right, title and interest in and to the licensed subject matter to the named assignee.

LICENCES/OPTIONS/ASSIGNMENTS (L/O/A) EXECUTED WITH EQUITY: The number of L/O/A that were executed in the year surveyed that included EQUITY, where EQUITY is defined as an institution acquiring an ownership interest in a company. (See Question 6.a and 12.d.)

LICENCES/OPTIONS/ASSIGNMENTS (L/O/A) YIELDING LICENCE INCOME: The number of L/O/A that generated LICENCE/OPTION/ASSIGNMENT INCOME RECEIVED in the year requested. (See Question 8.a.)

LICENCES/OPTIONS/ASSIGNMENTS (L/O/A) YIELDING RUNNING ROYALTIES: The number of L/O/A that generated RUNNING ROYALTIES in the year requested. (See Question 8.b.ii.)

MEDIUM COMPANIES: Companies that had 20-199 employees at the time the licence/option/assignment was signed. (See Question 6.c and 6.d.)

NEW AUSTRALIAN and U.S. PATENT APPLICATIONS FILED: NEW AUSTRALIAN or U.S. PATENT APPLICATIONS FILED is a subset of TOTAL PATENT APPLICATIONS FILED. It does not include continuations, divisionals, or reissues, and typically does not include CIPs. A provisional application filed in Year 2000 may be counted as new. If a provisional application is converted in Year 2000 to a regular application, then that corresponding regular application filed in Year 2000 should not be counted as new. (See Question 11.)

NON-EXCLUSIVE LICENCE: The assignment of a licence as exclusive or non-exclusive should adhere to the terms of the licence agreement. If a licence is designated as non-exclusive in the licence agreement, it should be assigned to non-exclusive licences under this Survey. (See Question 6.b and 6.d.)

OPERATIONAL: A company that possesses sufficient financial resources and expends these resources to make progress toward stated business goals. The company must also be diligent in its efforts to achieve these goals. (See Questions 12.b, 12.c, and 12.d.)

OTHER FTE: Person(s) employed in either full or fractional FTEs whose duties and responsibilities are to provide professional, administrative, or staff support of COMMERCIALISATION ACTIVITIES that are not otherwise included in COMMERCIALISATION FTE. Such duties might include management, compliance reporting, licence maintenance, negotiation of research agreements, contract management, accounting, MTA activity, and general office activity. General secretarial/administrative assistance may also be included in this category. (See Question 4.)

PROGRAM START DATE: PROGRAM START DATE refers to the year in which at least one half-time (0.5 FTE) PROFESSIONAL was devoted to COMMERCIALISATION ACTIVITIES. (See Question 3.)

RESEARCH EXPENDITURES: FEDERAL AND STATE GOVT. SOURCES: RESEARCH EXPENDITURES: FEDERAL GOVT. SOURCES include expenditures made in YEAR 2000 by the institution in support of its research activities that are funded respectively by the federal or state government. (See Question 5.)

RESEARCH EXPENDITURES: INDUSTRIAL SOURCES: RESEARCH EXPENDITURES: INDUSTRIAL SOURCES include expenditures made in YEAR 2000 by the institution in support of its research activities that are funded by for-profit *corporations*, but not expenditures supported by other sources such as foundations and other nonprofit organizations. (See Question 5.)

RESEARCH FUNDING: RESEARCH FUNDING includes the total amount of research support committed to your institution in YEAR 2000 (even if the funds are to be spent over several years) that was related to LICENCE/OPTION/ASSIGNMENT AGREEMENTS executed in the Survey period. RESEARCH FUNDING also includes the total amount of research support committed to your institution in YEAR 2000 (even if the funds are to be spent over several years) that was related to LICENCE/OPTION/ASSIGNMENT AGREEMENTS signed in a prior year for which the related RESEARCH FUNDING was not previously reported, e.g., RESEARCH FUNDING committed as a result of a renewal of a research agreement that is related to a LICENCE/OPTION/ASSIGNMENT AGREEMENT signed in a prior year. (See Question 7.)

RUNNING ROYALTIES: For the purposes of this Survey, RUNNING ROYALTIES are defined as royalties earned on the sale of products. Excluded from this number are licence issue fees, payments under options, termination payments, and the amount of annual minimums not supported by sales. Also excluded from this amount is CASHED-IN EQUITY, which should be reported separately. (See Question 8.b.i.)

SMALL COMPANIES: Companies that had 1-19 employees at the time the Licence/Option/Assignment was signed, but, for the purposes of this Survey, not including START-UP COMPANIES initiated by your institution. (See Questions 6.c and 6.d.)

START-UP COMPANIES: As used in this Survey, START-UP COMPANIES are companies or traders as persons engaged in businesses that were dependent upon licensing or assignment of the institution's technology for initiation. If a technology was licensed to an existing start-up company, but not to a START-UP COMPANY (as defined here), this company should be counted as a SMALL COMPANY when responding to Question 6.c, as opposed to a START-UP COMPANY. START-UP COMPANIES, as used in this Survey, will continue to refer only to those companies that were dependent upon your institution's technology for initiation. (See Questions 6.c, 6.d, and 12.a-12.d.)

TOTAL RESEARCH EXPENDITURES: TOTAL RESEARCH EXPENDITURES include expenditures made by the institution in Year 2000 in support of its research activities that are funded by all sources including the federal government, local government, industry, foundations, and other nonprofit organizations. (See Question 5.)

TOTAL PATENT APPLICATIONS FILED: TOTAL AUSTRALIAN and U.S. PATENT APPLICATIONS FILED includes any filing made during the year 2000, including provisional applications, provisional applications that are converted to regular applications, new filings, and if applicable Australia or the U.S., CIPs, continuations, divisionals, reissues, and plant patents. Applications for certificates of plant variety protection may also be included. (See Question 11.)

U.S. and AUSTRALIAN PATENTS ISSUED: includes the number of Australian and U.S. patents issued or reissued to your institution in the year requested. Plant breeder's rights may also be included.

APPENDIX 4—TABLES

TABLE A1. COMMERCIALISATION AND OTHER FTEs FOR YEAR 2000 (Ranked by Year 2000 Commercialisation FTEs)

	Medical School	Program Year	Program Age (years)	FY 2000 Commercialisation FTEs	FY 2000 Other FTEs	FY 2000 FTEs Employed in a Commercialisation Office	FY 2000 FTEs Employed in a Commercialisation Company
University							
The University of New England	N	1999	1	30.0	5.0	35.0	0.0
The University of New South Wales	Y	1983	17	8.0	1.0	0.0	9.0
The University of Adelaide	Y	1986	14	5.0	2.0	0.0	7.0
The Flinders University of South Australia	Y	0	na	5.0	7.0	2.0	2.0
Monash University	Y	1999	1	5.0	4.0	0.0	6.0
The University of Queensland	Y	1979	21	5.0	2.0	0.0	7.0
The University of Sydney	Y	1987	13	4.5	2.0	6.5	0.0
The Australian National University	N	1994	6	4.3	3.0	0.0	7.3
Murdoch University	N	1959	41	4.0	3.0	5.5	1.5
Deakin University	N	0	na	2.5	4.0	0.0	0.0
Royal Melbourne Institute of Technology		2000	0	2.5	1.0	0.5	1.5
Queensland University of Technology	N	1999	1	2.0	10.0	4.0	0.0
University of South Australia	N	1971	29	2.0	1.0	0.0	5.0
Griffith University		1988	12	1.5	0.0	0.0	0.0
Swinburne University of Technology	N	1985	15	1.0	0.8	1.5	0.0
University of Technology Sydney	N	1982	18	1.0	3.0	0.0	4.0
The University of Western Australia	Y	0	na	1.0	0.0	1.0	0.0
University of Western Sydney	N	0	na	1.0	0.5	0.5	0.0
La Trobe University	N	0	na	0.7	1.3	0.0	0.0
Macquarie University	N	0	na	0.7	0.5	0.0	1.2
University of Wollongong	N	1997	3	0.7	0.2	0.0	0.0
James Cook University	Y	0	na	0.5	0.5	1.0	0.0
The University of Newcastle	Y	1996	4	0.5	0.5	0.0	1.0
University of Tasmania	N	1986	14	0.5	0.0	0.0	0.0
Central Queensland University	N	1970	30	0.3	0.0	0.0	0.0
Victoria University of Technology	N	0	na	0.2	0.6	0.0	0.0
Australian Catholic University	N	1990	10	0.0	0.0	0.0	0.0
University of Ballarat	N	2000	0	0.0	0.0	0.0	0.0
Charles Sturt University	N	1996	4	0.0	0.0	0.0	0.0
Edith Cowan University	N	2001	-	0.0	0.3	0.0	0.0
The University of Melbourne	Y	2000	na	0.0	0.0	0.0	5.0
Northern Territory University	N	1986	14	0.0	0.0	0.0	0.0
The University of Notre Dame Australia	N	1986	14	0.0	0.0	0.0	0.0
Southern Cross University	N	0	na	0.0	0.0	0.0	0.0
TOTAL UNIVERSITIES:				**89.3**	**53.1**	**57.5**	**57.5**
Medical Research Institute							
Institute of Respiratory Medicine	N	0	na	2.0	1.85	0.0	0.0
Howard Florey Institute	N	1998	2	1.0	0.0	1.0	0.0
TVW Telethon Institute for Child Health Research	N	1998	2	1.0	0.0	1.0	0.0
Prince Henry's Institute of Medical Research	N	1999	1	0.6	0.0	0.6	0.0
Centenary Institute of Cancer Medicine and Cell Biology	N	2001	-	0.5	0.0	0.0	0.0
Peter MacCallum Cancer Institute	N	0	na	0.5	0.0	0.0	0.0
Murdoch Childrens Research Institute	N	2000	0	0.3	0.2	0.0	0.0
Queensland Institute of Medical Research	N	2001	-	0.25	0.0	0.0	0.0
Victor Chang Cardiac Research Institute	N	2001	na	0.25	0.0	0.0	0.0
Child Health Research Institute	N	2000	0	0.2	0.0	0.0	0.0
Royal North Shore Hospital	Y	2000	0	0.2	0.0	0.0	0.0
Macfarlane Burnet Institute for Medical Research and Public Health	N	0	na	0.1	0.0	0.0	0.0
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	N	0	na	0.0	0.0	0.0	0.0
Menzies School of Health Research	N	1999	1	0.0	0.0	0.0	0.0
The Walter and Eliza Hall Institute of Medical Research	N	0	na	0.0	0.0	0.0	0.0
TOTAL MEDICAL RESEARCH INSTITUTES				**6.9**	**2.1**	**2.6**	**0.0**
CSIRO	N	1980	20	96.6	39.0	0.00	0.00
TOTAL ALL RESPONDENTS				**192.8**	**94.2**	**60.1**	**57.5**

TABLE A2. RESEARCH EXPENDITURES FOR YEAR 2000 (Ranked by FY 2000 Total Research Expenditures)

		National Competitive Research Grants				Other Australian Sources			
	FY 2000 Total Research Expenditures	Commonwealth Schemes	Non Commonwealth Schemes	State and Local Government	Other Commonwealth Government	Business Enterprises	General University Funds (GUF)	Other	Overseas
University									
The University of Melbourne	$290,733,620	$54,849,000	$2,488,000	$11,037,000	$11,568,000	$13,912,000	$180,667,620	$7,372,000	$8,840,000
The Australian National University	$284,391,380	$17,471,020	$102,990	$870,000	$21,340,980	$4,021,980	$230,649,430	$1,618,000	$8,316,980
The University of Queensland	$268,030,300	$50,317,870	$1,340,450	$14,343,710	$10,131,310	$16,035,110	$159,350,970	$9,598,920	$6,911,960
The University of Sydney	$255,155,370	$47,231,440	$1,337,480	$1,303,750	$3,634,370	$4,041,130	$177,467,480	$9,136,130	$11,003,590
The University of New South Wales	$203,002,060	$51,540,040	$806,860	$2,557,380	$6,673,970	$14,111,590	$109,912,770	$8,764,750	$8,634,700
The University of Western Australia	$168,332,510	$34,085,580	$605,080	$8,406,090	$2,986,560	$6,528,410	$109,485,610	$4,159,240	$2,075,940
Monash University	$124,259,290	$33,555,160	$2,703,790	$5,033,120	$12,462,610	$12,119,330	$52,886,520	$3,888,460	$1,610,300
The University of Adelaide	$119,770,000	$35,740,000	$491,000	$5,470,000	$13,861,000	$7,562,000	$53,543,000	$1,420,000	$1,683,000
The University of Newcastle	$75,239,270	$10,889,920	$60,480	$1,597,830	$10,011,550	$2,813,600	$46,436,360	$2,980,070	$449,460
Griffith University	$75,140,700	$5,827,070	$215,000	$905,420	$3,364,540	$8,820,090	$54,720,910	$1,281,500	$6,170
La Trobe University	$74,229,070	$23,711,970	$0	$276,990	$10,202,870	$0	$33,475,560	$6,561,680	$0
University of Tasmania	$72,846,640	$10,867,270	$92,800	$7,370,100	$12,062,540	$2,807,210	$38,588,950	$492,020	$565,750
University of Wollongong	$62,983,210	$11,936,910	$57,500	$1,232,850	$1,264,990	$4,301,840	$43,227,330	$102,990	$858,800
Queensland University of Technology	$58,824,160	$9,230,460	$80,170	$3,127,120	$1,734,310	$1,398,650	$37,929,720	$4,448,940	$874,790
The Flinders University of South Australia	$57,798,770	$12,104,710	$141,150	$2,198,580	$3,023,480	$1,138,960	$36,718,800	$1,660,180	$812,910
Macquarie University	$53,698,770	$10,378,430	$68,950	$471,080	$1,713,730	$2,646,920	$36,527,880	$799,860	$1,091,920
University of Technology, Sydney	$53,526,760	$4,795,640	$146,730	$1,414,880	$2,864,560	$1,884,890	$41,648,400	$398,440	$373,220
University of South Australia	$45,586,370	$4,599,790	$50,230	$1,882,650	$4,597,490	$4,532,180	$27,556,750	$231,010	$2,136,270
The University of New England	$41,709,100	$5,039,330	$466,930	$906,310	$2,692,420	$1,098,710	$29,232,460	$1,869,480	$403,460
Royal Melbourne Institute of Technology	$41,287,840	$3,560,340	$417,280	$2,413,210	$5,595,450	$4,368,280	$24,028,600	$109,350	$795,330
Deakin University	$39,268,800	$3,683,000	$147,000	$1,402,000	$609,000	$3,585,000	$29,009,800	$386,000	$447,000
Swinburne University of Technology	$37,264,010	$1,880,000	$0	$260,000	$373,000	$1,507,000	$30,686,010	$2,481,000	$77,000
James Cook University	$33,228,300	$7,646,690	$56,320	$777,630	$4,330,210	$712,780	$16,406,440	$2,890,930	$407,300
Murdoch University	$31,460,610	$7,532,320	$0	$1,946,380	$3,462,470	$4,721,850	$11,974,410	$893,580	$929,600
University of Western Sydney	$30,319,620	$4,006,430	$0	$1,305,310	$3,820,230	$1,111,400	$19,228,580	$568,740	$278,930
Northern Territory University	$18,333,320	$1,647,230	$0	$1,129,980	$1,982,430	$667,850	$12,689,840	$158,360	$57,630
Victoria University of Technology	$17,987,380	$1,264,280	$0	$358,690	$1,482,300	$63,700	$13,459,350	$1,326,230	$32,830
Edith Cowan University	$13,727,000	$785,030	$49,960	$840,740	$621,090	$386,400	$11,043,780	$0	$0
Central Queensland University	$13,681,120	$1,936,780	$0	$1,025,320	$72,000	$589,130	$10,023,230	$34,660	$0
Charles Sturt University	$13,160,590	$3,089,750	$0	$2,606,700	$1,293,000	$399,300	$5,547,840	$0	$224,000
Southern Cross University	$13,080,750	$1,691,190	$0	$383,120	$1,068,380	$1,172,410	$8,619,150	$29,300	$117,200
Australian Catholic University	$9,032,970	$357,360	$0	$420,670	$9,570	$287,550	$7,949,990	$7,830	$0
University of Ballarat	$5,878,150	$420,200	$0	$452,180	$286,140	$745,910	$3,762,010	$211,710	$0
The University of Notre Dame Australia	$101,021	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
TOTAL UNIVERSITIES:	**$2,703,068,831**	**$473,672,210**	**$11,926,150**	**$85,726,790**	**$161,196,550**	**$130,093,160**	**$1,704,455,550**	**$75,881,360**	**$60,016,040**
Medical Research Institute									
The Walter and Eliza Hall Institute of Medical Research	$31,009,541	$12,756,971	$3,814,573	$2,530,004					
Queensland Institute of Medical Research	$23,078,701	$5,400,000	$4,855,000	$844,879					
Murdoch Childrens Research Institute	$17,321,518	$3,122,015	$960,325	$963,325					
Howard Florey Institute	$11,696,835	$5,049,848	$1,217,935	$1,656,206					
Macfarlane Burnet Institute for Medical Research and Public Health	$10,546,288	$4,412,728	$1,534,769	$401,899					
Peter MacCallum Cancer Institute	$9,771,000	$5,320,000	$2,683,000	$1,768,000					
TVW Telethon Institute for Child Health Research	$6,950,000	$3,600,000	$1,450,000	$790,000					
Prince Henry's Institute of Medical Research	$6,459,339	$2,046,684	$949,585	$303,363					
Victor Chang Cardiac Research Institute	$5,600,000	$2,300,000	$900,000	$70,000					
Centenary Institute of Cancer Medicine and Cell Biology	$5,500,000	$1,775,953	$1,400,000	$100,000					
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	$5,253,158	$533,951	$106,791	$2,901,185					
Menzies School of Health Research	$4,736,815	$1,833,147	$236,841	$0					
Royal North Shore Hospital	$3,445,000	$300,000	$650,000	$300,000					
Child Health Research Institute	$2,237,000	$242,000	$200,000	$692,500					
Institute of Respiratory Medicine	$2,010,582	$241,951	$416,600	$1,352,031					
TOTAL MEDICAL RESEARCH INSTITUTES	**$145,615,777**	**$48,935,248**	**$21,375,419**	**$14,673,392**					
CSIRO (refer to Table 4 in the main body of the report for distribution of expenditure)	$754,500	n/a	n/a	n/a					
TOTAL ALL RESPONDENTS	**$2,849,439,108**								

Note: Universities data sourced from the Department of Education, Science and Training (except for the University of Notre Dame Australia— data sourced from the National Survey of Research Commercialisation). Medical research institutes data sourced from the National Survey of Research Commercialisation. CSIRO data supplied by CSIRO.

TABLE A3. LICENSES\OPTIONS\ASSIGNMENTS (LOAs) EXECUTED: EXCLUSIVE AND NON-EXCLUSIVE FOR YEAR 2000 (Ranked by FY 2000 LOAs Executed)

	FY 2000 LOAs Executed	FY 2000 LOAs Executed: Exclusive	FY 2000 LOAs Executed: Non-Exclusive
University			
The University of Queensland	63	7	56
The University of Sydney	31	9	22
The University of Melbourne	25	n/a	n/a
Griffith University	19	3	16
Monash University	16	16	0
The University of New South Wales	12	12	0
The University of New England	11	5	6
The University of Western Australia	9	5	4
University of Technology Sydney	9	9	0
The Australian National University	8	8	0
La Trobe University	5	5	0
Southern Cross University	4	4	0
The Flinders University of South Australia	3	2	1
Macquarie University	3	3	0
The University of Newcastle	3	3	0
University of Western Sydney	3	3	0
Queensland University of Technology	2	2	0
University of South Australia	2	2	0
University of Wollongong	2	2	0
The University of Adelaide	1	1	0
Deakin University	1	1	0
James Cook University	1	1	0
Royal Melbourne Institute of Technology	1	0	0
Australian Catholic University	0	0	0
Central Queensland University	0	0	0
Charles Sturt University	0	0	0
Edith Cowan University	0	0	0
Northern Territory University	0	0	0
Swinburne University of Technology	0	0	0
The University of Notre Dame Australia	0	0	0
University of Ballarat	0	0	0
University of Tasmania	0	0	0
Victoria University of Technology	0	0	0
Murdoch University	n/a	n/a	n/a
TOTAL UNIVERSITIES:	**234**	**103**	**105**
Medical Research Institute			
Child Health Research Institute	4	4	0
Howard Florey Institute	3	2	1
Murdoch Childrens Research Institute	2	2	0
Queensland Institute of Medical Research	2	2	0
Royal North Shore Hospital	2	2	0
Institute of Respiratory Medicine	1	1	0
Victor Chang Cardiac Research Institute	1	1	0
Centenary Institute of Cancer Medicine and Cell Biology	0	0	0
Macfarlane Burnet Institute for Medical Research and Public Health	0	0	0
Menzies School of Health Research	0	0	0
Peter MacCallum Cancer Institute	0	0	0
Prince Henry's Institute of Medical Research	0	0	0
TVW Telethon Institute for Child Health Research	0	0	0
The Walter and Eliza Hall Institute of Medical Research	0	0	0
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	n/a	n/a	n/a
TOTAL MEDICAL RESEARCH INSTITUTES	**15**	**14**	**1**
CSIRO	168	41	127
TOTAL ALL RESPONDENTS	**417**	**158**	**233**

TABLE A4 **LICENSES\OPTIONS\ASSIGNMENTS (LOAs) EXECUTED: TO START-UPS, SMALL COMPANIES, MEDIUM COMPANIES, AND LARGE COMPANIES FOR YEAR 2000 (Ranked by FY 2000 LOAs Executed)**

	FY 2000 LOAs Executed	FY 2000 LOAs Executed: To Start-Ups	FY 2000 LOAs Executed: To Small Companies	FY 2000 LOAs Executed: To Medium Companies	FY 2000 LOAs Executed: To Large Companies
University					
The University of Queensland	63	2	2	4	55
The University of Sydney	31	2	18	1	10
The University of Melbourne	25	n/a	n/a	n/a	n/a
Griffith University	19	2	4	7	6
Monash University	16	12	3	1	0
The University of New South Wales	12	2	3	0	7
The University of New England	11	0	9	0	2
The University of Western Australia	9	4	1	0	4
University of Technology Sydney	9	1	2	0	6
The Australian National University	8	4	0	3	1
La Trobe University	5	2	3	0	0
Southern Cross University	4	n/a	n/a	n/a	n/a
The Flinders University of South Australia	3	0	1	1	1
Macquarie University	3	1	0	1	1
The University of Newcastle	3	2	0	1	0
University of Western Sydney	3	1	1	0	1
Queensland University of Technology	2	0	0	0	2
University of South Australia	2	0	0	0	2
University of Wollongong	2	0	0	2	0
The University of Adelaide	1	0	1	0	0
Deakin University	1	0	0	1	0
James Cook University	1	0	0	0	1
Royal Melbourne Institute of Technology	1	0	0	0	0
Australian Catholic University	0	0	0	0	0
Central Queensland University	0	0	0	0	0
Charles Sturt University	0	0	0	0	0
Edith Cowan University	0	0	0	0	0
Northern Territory University	0	0	0	0	0
Swinburne University of Technology	0	0	0	0	0
The University of Notre Dame Australia	0	0	0	0	0
University of Ballarat	0	0	0	0	0
University of Tasmania	0	0	0	0	0
Victoria University of Technology	0	0	0	0	0
Murdoch University	n/a	n/a	n/a	n/a	n/a
TOTAL UNIVERSITIES:	**234**	**35**	**48**	**22**	**99**
Name of Medical Research Institute					
Child Health Research Institute	4	0	0	2	2
Howard Florey Institute	3	0	0	2	1
Murdoch Childrens Research Institute	2	2	0	0	0
Queensland Institute of Medical Research	2	1	1	0	0
Royal North Shore Hospital	2	2	0	0	0
Institute of Respiratory Medicine	1	1	0	0	0
Victor Chang Cardiac Research Institute	1	0	0	1	0
Centenary Institute of Cancer Medicine and Cell Biology	0	0	0	0	0
Macfarlane Burnet Institute for Medical Research and Public Health	0	0	0	0	0
Menzies School of Health Research	0	0	0	0	0
Peter MacCallum Cancer Institute	0	0	0	0	0
Prince Henry's Institute of Medical Research	0	0	0	0	0
TVW Telethon Institute for Child Health Research	0	0	0	0	0
The Walter and Eliza Hall Institute of Medical Research	0	0	0	0	0
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	n/a	n/a	n/a	n/a	n/a
TOTAL MEDICAL RESEARCH INSTITUTES	**15**	**6**	**1**	**5**	**3**
CSIRO	168	18	14	14	71
TOTAL ALL RESPONDENTS	**417**	**59**	**63**	**41**	**173**

TABLE A5. LICENSES\OPTIONS\ASSIGNMENTS (LOAs) EXECUTED: EXCLUSIVE AND NON-EXCLUSIVE TO START-UP, SMALL, MEDIUM, AND LARGE COMPANIES FOR YEAR 2000 (Ranked by FY 2000 LOAs Executed)

	FY 2000 LOAs Executed	FY 2000 LOAs Executed: Start-Ups	FY 2000 LOAs Executed Start-Ups: Exclusive	FY 2000 LOAs Executed Start-Ups: Non-Exclusive	FY 2000 LOAs Executed Small Companies	FY 2000 LOAs Executed Small Companies: Exclusive	FY 2000 LOAs Executed Small Companies: Non-Exclusive	FY 2000 LOAs Executed Medium Companies	FY 2000 LOAs Executed Medium Companies: Exclusive	FY 2000 LOAs Executed Medium Companies: Non-Exclusive	FY 2000 LOAs Executed Large Companies	FY 2000 LOAs Executed Large Companies: Exclusive	FY 2000 LOAs Executed Large Companies: Non-Exclusive
University													
The University of Queensland	63	2	2	0	2	1	1	4	1	3	55	3	52
The University of Sydney	31	2	2	0	18	3	15	1	0	1	10	4	6
The University of Melbourne	25	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Griffith University	19	2	2	0	4	0	4	7	0	7	6	1	5
Monash University	16	12	12	0	3	3	0	1	1	0	0	0	0
The University of New South Wales	12	2	2	0	3	3	0	0	0	0	7	7	0
The University of New England	11	0	0	0	9	3	6	0	0	0	2	2	0
The University of Western Australia	9	4	4	0	1	1	0	0	0	0	4	0	4
University of Technology Sydney	9	1	1	0	2	2	0	0	0	0	6	6	0
The Australian National University	8	4	4	0	0	0	0	3	3	0	1	1	0
La Trobe University	5	2	2	0	3	3	0	0	0	0	0	0	0
Southern Cross University	4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
The Flinders University of South Australia	3	0	0	0	1	0	0	1	0	1	1	1	0
Macquarie University	3	1	1	0	0	0	0	1	1	0	1	1	0
The University of Newcastle	3	2	2	0	0	0	0	1	1	0	0	0	0
University of Western Sydney	3	1	1	0	1	1	0	0	0	0	1	1	0
Queensland University of Technology	2	0	0	0	0	0	0	0	0	0	2	2	0
University of South Australia	2	0	0	0	0	0	0	0	0	0	2	2	0
University of Wollongong	2	0	0	0	0	0	0	2	2	0	0	0	0
The University of Adelaide	1	0	0	0	1	1	0	0	0	0	0	0	0
Deakin University	1	0	0	0	0	0	0	1	1	0	0	0	0
James Cook University	1	0	0	0	0	0	0	0	0	0	1	1	0
Royal Melbourne Institute of Technology	1	0	0	0	0	0	0	0	0	0	0	0	0
Australian Catholic University	0	0	0	0	0	0	0	0	0	0	0	0	0
Central Queensland University	0	0	0	0	0	0	0	0	0	0	0	0	0
Charles Sturt University	0	0	0	0	0	0	0	0	0	0	0	0	0
Edith Cowan University	0	0	0	0	0	0	0	0	0	0	0	0	0
Northern Territory University	0	0	0	0	0	0	0	0	0	0	0	0	0
Swinburne University of Technology	0	0	0	0	0	0	0	0	0	0	0	0	0
The University of Notre Dame Australia	0	0	0	0	0	0	0	0	0	0	0	0	0
University of Ballarat	0	0	0	0	0	0	0	0	0	0	0	0	0
University of Tasmania	0	0	0	0	0	0	0	0	0	0	0	0	0
Victoria University of Technology	0	0	0	0	0	0	0	0	0	0	0	0	0
Murdoch University	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
TOTAL UNIVERSITIES:	**234**	**35**	**35**	**0**	**48**	**21**	**26**	**22**	**10**	**12**	**99**	**32**	**67**
Name of Medical Research Institute													
Child Health Research Institute	4	0	0	0	0	0	0	2	2	0	2	2	0
Howard Florey Institute	3	0	0	0	0	0	0	2	1	1	1	1	0
Murdoch Childrens Research Institute	2	2	2	0	0	0	0	0	0	0	0	0	0
Queensland Institute of Medical Research	2	1	1	0	1	1	0	0	0	0	0	0	0
Royal North Shore Hospital	2	2	2	0	0	0	0	0	0	0	0	0	0
Institute of Respiratory Medicine	1	1	1	0	0	0	0	0	0	0	0	0	0
Victor Chang Cardiac Research Institute	1	0	0	0	0	0	0	1	1	0	0	0	0
Centenary Institute of Cancer Medicine and Cell Biology	0	0	0	0	0	0	0	0	0	0	0	0	0
Macfarlane Burnet Institute for Medical Research and Public Health	0	0	0	0	0	0	0	0	0	0	0	0	0
Menzies School of Health Research	0	0	0	0	0	0	0	0	0	0	0	0	0
Peter MacCallum Cancer Institute	0	0	0	0	0	0	0	0	0	0	0	0	0
Prince Henry's Institute of Medical Research	0	0	0	0	0	0	0	0	0	0	0	0	0
TVW Telethon Institute for Child Health Research	0	0	0	0	0	0	0	0	0	0	0	0	0
The Walter and Eliza Hall Institute of Medical Research	0	0	0	0	0	0	0	0	0	0	0	0	0
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
TOTAL MEDICAL RESEARCH INSTITUTES	**15**	**6**	**6**	**0**	**1**	**1**	**0**	**5**	**4**	**1**	**3**	**3**	**0**
CSIRO	168	18	10	8	14	8	6	14	8	6	71	15	56
TOTAL ALL RESPONDENTS	**417**	**59**	**51**	**8**	**63**	**30**	**32**	**41**	**22**	**19**	**173**	**50**	**123**

TABLE A6. TOTAL ACTIVE LICENSES\OPTIONS\ASSIGNMENTS (LOAs) CUMULATIVE TO YEAR 2000 (Ranked by Total Active LOAs, Cumulative To 2000)

	LOAs Executed (Cumulative to Year 2000)	LOAs Executed with Equity (Cumulative to Year 2000)	LOAs Active Year (Cumulative to Year 2000)	LOAs Counting from Year 19__	LOAs Executed (Year 2000 only)	LOAs Executed with Equity (Year 2000 only)	LOAs Active Year (Year 2000 only)
University							
The University of Sydney	163	6	65	1986	31	3	27
The University of Queensland	63	2	63	2000	63	2	63
The University of New South Wales	42	2	38	1979	12	2	11
The University of Western Australia	41	n/a	41	1998	9	3	8
Queensland University of Technology	39	0	10	1989	2	0	2
The University of Adelaide	26	12	9	1982	1	1	0
The Australian National University	26	7	39	1998	8	3	8
University of Technology Sydney	22	0	4	1996	9	0	6
University of South Australia	20	1	12	n/a	2	0	2
Royal Melbourne Institute of Technology	17	0	11	1997	1	0	1
Monash University	15	2	15	1986	16	11	31
La Trobe University	13	2	2	1994	5	0	0
Victoria University of Technology	13	0	4	1993	0	0	0
Griffith University	11	0	0	1998	19	2	19
Macquarie University	10	0	9	1996	3	0	3
Southern Cross University	10	8	8	1998	4	1	4
The University of Newcastle	9	3	7	1985	3	0	3
The Flinders University of South Australia	8	8	8	1987	3	3	3
University of Wollongong	8	1	3	1986	2	0	3
Swinburne University of Technology	3	0	3	1995	0	0	0
Northern Territory University	2	0	1	1996	0	0	0
Australian Catholic University	0	0	0	0	0	0	0
Central Queensland University	0	0	0	0	0	0	0
Charles Sturt University	0	0	0	0	0	0	0
Edith Cowan University	0	0	0	0	0	0	0
James Cook University	0	0	0	0	1	0	1
The University of Notre Dame Australia	0	0	0	1995	0	0	0
University of Ballarat	0	0	0	0	0	0	0
University of Tasmania	0	0	0	0	0	0	0
Deakin University	n/a	0	6	n/a	1	1	4
Murdoch University	n/a	n/a	n/a	n/a	n/a	n/a	n/a
The University of Melbourne	n/a	n/a	n/a	n/a	25	0	40
The University of New England	n/a	n/a	60	1970	11	0	0
University of Western Sydney	n/a	n/a	n/a	n/a	3	1	0
TOTAL UNIVERSITIES:	**561**	**54**	**418**		**234**	**33**	**239**
Name of Medical Research Institute							
Centenary Institute of Cancer Medicine and Cell Biology	0	0	2	1992	0	0	0
Child Health Research Institute	10	4	6	1990	4	2	4
Howard Florey Institute	3	0	3	1997	3	0	3
Institute of Respiratory Medicine	0	0	0	1985	1	1	1
Macfarlane Burnet Institute for Medical Research and Public Health	4	0	4	1997	0	0	0
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Menzies School of Health Research	0	0	0	0	0	0	0
Murdoch Childrens Research Institute	5	4	5	1993	2	2	2
Peter MacCallum Cancer Institute	1	0	1	1999	0	0	0
Prince Henry's Institute of Medical Research	1	0	1	1984	0	0	0
Queensland Institute of Medical Research	7	7	3	1993	2	2	1
Royal North Shore Hospital	4	0	4	1998	2	0	2
TVW Telethon Institute for Child Health Research	7	0	3	1998	0	0	0
Victor Chang Cardiac Research Institute	0	0	1	n/a	1	0	1
The Walter and Eliza Hall Institute of Medical Research	n/a	n/a	n/a	1996	0	0	0
TOTAL MEDICAL RESEARCH INSTITUTES	**42**	**15**	**33**		**15**	**7**	**14**
CSIRO	392	n/a	318	1997	168	n/a	394
TOTAL ALL RESPONDENTS	**995**	**69**	**769**		**417**	**40**	**647**

TABLE A7 NEW RESEARCH FUNDING RELATED TO YEAR 2000 LICENSES\OPTIONS\ASSIGNMENTS (LOAs) (Ranked by FY 2000 New Research Funding)

	FY 2000 New Research Funding Related to LOAs
University	
Monash University	$18,000,000
The University of Queensland	$8,416,420
The University of New South Wales	$7,382,433
The Australian National University	$7,291,692
University of Technology Sydney	$6,483,303
The University of Sydney	$4,395,401
University of Wollongong	$3,200,000
Royal Melbourne Institute of Technology	$2,234,337
The University of Western Australia	$1,660,000
Southern Cross University	$1,000,000
The University of Melbourne	$965,000
The Flinders University of South Australia	$887,367
The University of Newcastle	$838,000
Swinburne University of Technology	$800,000
La Trobe University	$470,299
James Cook University	$274,006
Macquarie University	$77,000
Northern Territory University	$20,000
University of South Australia	$5,000
Australian Catholic University	$0
Central Queensland University	$0
Charles Sturt University	$0
Deakin University	$0
Edith Cowan University	$0
Griffith University	$0
Queensland University of Technology	$0
The University of New England	$0
The University of Notre Dame Australia	$0
University of Ballarat	$0
University of Tasmania	$0
University of Western Sydney	$0
Victoria University of Technology	$0
The University of Adelaide	n/a
Murdoch University	n/a
TOTAL UNIVERSITIES:	**$64,400,258**
Name of Medical Research Institute	
Howard Florey Institute	$1,656,206
TVW Telethon Institute for Child Health Research	$790,000
Child Health Research Institute	$692,000
Queensland Institute of Medical Research	$618,245
Royal North Shore Hospital	$580,000
Macfarlane Burnet Institute for Medical Research and Public Health	$432,425
Murdoch Childrens Research Institute	$383,194
Victor Chang Cardiac Research Institute	$232,000
Institute of Respiratory Medicine	$78,000
Centenary Institute of Cancer Medicine and Cell Biology	$0
Menzies School of Health Research	$0
Peter MacCallum Cancer Institute	$0
Prince Henry's Institute of Medical Research	$0
The Walter and Eliza Hall Institute of Medical Research	$0
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	n/a
TOTAL MEDICAL RESEARCH INSTITUTES	**$5,462,070**
TOTAL ALL RESPONDENTS	**$69,862,328**

TABLE A8 LICENSE INCOME INFORMATION FOR YEAR 2000 (Ranked by FY 2000 LOA Income Received)

	FY 2000 Gross LOA Income Received	FY 2000 LOA Income Paid to Other Institutions	FY 2000 Adjusted LOA Income Received	FY 2000 Total Number of LOAs Yielding Income
University				
The University of Melbourne	$52,000,000	$0	$52,000,000	40
The University of Queensland	$6,675,190	$0	$6,675,190	7
The University of New England	$6,075,407	$251,667	$5,823,740	62
The University of New South Wales	$4,446,000	$0	$4,446,000	12
The Flinders University of South Australia	$4,223,328	$0	$4,223,328	4
The University of Sydney	$1,823,253	$201,913	$1,621,340	32
University of Wollongong	$1,810,000	$0	$1,810,000	2
Queensland University of Technology	$1,283,597	$0	$1,283,597	6
University of Technology Sydney	$1,256,961	$0	$1,256,961	6
Macquarie University	$1,065,300	$0	$1,065,300	8
Swinburne University of Technology	$850,000	$0	$850,000	2
The Australian National University	$655,940	$29,615	$626,325	8
The University of Adelaide	$480,000	$0	$480,000	17
Monash University	$320,000	$0	$320,000	3
University of Western Sydney	$206,313	$0	$206,313	3
Griffith University	$185,409	$0	$185,409	17
Royal Melbourne Institute of Technology	$175,000	$0	$175,000	3
University of South Australia	$136,745	$23,530	$113,215	6
The University of Newcastle	$74,000	$30,000	$44,000	4
The University of Western Australia	$62,173	$0	$62,173	4
La Trobe University	$44,000	$0	$44,000	1
James Cook University	$24,200	$0	$24,200	4
University of Tasmania	$5,000	$0	$5,000	1
Australian Catholic University	$0	$0	$0	0
University of Ballarat	$0	$0	$0	0
Central Queensland University	$0	$0	$0	0
Charles Sturt University	$0	$0	$0	0
Deakin University	$0	$0	$0	0
Edith Cowan University	$0	$0	$0	0
Northern Territory University	$0	$0	$0	0
The University of Notre Dame Australia	$0	$0	$0	0
Southern Cross University	$0	$0	$0	0
Victoria University of Technology	$0	$0	$0	0
Murdoch University	n/a	n/a	n/a	n/a
TOTAL UNIVERSITIES:	**$83,877,816**	**$536,725**	**$83,341,091**	**252**
Medical Research Institute				
Child Health Research Institute	$2,400,000	$0	$2,400,000	2
The Walter and Eliza Hall Institute of Medical Research	$2,284,341	$1,371,325	$913,015	4
Howard Florey Institute	$1,656,206	$0	$1,656,206	3
TVW Telethon Institute for Child Health Research	$790,000	$0	$790,000	3
Queensland Institute of Medical Research	$618,245	$74,924	$543,321	2
Victor Chang Cardiac Research Institute	$232,000	$0	$232,000	1
Royal North Shore Hospital	$80,000	$0	$80,000	2
Murdoch Childrens Research Institute	$8,757	$0	$8,757	1
Centenary Institute of Cancer Medicine and Cell Biology	$1,200	$0	$1,200	1
Institute of Respiratory Medicine	$0	$0	$0	0
Macfarlane Burnet Institute for Medical Research and Public Health	$0	$0	$0	0
Menzies School of Health Research	$0	$0	$0	0
Peter MacCallum Cancer Institute	$0	$0	$0	0
Prince Henry's Institute of Medical Research	$0	$0	$0	0
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	n/a	n/a	n/a	n/a
TOTAL MEDICAL RESEARCH INSTITUTES	**$8,070,749**	**$1,446,249**	**$6,624,499**	**19**
CSIRO	$11,620,000	$2,180,000	$9,440,000	220
TOTAL ALL RESPONDENTS	**$103,568,565**	**$4,162,974**	**$99,405,590**	**491**

TABLE A9. LICENSE INCOME RECEIVED: RUNNING ROYALTIES, CASHED-IN EQUITY, AND ALL OTHER TYPES FOR YEAR 2000 (Ranked by FY 2000 License Income Received)

	FY 2000 Gross LOA Income Received	FY 2000 Gross LOA Income Received: Running Royalties	FY 2000 Gross LOA Income Received: Cashed-In Equity	FY 2000 Gross LOA Income Received: All Other Types	FY 2000 Number of Licenses Yielding Running Royalties
University					
The University of Melbourne	$52,000,000	$2,000,000	$50,000,000	$0	25
The University of Queensland	$6,675,190	$1,857,190	$0	$4,818,000	3
The University of New England	$6,075,407	$175,407	$0	$5,900,000	62
The University of New South Wales	$4,446,000	$528,000	$2,322,000	$1,546,000	12
The Flinders University of South Australia	$4,223,328	$309,460	$0	$123,868	4
The University of Sydney	$1,823,253	$1,205,630	$0	$617,623	21
University of Wollongong	$1,810,000	$10,000	$0	$1,800,000	1
Queensland University of Technology	$1,283,597	$62,097	$0	$1,221,500	4
University of Technology Sydney	$1,256,961	$95,851	$19,758	$1,141,352	1
Macquarie University	$1,065,300	$1,055,300	$0	$10,000	8
Swinburne University of Technology	$850,000	$150,000	$0	$700,000	1
The Australian National University	$655,940	$287,017	$0	$368,923	3
The University of Adelaide	$480,000	$308,000	$0	$172,000	16
Monash University	$320,000	$320,000	$0	$0	3
University of Western Sydney	$206,313	$4,064	$0	$0	1
Griffith University	$185,409	$0	$0	$185,409	0
Royal Melbourne Institute of Technology	$175,000	$0	$0	$175,000	0
University of South Australia	$136,745	$129,745	$0	$5,000	6
The University of Newcastle	$74,000	$74,000	$0	$0	4
The University of Western Australia	$62,173	$62,173	$0	$0	4
La Trobe University	$44,000	$44,000	$0	$0	1
James Cook University	$24,200	$24,200	$0	$0	4
University of Tasmania	$5,000	$0	$0	$5,000	0
Australian Catholic University	$0	$0	$0	$0	0
University of Ballarat	$0	$0	$0	$0	0
Central Queensland University	$0	$0	$0	$0	0
Charles Sturt University	$0	$0	$0	$0	0
Deakin University	$0	$0	$0	$0	0
Edith Cowan University	$0	$0	$0	$0	0
Northern Territory University	$0	$0	$0	$0	0
The University of Notre Dame Australia	$0	$0	$0	$0	0
Southern Cross University	$0	$0	$0	$0	0
Victoria University of Technology	$0	$0	$0	$0	0
Murdoch University	n/a	n/a	n/a	n/a	n/a
TOTAL UNIVERSITIES:	**$83,877,816**	**$8,702,134**	**$52,341,758**	**$18,789,675**	**184**
Medical Research Institute					
Child Health Research Institute	$2,400,000	$200,000	$2,200,000	$0	0
The Walter and Eliza Hall Institute of Medical Research	$2,284,341	$2,284,341	$0	$0	5
Howard Florey Institute	$1,656,206	$1,200,000	$0	$456,206	1
TVW Telethon Institute for Child Health Research	$790,000	$0	$0	$790,000	0
Queensland Institute of Medical Research	$618,245	$230,476	$0	$387,769	2
Victor Chang Cardiac Research Institute	$232,000	$77,500	$0	$155,000	0
Royal North Shore Hospital	$80,000	$0	$0	$80,000	2
Murdoch Childrens Research Institute	$8,757	$8,757	$0	$0	1
Centenary Institute of Cancer Medicine and Cell Biology	$1,200	$1,200	$0	$0	0
Institute of Respiratory Medicine	$0	$0	$0	$0	0
Macfarlane Burnet Institute for Medical Research and Public Health	$0	$0	$0	$0	0
Menzies School of Health Research	$0	$0	$0	$0	0
Peter MacCallum Cancer Institute	$0	$0	$0	$0	0
Prince Henry's Institute of Medical Research	$0	$0	$0	$0	0
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	n/a	n/a	n/a	n/a	n/a
TOTAL MEDICAL RESEARCH INSTITUTES	**$8,070,749**	**$4,002,274**	**$2,200,000**	**$1,868,975**	**11**
CSIRO	$11,620,000	$5,455,000	$600,000	$5,565,000	170
TOTAL ALL RESPONDENTS	**$103,568,565**	**$18,159,408**	**$55,141,758**	**$26,223,650**	**365**

TABLE A10. LEGAL FEES EXPENDED AND REIMBURSED FOR YEAR 2000 (Ranked by FY 2000 Legal Fees Expended)

	FY 2000 Legal Fees Expended	FY 2000 Legal Fees Reimbursed
University		
The University of Queensland	$1,434,328	$537,106
The Australian National University	$728,361	$294,681
The University of Sydney	$615,622	$365,876
The University of Melbourne	$600,000	$350,000
The University of New South Wales	$559,000	$347,000
Monash University	$302,000	$5,000
Macquarie University	$248,210	$90,775
The University of Newcastle	$243,000	$14,000
The Flinders University of South Australia	$180,479	$126,003
The University of Adelaide	$170,000	$54,000
Southern Cross University	$150,000	$50,000
University of Technology Sydney	$125,000	$0
Swinburne University of Technology	$92,000	$15,000
Griffith University	$83,076	$0
The University of Western Australia	$71,000	$62,173
Queensland University of Technology	$54,580	$0
University of Wollongong	$53,000	$31,000
University of South Australia	$31,311	$23,490
Royal Melbourne Institute of Technology	$24,435	$0
La Trobe University	$19,919	$775
Murdoch University	$19,500	$0
James Cook University	$19,300	$0
The University of New England	$11,928	$0
University of Tasmania	$3,181	$0
Deakin University	$2,000	$0
Edith Cowan University	$1,650	$0
Victoria University of Technology	$1,645	$0
Australian Catholic University	$0	$0
University of Ballarat	$0	$0
Central Queensland University	$0	$0
Charles Sturt University	$0	$0
Northern Territory University	$0	$0
The University of Notre Dame Australia	$0	$0
University of Western Sydney	n/a	n/a
TOTAL UNIVERSITIES:	**$5,844,525**	**$2,366,879**
Medical Research Institute		
Queensland Institute of Medical Research	$241,930	$177,500
The Walter and Eliza Hall Institute of Medical Research	$134,641	$0
Howard Florey Institute	$88,213	$80,534
Royal North Shore Hospital	$45,000	$0
Murdoch Childrens Research Institute	$38,685	$0
Prince Henry's Institute of Medical Research	$29,000	$0
TVW Telethon Institute for Child Health Research	$25,000	$0
Peter MacCallum Cancer Institute	$23,690	$12,520
Macfarlane Burnet Institute for Medical Research and Public Health	$19,892	$0
Victor Chang Cardiac Research Institute	$6,000	$0
Centenary Institute of Cancer Medicine and Cell Biology	$1,875	$0
Institute of Respiratory Medicine	$1,200	$0
Child Health Research Institute	$1,200	$0
Menzies School of Health Research	$0	$0
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	n/a	n/a
TOTAL MEDICAL RESEARCH INSTITUTES	**$656,326**	**$270,554**
CSIRO	$4,719,731	$738,864
TOTAL ALL RESPONDENTS	**$11,220,582**	**$3,376,297**

TABLE A11. INVENTION DISCLOSURES RECEIVED FOR YEAR 2000 (Ranked by FY 2000 Invention Disclosures Received)

	FY 2000 Invention Disclosures Received
University	
The University of Queensland	123
The University of Sydney	52
The University of New South Wales	46
Monash University	40
The Australian National University	25
The University of Adelaide	23
University of Wollongong	21
Swinburne University of Technology	20
The University of Western Australia	20
The University of Newcastle	14
University of South Australia	12
The Flinders University of South Australia	8
Queensland University of Technology	7
Macquarie University	6
University of Technology Sydney	5
University of Western Sydney	5
Griffith University	4
James Cook University	4
Northern Territory University	4
La Trobe University	3
University of Tasmania	2
The University of New England	1
Australian Catholic University	0
University of Ballarat	0
Central Queensland University	0
Charles Sturt University	0
Deakin University	0
Edith Cowan University	0
The University of Notre Dame Australia	0
Royal Melbourne Institute of Technology	0
Southern Cross University	0
The University of Melbourne	n/a
Murdoch University	n/a
Victoria University of Technology	n/a
TOTAL UNIVERSITIES:	**445**
Medical Research Institute	
Peter MacCallum Cancer Institute	16
Queensland Institute of Medical Research	10
Howard Florey Institute	6
TVW Telethon Institute for Child Health Research	5
Prince Henry's Institute of Medical Research	3
Macfarlane Burnet Institute for Medical Research and Public Health	1
Centenary Institute of Cancer Medicine and Cell Biology	0
Child Health Research Institute	0
Institute of Respiratory Medicine	0
Menzies School of Health Research	0
Murdoch Childrens Research Institute	0
Royal North Shore Hospital	0
Victor Chang Cardiac Research Institute	0
The Walter and Eliza Hall Institute of Medical Research	0
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	n/a
TOTAL MEDICAL RESEARCH INSTITUTES	**41**
CSIRO	62
TOTAL ALL RESPONDENTS	**548**

TABLE A12. PATENT APPLICATIONS FILED IN THE US AND AUSTRALIA FOR YEAR 2000 (Ranked by FY 2000 Total Patent Applications Filed)

	New and Continuing Australian and US Patent Applications Filed	New Australian Patent Applications Filed	New US Patent Applications Filed	PCT Applications Filed
University				
The Australian National University	115	12	23	12
The University of Sydney	102	36	6	26
The University of Queensland	72	28	7	15
The University of New South Wales	61	54	7	19
The University of Melbourne	47	28	19	0
Monash University	32	27	3	11
The University of Newcastle	17	10	0	7
The Flinders University of South Australia	16	6	5	1
Queensland University of Technology	16	12	2	2
Southern Cross University	15	15	3	0
University of South Australia	12	5	1	1
The University of Adelaide	11	11	4	4
The University of Western Australia	10	10	0	5
Swinburne University of Technology	9	4	3	2
Macquarie University	8	6	0	2
La Trobe University	7	5	0	2
James Cook University	5	4	0	1
Royal Melbourne Institute of Technology	5	5	0	1
University of Technology Sydney	5	5	0	2
University of Western Sydney	5	5	0	0
University of Wollongong	5	5	4	2
Victoria University of Technology	4	2	0	2
The University of New England	2	1	0	1
University of Tasmania	2	2	0	0
Deakin University	1	1	0	0
Edith Cowan University	1	1	0	0
Griffith University	1	1	0	2
Australian Catholic University	0	0	0	0
University of Ballarat	0	0	0	0
Central Queensland University	0	0	0	0
Charles Sturt University	0	0	0	0
Northern Territory University	0	0	0	0
The University of Notre Dame Australia	0	0	0	0
Murdoch University	n/a	n/a	n/a	n/a
TOTAL UNIVERSITIES:	**586**	**301**	**87**	**120**
Medical Research Institute				
The Walter and Eliza Hall Institute of Medical Research	24	13	4	7
Peter MacCallum Cancer Institute	13	12	1	0
TVW Telethon Institute for Child Health Research	9	5	1	2
Howard Florey Institute	6	3	3	2
Queensland Institute of Medical Research	6	5	1	0
Murdoch Childrens Research Institute	5	1	2	2
Child Health Research Institute	2	0	0	1
Victor Chang Cardiac Research Institute	2	0	0	2
Macfarlane Burnet Institute for Medical Research and Public Health	1	1	0	1
Prince Henry's Institute of Medical Research	1	1	1	1
Royal North Shore Hospital	1	1	1	1
Centenary Institute of Cancer Medicine and Cell Biology	0	0	0	0
Institute of Respiratory Medicine	0	0	0	0
Menzies School of Health Research	0	0	0	0
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	n/a	n/a	n/a	n/a
TOTAL MEDICAL RESEARCH INSTITUTES	**70**	**42**	**14**	**19**
CSIRO	178	126	1	62
TOTAL ALL RESPONDENTS	**834**	**469**	**102**	**201**

TABLE A13. TOTAL PATENTS ISSUED WORLDWIDE AND AUSTRALIAN AND US PATENTS ISSUED FOR YEAR 2000 (Ranked by FY 2000 Total Patents Issued Worldwide)

	Number of Patents Issued Worldwide	Number of Australian Patents Issued	Number of US Patents Issued
University			
The University of Queensland	50	6	15
The University of Melbourne	31	18	13
The University of Sydney	23	5	9
The Australian National University	22	5	6
The University of New South Wales	20	9	5
The University of Adelaide	13	3	2
Queensland University of Technology	11	0	2
Monash University	10	15	1
The Flinders University of South Australia	8	4	4
The University of Western Australia	6	2	1
University of Technology Sydney	5	3	2
University of Western Sydney	5	5	0
University of South Australia	4	2	0
Victoria University of Technology	4	2	0
La Trobe University	2	0	0
University of Wollongong	2	1	1
Griffith University	1	0	1
The University of Newcastle	1	0	1
Swinburne University of Technology	1	0	1
Australian Catholic University	0	0	0
University of Ballarat	0	0	0
Central Queensland University	0	0	0
Charles Sturt University	0	0	0
Deakin University	0	0	0
Edith Cowan University	0	0	0
James Cook University	0	0	0
Macquarie University	0	0	0
The University of New England	0	1	0
Northern Territory University	0	0	0
The University of Notre Dame Australia	0	0	0
Royal Melbourne Institute of Technology	0	0	0
Southern Cross University	0	15	3
University of Tasmania	0	0	0
Murdoch University	n/a	n/a	n/a
TOTAL UNIVERSITIES:	**219**	**96**	**67**
Medical Research Institute			
The Walter and Eliza Hall Institute of Medical Research	9	3	2
Centenary Institute of Cancer Medicine and Cell Biology	3	1	0
TVW Telethon Institute for Child Health Research	3	0	0
Howard Florey Institute	2	2	2
Macfarlane Burnet Institute for Medical Research and Public Health	2	0	2
Royal North Shore Hospital	2	0	0
Prince Henry's Institute of Medical Research	1	1	1
Child Health Research Institute	0	0	0
Institute of Respiratory Medicine	0	0	0
Menzies School of Health Research	0	0	0
Murdoch Childrens Research Institute	0	0	0
Peter MacCallum Cancer Institute	0	0	0
Queensland Institute of Medical Research	0	0	0
Victor Chang Cardiac Research Institute	0	0	0
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	n/a	n/a	n/a
TOTAL MEDICAL RESEARCH INSTITUTES	**22**	**7**	**7**
CSIRO	257	40	41
TOTAL ALL RESPONDENTS	**498**	**143**	**115**

TABLE A14. START-UP COMPANIES FORMED FOR YEAR 2000 (Ranked by FY 2000 Start-Up Companies Formed)

	FY 2000 Start-Up Companies Formed	FY 2000 of the Start-Up Companies Formed — Those Having Place of Business in Australia	FY 2000 of the Start-Up Companies Formed — Those Having Headquarters in Australia	Start-Up Companies that Became Non-Operational as of Year 2000 End	Start-Up Companies Operational as of Year 2000 End	Start-Up Companies Operational as of Year 2000 End with Institution Holding Equity
University						
The University of Sydney	6	5	5	0	20	14
The Australian National University	3	4	4	0	8	7
The University of Western Australia	4	4	4	0	4	2
Monash University	3	3	3	0	5	5
Griffith University	2	1	1	0	4	2
La Trobe University	2	2	2	1	2	0
Murdoch University	2	2	2	0	1	1
The University of Queensland	2	2	2	0	15	15
Southern Cross University	2	2	2	0	2	2
Deakin University	1	1	1	0	1	1
The Flinders University of South Australia	1	1	1	0	1	1
The University of New South Wales	1	1	1	0	8	8
The University of Newcastle	1	1	1	0	1	0
Royal Melbourne Institute of Technology	1	1	1	0	1	1
University of South Australia	1	1	0	0	3	3
University of Western Sydney	0	0	0	0	0	0
The University of Adelaide	0	0	0	0	0	0
Australian Catholic University	0	0	0	0	0	0
University of Ballarat	0	0	0	0	0	0
Central Queensland University	0	0	0	0	0	0
Charles Sturt University	0	0	0	0	0	0
Edith Cowan University	0	0	0	0	0	0
James Cook University	0	0	0	0	0	0
Macquarie University	0	0	0	0	0	0
The University of Melbourne	0	0	0	0	3	2
The University of New England	0	0	0	0	0	0
Northern Territory University	0	0	0	0	0	0
The University of Notre Dame Australia	0	0	0	0	0	0
Queensland University of Technology	0	0	0	0	3	1
Swinburne University of Technology	0	0	0	0	0	0
University of Tasmania	0	0	0	0	0	0
University of Technology Sydney	0	0	0	0	0	0
Victoria University of Technology	0	0	0	0	0	0
University of Wollongong	0	0	0	0	0	0
TOTAL UNIVERSITIES:	**32**	**31**	**30**	**1**	**82**	**65**
Name of Medical Research Institute						
Child Health Research Institute	1	1	1	0	1	1
Royal North Shore Hospital	1	1	1	0	2	0
Centenary Institute of Cancer Medicine and Cell Biology	0	0	0	0	0	0
Howard Florey Institute	0	0	0	0	0	0
Institute of Respiratory Medicine	0	0	0	0	1	1
Macfarlane Burnet Institute for Medical Research and Public Health	0	0	0	0	0	0
Menzies School of Health Research	0	0	0	0	0	0
Murdoch Childrens Research Institute	0	0	0	0	2	2
Peter MacCallum Cancer Institute	0	0	0	0	0	0
Prince Henry's Institute of Medical Research	0	0	0	0	0	0
Queensland Institute of Medical Research	0	0	0	0	0	0
TVW Telethon Institute for Child Health Research	0	0	0	0	0	0
Victor Chang Cardiac Research Institute	0	0	0	0	0	0
The Walter and Eliza Hall Institute of Medical Research	0	0	0	0	0	0
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	n/a	n/a	n/a	n/a	n/a	n/a
TOTAL MEDICAL RESEARCH INSTITUTES	**2**	**2**	**2**	**0**	**6**	**4**
CSIRO	13	11	11	0	n/a	n/a
TOTAL ALL RESPONDENTS	**47**	**44**	**43**	**1**	**88**	**69**

TABLE A15. LICENSES\OPTIONS\ASSIGNMENTS (LOAs) EXECUTED WITH EQUITY FOR YEAR 2000 (Ranked by FY 2000 LOAs Executed with Equity)

	LOAs Executed with Equity
University	
Monash University	11
The Australian National University	3
The Flinders University of South Australia	3
The University of Sydney	3
The University of Western Australia	3
Griffith University	2
The University of Queensland	2
The University of New South Wales	2
The University of Adelaide	1
Deakin University	1
Southern Cross University	1
University of Western Sydney	1
Australian Catholic University	0
Central Queensland University	0
Charles Sturt University	0
Edith Cowan University	0
James Cook University	0
La Trobe University	0
Macquarie University	0
Northern Territory University	0
Queensland University of Technology	0
Royal Melbourne Institute of Technology	0
Swinburne University of Technology	0
The University of Melbourne	0
The University of New England	0
The University of Newcastle	0
The University of Notre Dame Australia	0
University of Ballarat	0
University of South Australia	0
University of Tasmania	0
University of Technology Sydney	0
University of Wollongong	0
Victoria University of Technology	0
Murdoch University	n/a
TOTAL UNIVERSITIES:	**33**
Medical Research Institute	
Child Health Research Institute	2
Murdoch Childrens Research Institute	2
Queensland Institute of Medical Research	2
Institute of Respiratory Medicine	1
Centenary Institute of Cancer Medicine and Cell Biology	0
Howard Florey Institute	0
Macfarlane Burnet Institute for Medical Research and Public Health	0
Menzies School of Health Research	0
Peter MacCallum Cancer Institute	0
Prince Henry's Institute of Medical Research	0
Royal North Shore Hospital	0
TVW Telethon Institute for Child Health Research	0
Victor Chang Cardiac Research Institute	0
The Walter and Eliza Hall Institute of Medical Research	0
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	n/a
TOTAL MEDICAL RESEARCH INSTITUTES	**7**
CSIRO	3
TOTAL ALL RESPONDENTS	**43**

TABLE A16. REPORTING PERIOD FOR DATA ENTERED IN QUESTIONNAIRE (Ranked by Program Year)

	Calendar Year	Fiscal Year Start	Fiscal Year End
University			
The University of New South Wales	2000	no data	no data
The University of New England	2000		
Royal Melbourne Institute of Technology	2000		
The Australian National University	2000		
The University of Adelaide	2000		
The University of Queensland	2000		
The University of Newcastle	2000		
Monash University	2000		
Murdoch University	2000		
The University of Sydney	2000		
University of Wollongong	2000		
The Flinders University of South Australia	2000		
Griffith University	2000		
Queensland University of Technology	2000		
University of South Australia	2000		
Macquarie University	2000		
University of Technology Sydney	2000		
Deakin University	2000		
La Trobe University	2000		
Swinburne University of Technology	2000		
The University of Western Australia	2000		
James Cook University	2000		
University of Tasmania	2000		
University of Western Sydney	2000		
Victoria University of Technology	2000		
Australian Catholic University	2000		
University of Ballarat	2000		
Central Queensland University	2000		
Charles Sturt University	2000		
Edith Cowan University	2000		
The University of Melbourne	2000		
Northern Territory University	2000		
The University of Notre Dame Australia	2000		
Southern Cross University	2000		
Medical Research Institute			
Howard Florey Institute	2000	no data	no data
Institute of Respiratory Medicine	2000		
Centenary Institute of Cancer Medicine and Cell Biology	2000		
Queensland Institute of Medical Research		07/01/00	06/30/01
Peter MacCallum Cancer Institute		07/01/00	06/30/01
Prince Henry's Institute of Medical Research	2000	no data	no data
TVW Telethon Institute for Child Health Research	2000		
Murdoch Childrens Research Institute	2000		
Royal North Shore Hospital		07/01/00	06/30/01
The Walter and Eliza Hall Institute of Medical Research		07/01/99	06/30/00
Child Health Research Institute		07/01/00	06/30/01
Macfarlane Burnet Institute for Medical Research and Public Health	2000	no data	no data
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	2000		
Menzies School of Health Research		07/01/00	06/30/01
Victor Chang Cardiac Research Institute	2000	no data	no data
CSIRO		7/1/2000	6/30/2001

TABLE A17. VALUE OF ALL EQUITY HOLDINGS AT END YEAR 2000 (Ranked by Value of All Equity Holdings at Year End 2000)

	Value of All Equity Holdings at Year End 2000
University	
The University of Western Australia	$20,000,000
The University of Queensland	$11,330,000
The University of Sydney	$10,300,000
The University of Melbourne	$10,000,000
Swinburne University of Technology	$9,000,000
The Australian National University	$3,288,750
The Flinders University of South Australia	$3,039,156
University of South Australia	$2,540,111
The University of New South Wales	$975,000
Southern Cross University	$550,000
James Cook University	$409,000
La Trobe University	$136,000
Royal Melbourne Institute of Technology	$102,000
Griffith University	$96,212
The University of Newcastle	$8,000
The University of Adelaide	$0
Australian Catholic University	$0
University of Ballarat	$0
Central Queensland University	$0
Charles Sturt University	$0
Deakin University	$0
Edith Cowan University	$0
Macquarie University	$0
Monash University	$0
The University of New England	$0
The University of Notre Dame Australia	$0
Queensland University of Technology	$0
University of Tasmania	$0
University of Technology Sydney	$0
Victoria University of Technology	$0
University of Western Sydney	$0
University of Wollongong	$0
Murdoch University	n/a
Northern Territory University	n/a
TOTAL UNIVERSITIES:	**$71,774,229**
Medical Research Institute	
Child Health Research Institute	$12,000,000
Howard Florey Institute	$3,179,347
Institute of Respiratory Medicine	$1,500,000
Queensland Institute of Medical Research	$755,538
Murdoch Childrens Research Institute	$4
Victor Chang Cardiac Research Institute	$0
TVW Telethon Institute for Child Health Research	$0
The Walter and Eliza Hall Institute of Medical Research	$0
Royal North Shore Hospital	$0
Prince Henry's Institute of Medical Research	$0
Peter MacCallum Cancer Institute	$0
Menzies School of Health Research	$0
Macfarlane Burnet Institute for Medical Research and Public Health	$0
Centenary Institute of Cancer Medicine and Cell Biology	$0
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	n/a
TOTAL MEDICAL RESEARCH INSTITUTES	**$17,434,889**
CSIRO	$29,808,461
TOTAL ALL RESPONDENTS	**$119,017,579**

TABLE A18. NUMBER OF LICENSES\OPTIONS\ASSIGNMENTS (LOAs) BY DISCIPLINE (Ranked by FY 2000 LOAs Executed (Cumulative to Year 2000))

Name Of University	LOAs Executed (Cumulative to Year 2000)	LOAs Executed with Equity (Cumulative to Year 2000)	LOAs Active Year (Cumulative to Year 2000)	LOAs Executed — Biological Sciences and Biotechnology (Cumulative to Year 2000)	LOAs Executed with Equity — Biological Sciences and Biotechnology (Cumulative to Year 2000)	LOAs Active Year — Biological Sciences and Biotechnology (Cumulative to Year 2000)	LOAs Executed — Physical, Chemical. Earth Sciences Cumulative to Year 2000)	LOAs Executed with Equity — Physical, Chemical. Earth Sciences (Cumulative to Year 2000)	LOAs Active Year — Physical, Chemical. Earth Sciences (Cumulative to Year 2000)	LOAs Executed — Mathematics, Information and Communication Sciences (Cumulative to Year 2000)	LOAs Executed with Equity — Mathematics, Information and Communication Sciences (Cumulative to Year 2000)	LOAs Active Year — Mathematics, Information and Communication Sciences (Cumulative to Year 2000)	LOAs Executed — Social, Behavioural and Economic (Cumulative to Year 2000)	LOAs Executed with Equity — Social, Behavioural and Economic (Cumulative to Year 2000)	LOAs Active Year — Social, Behavioural and Economic (Cumulative to Year 2000)
The University of Sydney	163	6	65	0	0	0	0	0	0	0	0	0	0	0	0
The University of Queensland	63	2	63	0	0	0	0	0	0	0	0	0	0	0	0
The University of New South Wales	42	2	38	0	0	0	0	0	0	0	0	0	0	0	0
The University of Western Australia	41	N/A	41	0	N/A	0	0	N/A	0	0	N/A	0	0	N/A	0
Queensland University of Technology	39	0	10	0	0	0	0	0	0	0	0	0	0	0	0
The University of Adelaide	26	12	9	0	0	0	0	0	0	0	0	0	0	0	0
The Australian National University	26	7	39	1	0	0	0	0	0	0	0	0	0	0	0
University of Technology Sydney	22	0	4	0	0	0	0	0	0	0	0	0	0	0	0
University of South Australia	20	1	12	0	0	0	0	0	0	0	0	0	0	0	0
Royal Melbourne Institute of Technology	17	0	11	0	0	0	0	0	0	0	0	0	0	0	0
Monash University	15	2	15	1	1	0	0	0	0	0	0	0	0	0	0
La Trobe University	13	2	2	1	1	1	0	0	0	0	1	0	0	0	0
Victoria University of Technology	13	0	4	0	0	0	0	0	1	0	0	0	0	0	0
Griffith University	11	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Macquarie University	10	0	9	1	0	0	0	0	0	0	0	0	0	0	0
Southern Cross University	10	8	8	1	1	0	0	0	0	0	0	0	0	0	0
The University of Newcastle	9	3	7	0	0	0	0	0	0	0	0	0	0	0	0
The Flinders University of South Australia	8	8	8	1	0	0	0	0	0	0	0	0	0	0	0
University of Wollongong	8	1	3	2	0	0	3	0	2	1	0	1	0	0	0
Swinburne University of Technology	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Northern Territory University	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Australian Catholic University	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central Queensland University	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Charles Sturt University	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edith Cowan University	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
James Cook University	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
The University of Notre Dame Australia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
University of Ballarat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
University of Tasmania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deakin University	N/A	0	6	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Murdoch University	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
The University of Melbourne	N/A	N/A	N/A	6	0	10	3	0	4	3	0	4	0	0	0
The University of New England	N/A	N/A	60	N/A	N/A	0	N/A	N/A	0	N/A	N/A	1	N/A	N/A	0
University of Western Sydney	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL UNIVERSITIES:	**561**	**54**	**418**	**15**	**3**	**11**	**6**	**0**	**7**	**4**	**1**	**6**	**1**	**0**	**0**

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TABLE A18. NUMBER OF LICENSES\OPTIONS\ASSIGNMENTS (LOAs) BY DISCIPLINE (Ranked by FY 2000 LOAs Executed (Cumulative to Year 2000)) (Continued)

	LOAs Executed (Cumulative to Year 2000)	LOAs Executed with Equity (Cumulative to Year 2000)	LOAs Active Year (Cumulative to Year 2000)	LOAs Executed — Biological Sciences and Biotechnology (Cumulative to Year 2000)	LOAs Executed with Equity — Biological Sciences and Biotechnology (Cumulative to Year 2000)	LOAs Active Year — Biological Sciences and Biotechnology (Cumulative to Year 2000)	LOAs Executed — Physical, Chemical. Earth Sciences (Cumulative to Year 2000)	LOAs Executed with Equity — Physical, Chemical. Earth Sciences (Cumulative to Year 2000)	LOAs Active Year — Physical, Chemical. Earth Sciences (Cumulative to Year 2000)	LOAs Executed — Mathematics, Information and Communication Sciences (Cumulative to Year 2000)	LOAs Executed with Equity — Mathematics, Information and Communication Sciences (Cumulative to Year 2000)	LOAs Active Year — Mathematics, Information and Communication Sciences (Cumulative to Year 2000)	LOAs Executed — Social, Behavioural and Economic (Cumulative to Year 2000)	LOAs Executed with Equity — Social, Behavioural and Economic (Cumulative to Year 2000)	LOAs Active Year — Social, Behavioural and Economic (Cumulative to Year 2000)
Medical Research Institute															
Child Health Research Institute	10	4	6	1	1	1	0	0	0	0	0	0	0	0	0
Queensland Institute of Medical Research	7	7	3	1	1	1	0	0	0	0	0	0	0	0	0
TVW Telethon Institute for Child Health Research	7	0	3	1	0	1	0	0	0	0	0	0	0	0	0
Murdoch Childrens Research Institute	5	4	5	1	1	1	0	0	0	0	0	0	0	0	0
Macfarlane Burnet Institute for Medical Research and Public Health	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Royal North Shore Hospital	4	0	4	1	0	1	0	0	0	0	0	0	0	0	0
Howard Florey Institute	3	0	3	1	0	1	0	0	0	0	0	0	0	0	0
Peter MacCallum Cancer Institute	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0
Prince Henry's Institute of Medical Research	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0
Centenary Institute of Cancer Medicine and Cell Biology	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0
Institute of Respiratory Medicine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Menzies School of Health Research	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Victor Chang Cardiac Research Institute	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
The Walter and Eliza Hall Institute of Medical Research	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL MEDICAL INSTITUTES	**42**	**15**	**33**	**9**	**3**	**10**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CSIRO	392	n/a	318	n/a	n/a	113	n/a	n/a	164	n/a	n/a	16	0	0	0
TOTAL ALL RESPONDENTS	**995**	**69**	**769**	**24**	**6**	**134**	**6**	**0**	**171**	**4**	**1**	**22**	**1**	**0**	**0**

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TABLE A18. NUMBER OF LICENSES\OPTIONS\ASSIGNMENTS (LOAs) BY DISCIPLINE (Ranked by FY 2000 LOAs Executed (Cumulative to Year 2000)) (Continued)

	LOAs Executed (Cumulative to Year 2000)	LOAs Executed with Equity (Cumulative to Year 2000)	LOAs Active Year (Cumulative to Year 2000)	LOAs Executed — Humanities and Creative Arts (Cumulative to Year 2000)	LOAs Executed with Equity — Humanities and Creative Arts (Cumulative to Year 2000)	LOAs Active Year — Humanities and Creative Arts (Cumulative to Year 2000)	LOAs Executed — Engineering and Environmental Sciences (Cumulative to Year 2000)	LOAs Executed with Equity — Engineering and Environmental Sciences (Cumulative to Year 2000)	LOAs Active Year — Engineering and Environmental Sciences (Cumulative to Year 2000)	LOAs Executed — Health and Clinical Sciences (Cumulative to Year 2000)	LOAs Executed with Equity — Health and Clinical Sciences (Cumulative to Year 2000)	LOAs Active Year — Health and Clinical Sciences (Cumulative to Year 2000)	LOAs Executed — Other (Cumulative to Year 2000)	LOAs Executed with Equity — Other (Cumulative to Year 2000)	LOAs Active Year — Other (Cumulative to Year 2000)
University															
The University of Sydney	163	6	65	0	0	0	0	0	0	1	0	1	0	0	0
The University of Queensland	63	2	63	0	0	0	0	1	0	0	0	0	0	0	0
University of New South Wales	42	2	38	0	0	0	1	1	1	0	0	0	0	0	0
The University of Western Australia	41	N/A	41	0	N/A	0	0	N/A	0	0	N/A	0	0	0	0
Queensland University of Technology	39	0	10	0	0	0	0	0	0	0	0	0	0	0	0
Adelaide University	26	12	9	0	0	0	0	0	0	0	0	0	0	1	0
Australian National University	26	7	39	0	0	0	0	0	0	0	1	0	0	0	0
University of Technology Sydney	22	0	4	0	0	0	0	0	1	0	0	0	0	0	0
University of South Australia	20	1	12	0	0	0	0	0	0	0	0	0	0	0	0
Royal Melbourne Institute of Technology	17	0	11	0	0	0	0	0	0	0	0	0	0	0	0
Monash University	15	2	15	0	0	0	0	0	0	0	0	0	0	0	0
La Trobe University	13	2	2	0	0	0	0	0	0	0	0	0	0	0	0
Victoria University of Technology	13	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Griffith University	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Macquarie University	10	0	9	0	0	0	0	0	0	0	0	0	0	0	0
Southern Cross University	10	8	8	0	0	0	0	0	0	0	0	0	0	0	0
The University of Newcastle	9	3	7	0	0	0	1	1	0	0	0	0	0	0	0
Flinders University	8	8	8	0	0	0	0	0	0	0	0	0	0	0	0
University of Wollongong	8	1	3	1	0	0	1	0	0	0	0	0	0	0	0
Swinburne University of Technology	3	0	3	0	0	0	1	0	1	0	0	0	0	0	0
Northern Territory University	2	0	1	0	0	0	1	0	1	0	0	0	0	0	0
Australian Catholic University	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Central Queensland University	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Charles Sturt University	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edith Cowan University	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
James Cook University	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
The University of Notre Dame Australia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
University of Ballarat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
University of Tasmania	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deakin University	N/A	0	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Murdoch University	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
The University of Melbourne	N/A	N/A	N/A	0	0	0	5	0	8	9	0	14	0	0	0
The University of New England	N/A	N/A	60	N/A	N/A	0	N/A	N/A	0	N/A	N/A	0	N/A	N/A	0
University of Western Sydney	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL UNIVERSITIES:	**561**	**54**	**418**	**1**	**0**	**0**	**10**	**3**	**12**	**10**	**1**	**15**	**0**	**1**	**0**

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TABLE A18. NUMBER OF LICENSES\OPTIONS\ASSIGNMENTS (LOAs) BY DISCIPLINE (Ranked by FY 2000 LOAs Executed (Cumulative to Year 2000)) (Continued)

	LOAs Executed (Cumulative to Year 2000)	LOAs Executed with Equity (Cumulative to Year 2000)	LOAs Active Year (Cumulative to Year 2000)	LOAs Executed — Humanities and Creative Arts (Cumulative to Year 2000)	LOAs Executed with Equity — Humanities and Creative Arts (Cumulative to Year 2000)	LOAs Active Year — Humanities and Creative Arts (Cumulative to Year 2000)	LOAs Executed — Engineering and Environmental Sciences (Cumulative to Year 2000)	LOAs Executed with Equity — Engineering and Environmental Sciences (Cumulative to Year 2000)	LOAs Active Year — Engineering and Environmental Sciences (Cumulative to Year 2000)	LOAs Executed — Health and Clinical Sciences (Cumulative to Year 2000)	LOAs Executed with Equity — Health and Clinical Sciences (Cumulative to Year 2000)	LOAs Active Year — Health and Clinical Sciences (Cumulative to Year 2000)	LOAs Executed — Other (Cumulative to Year 2000)	LOAs Executed with Equity — Other (Cumulative to Year 2000)	LOAs Active Year — Other (Cumulative to Year 2000)
Medical Institute															
Child Health Research Institute	10	4	6	0	0	0	0	0	0	0	0	0	0	0	0
Queensland Institute of Medical Research	7	7	3	0	0	0	0	0	0	0	0	0	0	0	0
TVW Telethon Institute for Child Health Research	7	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Murdoch Childrens Research Institute	5	4	5	0	0	0	0	0	0	0	0	0	0	0	0
Macfarlane Burnet Institute for Medical Research and Public Health	4	0	4	0	0	0	0	0	0	1	0	1	0	0	0
Royal North Shore Hospital	4	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Howard Florey Institute	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Peter MacCallum Cancer Institute	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Prince Henry's Institute of Medical Research	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Centenary Institute of Cancer Medicine and Cell Biology	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Institute of Respiratory Medicine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Menzies School of Health Research	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Victor Chang Cardiac Research Institute	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
The Walter and Eliza Hall Institute of Medical Research	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TOTAL MEDICAL RESEARCH INSTITUTES	**42**	**15**	**33**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**0**	**0**	**0**
CSIRO	392	n/a	318	0	0	0	n/a	n/a	58	n/a	n/a	22	n/a	n/a	19
TOTAL ALL RESPONDENTS	**995**	**69**	**769**	**1**	**0**	**0**	**10**	**3**	**70**	**11**	**1**	**38**	**0**	**1**	**19**

TABLE A19. INVENTOR INVOLVEMENT IN LICENSING—YEAR 2000 (Ranked by Inventor Extremely Involved)

	LOA Count—Inventor Extremely Involved	LOA Count—Inventor Very Involved	LOA Count—Inventor Moderately Involved	LOA Count—Inventor Somewhat Involved	LOA Count—Inventor UnInvolved
Name Of University					
The University of Melbourne	19	5	1	0	0
Griffith University	18	0	0	1	0
Monash University	16	0	0	0	0
The University of New England	6	0	0	5	0
The University of Western Australia	6	3	0	0	0
University of Technology Sydney	5	0	0	0	4
The Australian National University	3	2	1	1	1
The University of Sydney	3	12	12	4	0
University of Western Sydney	3	0	0	0	0
La Trobe University	2	1	1	1	0
The University of Queensland	2	56	3	3	1
University of Wollongong	2	0	0	0	0
Deakin University	1	0	0	0	0
James Cook University	1	0	0	0	0
The University of Adelaide	0	0	1	0	0
Australian Catholic University	0	0	0	0	0
Central Queensland University	0	0	0	0	0
Charles Sturt University	0	0	0	0	0
Edith Cowan University	0	0	0	0	0
The Flinders University of South Australia	0	2	1	0	0
Macquarie University	0	1	1	1	0
Northern Territory University	0	0	0	0	0
Queensland University of Technology	0	0	2	0	0
Royal Melbourne Institute of Technology	0	0	0	0	1
Swinburne University of Technology	0	0	0	0	0
The University of Newcastle	0	3	0	0	0
The University of Notre Dame Australia	0	0	0	0	0
University of Ballarat	0	0	0	0	0
The University of New South Wales	0	4	0	8	0
University of South Australia	0	1	1	0	0
University of Tasmania	0	0	0	0	0
Victoria University of Technology	0	0	0	0	0
Murdoch University	n/a	n/a	n/a	n/a	n/a
Southern Cross University	n/a	n/a	n/a	n/a	n/a
TOTAL UNIVERSITIES:	**87**	**90**	**24**	**24**	**7**
Name of Medical Research Institute					
Child Health Research Institute	3	1	0	0	0
Howard Florey Institute	2	0	1	0	0
Murdoch Childrens Research Institute	2	0	0	0	0
Royal North Shore Hospital	2	0	0	0	0
Institute of Respiratory Medicine	1	0	0	0	0
Victor Chang Cardiac Research Institute	1	0	0	0	0
Centenary Institute of Cancer Medicine and Cell Biology	0	0	0	0	0
Macfarlane Burnet Institute for Medical Research and Public Health	0	0	0	0	0
Menzies School of Health Research	0	0	0	0	0
Peter MacCallum Cancer Institute	0	0	0	0	0
Prince Henry's Institute of Medical Research	0	0	0	0	0
Queensland Institute of Medical Research	0	2	0	0	0
TVW Telethon Institute for Child Health Research	0	0	0	0	0
The Walter and Eliza Hall Institute of Medical Research	0	0	0	0	0
Melbourne Health (incorporating The Royal Melbourne Hospital Research Foundation)	n/a	n/a	n/a	n/a	n/a
TOTAL MEDICAL RESEARCH INSTITUTES	**11**	**3**	**1**	**0**	**0**
CSIRO	62	51	16	26	13
TOTAL ALL RESPONDENTS	**160**	**144**	**41**	**50**	**20**

APPENDIX 5
START-UP COMPANIES FORMED IN YEAR 2000

Universities	Start-up Companies
Deakin University	Chirogen Pty Ltd
Griffith University	antenova Ltd
	Calytrix Technologies Ltd
La Trobe University	OFDM IP
	STATPLAY
Monash University	EM Stem Cells International
	Copyrat Pty Ltd
	Prostate Diagnostics Pty Ltd
Murdoch University	MS Biotechnology Pty Ltd
	Rumen Biotech Pty Ltd
Southern Cross University	Australian Phytochemicals Ltd
	Puragrain
The Australian National University	Acton Lasers Pty Ltd
	Seeing Machines Pty Ltd
	Pi2 Ltd
The Flinders University of South Australia	Your Amigo
The Royal Melbourne Institute of Technology	Spatial Vision Innovations Pty Ltd
The University of Newcastle	VRIBioMedical Ltd
The University of New South Wales	ACYTE Biotech Pty Ltd
The University of Queensland	Nanochem
	Magnetica Technologies Pty Ltd
The University of Sydney	Biosceptre Pty Ltd
	Brain Resource Company Ltd
	i-Care Pty Ltd (formerly TA-Med Pty Ltd)
	Objectivision Pty Ltd
	Personis Pty Ltd
	Xenopharm Inc
The University of Western Australia	Advanced Powder Technology Pty Ltd
	Inner Visions Biometrics Pty Ltd
	e-Genius Pty Ltd
	Skin Cancer Analysis Technologies (SCAT)
University of South Australia	Knowledge South

Medical Research Institutes	Start-up Companies
Child Health Research Institute	TGR BioSciences
Royal North Shore Hospital	Heart Assist Technologies Pty Ltd

CSIRO - Start-up Companies

ARIES Information Services Pty Ltd (ABN 59 093 047 155)

ATM Casting Technologies Ltd (ABN 22 095 732 105)

Boron Molecular Pty Ltd (ABN 76 092 480 674)

C Qentec Diagnostics Pty Ltd (ABN 56 094 277 175)

CSIRO Bioinformatics Pty Ltd (ABN 38 097 210 850)

Gelled Food Products Aust Pty Ltd (ABN 80 092 671 479)

Oz Insight Pty Ltd (ABN 88 094 813 091)

Quantm Ltd (ABN 36 089 066 366)

Quickstep Technologies Pty Ltd (ABN 68 088 154 876)

Shimoda Biotech Ltd

UCC Energy Pty Ltd (ABN 15 003 435 836)

Vectogen Ltd (ABN 40 089 058 284)

Versagel International Aps