THE HEARING COOPERATIVE RESEARCH CENTRE BRINGS TOGETHER AN INTERNATIONALY UNIQUE CONSORTIUM OF RESEARCH, CLINICAL AND INDUSTRY ORGANISATIONS DEDICATED TO THE COMMON PURPOSE OF ‘creating sound value’ THROUGH RESEARCH AND EDUCATION – TO PREVENT AND BETTER REMEDIATE THE LOST PRODUCTIVITY RESULTING FROM HEARING LOSS IN CHILDREN AND ADULTS.

OBJECTIVES

The objectives of The HEARing Cooperative Research Centre are:

- To enhance Australia’s industrial, commercial and economic growth through a program of sustained, user-driven cooperative research into hearing loss prevention and mitigation; and

- Through education and commercialisation of research findings, to reduce the incidence of hearing loss and increase the effectiveness with which hearing loss and hearing disorders are treated through improved technology, processes or clinical services.

The consortium will also create opportunities for industry growth in hearing healthcare together with improved clinical tools and procedures to meet projected increases in demand for hearing healthcare.
SCOPE OF THE PROBLEM: Hearing loss affects one in six Australians, and its prevalence is age-related, rising from less than 1% for people under 15 years of age to 75% of those over 70. With the ageing of our population, and the rising noise levels in everyday life, this is projected to rise to one in four by 2050. The financial cost of hearing loss to Australia in 2005 was estimated to be $11.75 billion or 1.4% of GDP.

OUR INNOVATIVE APPROACH:

MAXIMISE LIFELONG HEARING RETENTION:
by genetic and pharmacological approaches to identify and ameliorate childhood and acquired (including age-related) hearing loss; application of new sound coding and bioengineering knowledge to the design, capabilities and function of hearing protection, hearing remediation and telecommunication devices; and application of new knowledge to the diagnosis and rehabilitation of tinnitus and central auditory processing disorders.

IMPROVED TAKE-UP OF TECHNOLOGY:
by helping industry partners to achieve significant economic growth through investigation of barriers to use of hearing protection, and to the uptake of and use of implantable and acoustic prosthetics, thereby resulting in new and expanding markets, industry export and domestic earnings and job growth.

REDUCED PRODUCTIVITY LOSSES FROM HEARING LOSS:
by provision of more effective hearing protection, improved implantable technology and improved hearing aids that people will consistently use; and by providing innovative solutions that increase workforce capacity and effectiveness, helping Australians to age productively.

EDUCATION AND TRAINING:
by postgraduate and professional education and the development of an expanded network of clinicians, to support effective adoption of innovations, delivery of improved hearing services and encourage greater uptake of commercial products developed by HEARing CRC industry partners.

PREVALENCE ESTABLISHED
INCREASED UPTAKE
ACCELERATED INTERVENTION
ACCELERATED INTERVENTION

1 Listen Hear! The Economic Impact and Cost of Hearing Loss in Australia, Access Economics, 2006
## EXECUTIVE SUMMARY

**NUMBER CRUNCH 2009-10**

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patents</td>
<td>6 new commercial patents applied for and/or granted</td>
</tr>
<tr>
<td>Independents</td>
<td>2 new independent Board members; HEARing CRC Board of Directors membership now complete at 9</td>
</tr>
<tr>
<td>Award</td>
<td>1 CRC Association Award for Excellence in Innovation</td>
</tr>
<tr>
<td>Publications</td>
<td>22 peer-reviewed journal articles and conference proceedings</td>
</tr>
<tr>
<td>Presentations</td>
<td>118 conference presentations</td>
</tr>
<tr>
<td>Students</td>
<td>11 new PhD students; 25 PhD students now in progress or completed</td>
</tr>
<tr>
<td>Collaborations</td>
<td>17 international collaborative research alliances</td>
</tr>
<tr>
<td>Remote MAPs</td>
<td>2 paediatric cochlear implants successfully MAPped between Sydney and (i) Apia, Samoa and (ii) Nhulumbouy, Arnhem Land</td>
</tr>
<tr>
<td>Workshops</td>
<td>2 Cochlear Implant Training Workshops held; 40 attendees from 10 different countries</td>
</tr>
<tr>
<td>Senate Enquiry</td>
<td>Contribution to the Senate Enquiry into Hearing Health in Australia</td>
</tr>
<tr>
<td>Trial Sites</td>
<td>Safears™ Mark I hearing protection device field trials held at 5 sites across Victoria and Queensland</td>
</tr>
<tr>
<td>Visits</td>
<td>Almost 8,500 visits to the HEARing CRC website, launched November 2009</td>
</tr>
</tbody>
</table>
The HEARing Cooperative Research Centre (CRC) has now completed its first three years of operations and we are pleased to report on achievements for the period July 2009 to June 2010.

We were delighted to receive one of the CRC Association Awards for Excellence in Innovation 2010, in recognition of our development work for the Hybrid-L electrode array. This was recently released by Cochlear Ltd as a component of their commercial Cochlear™ Hybrid™ System. The new technology has the potential to significantly expand cochlear implant candidature, opening opportunities to individuals who have lost high frequency hearing but retain the capacity to hear low frequency sound.

Our ongoing research activities are progressing well across Melbourne, Sydney, Wollongong, Newcastle and Brisbane sites. We are pleased to have been able to significantly increase our research project expenditure this year through the use of trust funds provided by HEARworks (from commercial activities).

Outcomes from a number of research projects are now being commercialised. These include a trainable hearing aid and the NAL-NL2 hearing aid fitting software (released by Siemens Hearing Instruments Pty Ltd) and HEARLab and its NAL-ACA aided cortical assessment module (released by licencee Frye Electronics Inc.). NAL-NL2 is an updated version of NAL-NL1 fitting software, developed by the National Acoustic Laboratories and the previous CRC HEAR. NAL-NL1 is one of two industry benchmarks currently used to fit half the world’s eight million hearing aids per annum. These achievements underline the HEARing CRC’s focus on development of technology that meets industry and clinical-service needs, which ultimately create benefit for our end-users and economic impact for Australia.

In anticipation of our Third Year Review, the Board initiated an in-depth strategic review of all research projects by our Science Advisory Group, chaired by Professor Rob Patuzzi. This review assessed aims, progress to date and future outcomes – delivering clear recommendations for the future direction of our research portfolio. It also provided a forum for Project Leaders to exchange ideas and identify new inter-project synergies and collaborations.

Our Professional Education Program, in partnership with Cochlear Ltd, continues to deliver high quality Cochlear Implant Training Workshops for surgeons and healthcare professionals from across Asia Pacific. Our Postgraduate Program is also growing well; it is pleasing to report that 25 PhD students are now actively engaged in HEARing CRC projects, benefitting from multidisciplinary and multi-Member supervision arrangements. Involvement in CRC research provides excellent training and mentoring, opening up opportunities for international postdoctoral placements and for careers with industry Members.

The governance structure of the HEARing CRC is now complete, with the appointment of Dr Michele Allan and Dr Lisa Springer as Independent Directors who bring with them significant management and commercial acumen.

We thank all of our Board members for their diligent work over the year, as well as our Core and Supporting Members for their ongoing investments and interest in achieving our mission and objectives. We extend our gratitude to the Management team, researchers, staff and students for what has been a stimulating and productive year. As always, we give special thanks to the adults, children and their families who give so generously of their time to participate in our research studies. Without their help we would be unable to achieve our goals.
The HEARing CRC is a multidisciplinary collaboration of five core and 21 supporting members, each of which contributes specific expertise and infrastructure to the strategic program of activities.

### MEMBERS

#### Core Members

<table>
<thead>
<tr>
<th>Australian Hearing</th>
<th>Cochlear</th>
<th>Macquarie University</th>
<th>Siemens</th>
<th>The University of Melbourne</th>
</tr>
</thead>
</table>

There have been no changes to the Members of the HEARing CRC during the 2009-10 year.

#### Supporting Members

<table>
<thead>
<tr>
<th>Acoustics Pty Ltd</th>
<th>attune</th>
<th>Audiology Australia</th>
<th>The Bianc Ear Institute</th>
<th>The Children’s Hospital at Westmead</th>
<th>Murdocks Childrens Research Institute</th>
<th>MURIGEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hear and Say Centre</td>
<td>hybrid electronics</td>
<td>Murdoch Childrens Research Institute</td>
<td>The Royal Victorian Eye &amp; Ear Hospital</td>
<td>The Shepherd Centre</td>
<td>MURIGEN</td>
<td></td>
</tr>
<tr>
<td>Neuromonics Tinnitus Treatment</td>
<td>Royal Institute for Deaf and Blind Children</td>
<td>The Royal Victorian Eye &amp; Ear Hospital</td>
<td>The Royal Victorian Eye &amp; Ear Hospital</td>
<td>The University of Queensland Australia</td>
<td>MURIGEN</td>
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<tr>
<td>SYDNEY SOUTH WEST</td>
<td>Taralye</td>
<td>Taralye the one language centre for deaf children</td>
<td>Walter+Eliza Hall</td>
<td>Walter+Eliza Hall</td>
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<tr>
<td>AREA HEALTH SERVICE</td>
<td></td>
<td>getting deaf kids talking</td>
<td>Institute of Medical Research</td>
<td></td>
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<tr>
<td>NSW HEALTH</td>
<td></td>
<td>getting deaf kids talking</td>
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</table>

There have been no changes to the Members of the HEARing CRC during the 2009-10 year.
CORPORATE / GOVERNANCE STRUCTURE

MEMBER INSTITUTIONS

- Support Members Group
- Science Advisory Group

BOARD

Chairman, Nominee & Independent Directors

Nominations & Appointments Committee

Finance & Audit Committee

CHIEF EXECUTIVE OFFICER

Exec Asst to CEO

RESEARCH

- Program Coordinators (3 positions x 0.5)
  - Key Scientists

PROJECTS

- Project Leaders

EDUCATION

- Communication and Education Manager
  - University audiology representatives
  - Member contacts

COMMERCIAL

- Commercialisation Working Group

FINANCE

- Chief Financial Officer (Company Secretary)
  - Finance Assistant

HEARING CRC LTD
(ABN 94 123 522 725):

is a company limited by guarantee, established to manage the activities of the HEARing CRC.

HEARWORKS PTY LTD
(ABN 37 089 900 676):

is a proprietary company limited by shares, created by the Members, for the purposes of acting as Trustee for IP and undertaking commercialisation of research outcomes. HEARworks operates under a Management Deed and Trust Deed with the HEARing CRC Limited and its Members.

HEAR IP PTY LTD
(ACN 134 173 854):

incorporated in November 2008 as a trustee company, HEAR IP was created for the purposes of acting as Trustee for IP created by the HEARing CRC.
HEARING CRC GOVERNING BOARD OF DIRECTORS

The HEARing CRC operates under a Member’s Agreement, whereby composition of the Board comprises: an independent Chair, a nominee Director from each of the five Core Members (namely Australian Hearing, Cochlear Ltd, Macquarie University, Siemens Hearing Instruments Pty Ltd, and The University of Melbourne), two or more independent Directors and the CEO. In 2009-10, two independent Directors were appointed to the Board. Each of the five nominee Directors have the right to appoint an Alternate.

The Board is responsible for setting strategic goals and objectives and oversees the performance of the activities of the HEARing CRC, including IP and commercial operations as managed through HEAR IP and HEARworks. The Board is accountable to the Commonwealth and the Members for the governance, management and control of the business and affairs of the Company.

The Board and management follow good corporate governance practice as recommended by ASX and AICD guidelines. The HEARing CRC operates under the terms and guiding doctrines of:

- its Constitution
- the Commonwealth Agreement, ‘the Agreement between the Commonwealth of Australia and the HEARing CRC’; and
- The Member’s Agreement for the establishment and operation of the HEARing CRC’ an agreement between each of the individual Members and the HEARing CRC Ltd.

Finance and Audit (F&A) Committee

The Finance and Audit Committee assists the Board by providing oversight of the financial operations and affairs of the Company. This Committee also oversees the relationship with the external auditor, and the process of identification and management of business, commercial and financial risks.

For the reporting period this committee met four times and the members’ attendance record is disclosed following. It is Company practice that the CEO and Chief Financial Officer (CFO) are in attendance for all meetings.

The F&A Committee includes:

- Mr Barry Roberts (Chair)
- Mr Richard Searby
- Prof Robin Evans
- Mr Neville Mitchell

Nominations and Appointments (N&A) Committee

The Nominations and Appointments Committee assists the Board by making recommendations on the appointment and remuneration of Directors to the Boards of the HEARing CRC and HEARworks. If required, this Committee also assists in the appointment of a Chair, or CEO, and in making recommendations on the remuneration of these officers.

For the reporting period this committee met four times and the members’ attendance record is disclosed below. It is Company practice that the CEO is in attendance for all meetings.

The N&A Committee includes:

- Ms Kathryn Greiner (Chair)
- Mr Richard Searby
- Mr Barry Roberts

Commercialisation Working Group

In March 2010, the Board established a Commercialisation Working Group to assist in developing commercial and technology transfer strategy and plans. The group’s role is to provide informed recommendations to the Board and management on licencing and other commercial activities, as well as work with individual Project Leaders to develop commercial plans.

The Commercialisation Working Group includes:

- Dr Michele Allan: The HEARing CRC
- Dr Lisa Springer: The HEARing CRC
- A/Prof Harvey Dillon: NAL
- Ms Jenni Lightowlers: FAL Lawyers; and
- A/Prof Robert Cowan: The HEARing CRC

Science Advisory Group

The Science Advisory Group, Chaired by Professor Rob Patuzzi, includes key scientists drawn from across the Members. To strengthen its expertise, an independent expert in genetics, Professor Bronya Keats has been recruited. The group assists the Board and CEO in the annual Research Project Review, and in special reviews to be conducted under the CRC Program.

The Science Advisory Group includes:

- Dr Rob Patuzzi: University of Western Australia
- A/Prof Robert Cowan: The HEARing CRC
- A/Prof Harvey Dillon: NAL
- Prof Richard Dowell: The University of Melbourne
- Prof Louise Hickson: The University of Queensland
- Prof Doug Hilton: The Walter and Eliza Hall Medical Research Institute
- Prof Bronya Keats: Australian National University
- Dr Catherine McMahon: Macquarie University
- A/Prof Jim Patrick: Cochlear Ltd

Support Members Group

The Support Members Group is intended to provide a forum for the Support Members to meet with the Board and management. Meetings are held as required, with at least one meeting held per year.

HEARWORKS BOARD OF DIRECTORS

HEARworks Pty Ltd operates under a Management Deed and Trust Deed with the HEARing CRC and its Members, and is charged with managing commercial operations for the HEARing CRC.

- Mr Richard Searby (Chairman)
- A/Prof Robert Cowan
- Ms Kathryn Greiner
- Mr Barry Roberts
CEO, GOVERNANCE AND COMMITTEE MEMBERS

Richard Searby
AO, QC, MA (Oxon), Hon LLD (Deakin)
Independent Chairperson (HEARing CRC and HEARworks)

Mr Searby was appointed as Chairman of the HEARing CRC Ltd in April 2007. He is a leading member of Australia's legal profession, and has held a wide range of directorships of Australian and international corporations. He has advised the Australian Government on various occasions and has drafted amendments to Australian and Victorian legislation. He was Chancellor of Deakin University from 1997 through 2005. Amongst a long list of corporate activities, he was a Director of News Corporation from 1979-1992 and Chairman from 1981-1991, and a Director of Rio Tinto Ltd from 1977-1997. He was awarded the Order of Australia in 2006 for his services to education, as a contributor to the programs of major cultural institutions, business and the law.

Mr Searby is an ex officio member of the Finance and Audit Committee and Nominations and Appointments Committee.

Robert Cowan
BSc (Hons), MBA, PhD(Melb), DipAud, Gr Cert Health Economics, Gr Dip Tech Mgt, FAudSA (CCP), GAICD

Chief Executive Officer (HEARing CRC)

A/Prof Cowan was appointed as CEO of the HEARing CRC Ltd in January 2007 and Managing Director of HEARworks in 2001.

He is a Principal Research Fellow in The University of Melbourne, has published extensively in the fields of audiology, cochlear implants, sensory device and biomedical management, holds a number of international and Australian technology patents, and teaches biomedical management. He has advised the Australian Government as a member of the Minister’s Hearing Services Consultative Committee, and the CRC Association Executive Committee (CRCA Deputy Chair from 2002-2005). He was President of Audiology Australia (1992-1996 and 1997-2000), and is a Federal Councillor and Fellow. He was Australian Professional of the Year (Professions Australia 2004) and received Audiology Australia’s President’s Distinguished Service Award (2003) and Denis Byrne Memorial Lecture (2006) and the Deafness Forum’s Libby Harrick’s Memorial Oration (2007). In 2010, he became President-elect of the International Society of Audiology.

Michele Allan
BSc, PhD, GAICD
Appointed 8th December 2009.

Independent Director (HEARing CRC)

Dr Allan is currently Chair of William Angliss Institute and Go Grains Health and Nutrition Limited, Non Executive Director of Food Standards Australia and New Zealand, Wood Products Australia and MG Corporation. She is also a member of the audit and risk committees of three of these organisations.

Until 2008 Dr Allan was Chief Executive Officer and Managing Director of the listed food manufacturer and marketer Patties Foods Limited. Prior to that role she was Group General Manager Risk and Sustainability for Amcor Limited. Dr Allan has held executive roles with Kraft Foods, Bonlac Foods Limited, ICI and Nestle. Dr Allan has a Bachelor of Applied Science from University of Technology Sydney, Master of Management of Technology from The University of Melbourne, Master Commercial Law Deakin University and Doctorate from RMIT. She is a graduate of the Australian Institute of Company Directors and a Fellow.

Robin Evans
BE, PhD (Newcastle)
Nominee Director

The University of Melbourne (HEARing CRC)

Prof Evans is the Director of the Victoria Research Laboratory, National ICT Australia, and a Professor of Electrical Engineering at The University of Melbourne. Prof Evans was a Professor of Computer Engineering at The University of Newcastle before becoming Head of Electrical Engineering and Research Leader for the Co-operative Research Centre for Sensor Signal and Information Processing at The University of Melbourne. He has worked extensively with industry throughout his career, has over 450 peer-reviewed publications and is a Fellow of the Australian Academy of Science, the Australian Academy of Technological Sciences and Engineering, the Institution of Electrical and Electronic Engineers USA, and the Institution of Engineers Australia.

Prof Evans is a member of the Finance and Audit Committee.

Kathryn Greiner
AO, B Soc Work
Nominee Director

Australian Hearing Services (HEARing CRC and HEARworks)

Ms Greiner was appointed as a Director of the HEARing CRC Ltd in November 2008. She has been Chair and Non-Executive Director of Australian Hearing since October 2006. Her professional career has involved administering early childhood services and mental health programs, both in Australia and the United States. She has extensive experience in the development of communities and their services. Ms Greiner has held many corporate and not-for-profit directorships, including the Salvation Army Sydney Shield Appeal, Save the Children Fund, LEK Consulting, International Council of the Asia Society and the Sydney Peace Prize Foundation.

Ms Greiner is Chair of the Nominations and Appointments Committee.
**Neville Mitchell**  
BComm, CA(SA), CA  
Nominee Director  
Cochlear Ltd  
(HEARing CRC)

Mr Mitchell was appointed as a Director of the HEARing CRC Ltd in April 2007. He has been Chief Financial Officer and Company Secretary of Cochlear Ltd since its listing in 1995 and was Cochlear Ltd’s Financial Controller since joining the company in 1990. Mr Mitchell was formerly a Senior Manager with KPMG in Johannesburg, South Africa.

Mr Mitchell is a member of the Finance and Audit Committee.

**Jim Piper**  
BSc(Hons), PhD  
Nominee Director  
Macquarie University  
(HEARing CRC)

Prof Piper is Deputy Vice Chancellor [Research] and Professor of Physics at Macquarie University. Prof Piper has published widely in the field of dye laser design and has extensive experience in lasers, optics and photonics, and applications in micro fabrication. He received a Centenary Professorship from Carnegie Trust Universities of Scotland (2004), the Australian Optical Society Medal (1997), The Walter Boas Medal of the Australian Institute of Physics (1984) and the Pawsley Medal of the Australian Academy of Science (1982).

**Barry Roberts**  
FCPA, FCIS  
Nominee Director:  
Siemens Hearing Instruments Pty Ltd  
(HEARing CRC and HEARworks)

Mr Roberts was appointed as a Director of the HEARing CRC Ltd in April 2007. Mr Roberts has been Chairman of Siemens Hearing Instruments Pty Ltd since 1994, having first joined the Board in 1988. He joined Siemens Australia in 1960, and was Finance Director, CFO and Deputy CEO of the Australian and New Zealand Group between 1985 and 2002. Mr Roberts has over 40 years experience in budgeting, financial management and control, corporate governance, project management and administration. Mr Roberts is former Chairman of JAS-ANZ and Vice President of the Australian Electrical and Electronics Manufacturers Association.

Mr Roberts is Chair of the Finance and Audit Committee, and a member of the Nominations and Appointments Committee.

**Lisa Springer**  
BSc, PhD, GAIDC  
Appointed 14th December 2009.  
Independent Director  
(HEARing CRC)

Dr Springer is currently the Principal of Maia Partners, an independent corporate advisory firm which assists biotechnology and medical device companies to outperform.

Dr Springer has significant investment banking and investment analysis experience and has also held a strategic role at Johnson and Johnson, a multinational pharmaceutical company. For the past 12 years, Dr Springer has raised several hundred million dollars and provided corporate and strategic advice for several Australian Life Sciences companies enabling them to continue to develop their drug products and devices for the global market. She holds a PhD in physiology and molecular biology and is currently a Director of Neuromodics Pty Ltd and on the Executive Committee of the Australian Aphasia Association. She is a graduate member of the Australian Institute of Company Directors.

**Steven Grundy**  
Managing Director  
Australian Hearing Services  
(Alternate for Kathryn Greiner)

**Jim Patrick**  
Chief Scientific Officer  
Cochlear Ltd  
(Alternate for Neville Mitchell)

**Dominic Jenkins**  
Chief Financial Officer  
Siemens Hearing Instruments Pty Ltd  
(Alternate for Barry Roberts)

**Janet Greeley**  
Executive Dean (Faculty of Human Services)  
Macquarie University  
(Alternate for Jim Piper)
HEARING CRC GOVERNING BOARD OF DIRECTORS

Richard Searby  Kathryn Greiner  Robert Cowan  Neville Mitchell  Barry Roberts
3: GOVERNANCE AND MANAGEMENT

Jim Piper  Michele Allan  Robin Evans  Lisa Springer
EXECUTIVE MANAGEMENT TEAM

Chief Executive Officer (CEO) and Director: A/Prof Robert Cowan

Responsibilities: Providing scientific and academic leadership to the HEARing CRC; responsible to the Governing Board for the implementation and conduct of Centre research, education, commercialisation and management programs.

Executive Assistant: Ms Amanda Campbell

Background: Amanda holds a tertiary qualification in Psychology and Market Research and has over nine years of experience in administration. Over the last six years, Amanda has focused on Personal / Executive assistant roles.

Responsibilities: Direct support to the CEO and Board, and broad support to the activities of the Management Team.

Chief Financial Officer and Company Secretary: Mrs Lisa Norden

Background: Lisa has 20 years of financial experience in industry and not-for-profit organisations. She has spent the last eight years working with CRCs. Her qualifications include Certified Practicing Accountant, Chartered Secretaries Australia Corporate Governance Graduate Diploma and Australian Institute of Company Directors Course Diploma.

Responsibilities: Co-ordinating financial, statutory and operational activities. Preparation of all reports as required by the Commonwealth, Board, CEO and Program Managers.

Communication and Education Manager: Dr Jane Sewell

Background: Jane started out as a research scientist, completing a PhD and post-doctoral role in the field of Molecular Oncology. She switched careers to become a Science Communicator and over the last six years has worked on the development of scientific and clinical multimedia resources and more recently as the Program Manager for the Victorian State Government, focused on the translation of clinical cancer research into practice.

Responsibilities: External and internal communication strategies; managing the higher degree and professional education activities of the HEARing CRC, including Training Workshops.

Commercial Operations Manager: Mr Trifon Chryssafis

Background: Trifon brought over 17 years of commercial and risk management experience from the information technology and telecommunications industry. Trifon resigned in February 2010.

Responsibilities: IP management strategy and administration of IP and commercial registers. Responsibility for this activity has now been transferred to the Commercial Working Group.
EXECUTIVE MANAGEMENT TEAM (cont.)

Dominic Lou  Pam Jackson  Brendan Murray

Research Program Coordinators

Responsible for coordinating activities and reporting of projects within the respective Research Programs, the research coordinators help to ensure effective working relationships across projects, within Programs, and between research and education activities.

**Dr Dominic Lou (Sydney):**
Dominic is an educator, an experienced e-learning instructional designer, developer and project manager - having worked with a range of educational organisations. His research interest is in utilising technology to augment teaching, research and learning and he is based at Macquarie University.

**Ms Pam Jackson (Sydney):**
Pam has tertiary qualifications in Business and Book Editing and Publishing, with many years administrative experience across a range of industries. She is based at Australian Hearing.

**Mr Brendan Murray (Melbourne):**
Brendan is a clinical audiologist with nearly 15 years experience in the cochlear implant field. Brendan resigned in February 2010.

**Dr Adrienne Paterson (Melbourne):**
Adrienne was recruited to commence in July 2010 and brings significant postdoctoral research and pharmaceutical industry experience to this role.

<table>
<thead>
<tr>
<th>Project Leaders</th>
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</thead>
<tbody>
<tr>
<td>Responsible for the achievement of the aims and milestones of their specific research project.</td>
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</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Organisation</th>
<th>CRC Position / Role</th>
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<tbody>
<tr>
<td>A/Prof Rob Briggs</td>
<td>The University of Melbourne</td>
<td>Project Leader R3.2.2, R3.3.1</td>
</tr>
<tr>
<td>Dr Rachel Burt</td>
<td>Walter and Eliza Hall Medical Research Institute</td>
<td>Co-Project Leader R1.2.2</td>
</tr>
<tr>
<td>Mr Eric Burwood</td>
<td>Australian Hearing</td>
<td>Project Leader R3.3.1</td>
</tr>
<tr>
<td>Dr Peter Busby*</td>
<td>Cochlear Ltd</td>
<td>Project Leader R4.3.2</td>
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<tr>
<td>Dr Sharon Cameron</td>
<td>Australian Hearing</td>
<td>Project Leader R1.1.1, R1.1.2</td>
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<tr>
<td>A/Prof Teresa Ching</td>
<td>Australian Hearing</td>
<td>Project Leader R4.6.2, R4.6.6</td>
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<td>A/Prof Robert Cowan</td>
<td>The University of Melbourne</td>
<td>Project Leader R4.1.2</td>
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<tr>
<td>A/Prof Henrik Dahl</td>
<td>Murdoch Children’s Research Institute</td>
<td>Project Leader R1.2.1</td>
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<tr>
<td>Dr Shani Dettman</td>
<td>The University of Melbourne</td>
<td>Co-Project Leader R4.2.2</td>
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<tr>
<td>A/Prof Harvey Dillon</td>
<td>Australian Hearing</td>
<td>Project Leader R4.6.3, C4.2</td>
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<tr>
<td>Ms Dimity Dernan</td>
<td>Hear and Say Centre for Deaf Children</td>
<td>Co-Project Leader R4.2.2</td>
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<tr>
<td>Prof Richard Dowell</td>
<td>The University of Melbourne</td>
<td>Project Leader R4.6.1</td>
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<td>Dr Michael Fisher</td>
<td>Australian Hearing</td>
<td>Project Leader R3.4.1, R3.4.5</td>
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<tr>
<td>Mr Mark Harrison</td>
<td>The University of Melbourne</td>
<td>Project Leader R3.4.3</td>
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<tr>
<td>Dr John Heasman</td>
<td>Cochlear Ltd</td>
<td>Project Leader R2.4</td>
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<tr>
<td>Prof Louise Hickson</td>
<td>The University of Queensland</td>
<td>Project Leader R4.1.1, R4.5.3a</td>
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<tr>
<td>Prof Doug Hilton</td>
<td>Walter and Eliza Hall Medical Research Institute</td>
<td>Co-Project Leader R1.2.2</td>
</tr>
<tr>
<td>Dr Gitte Keidser</td>
<td>Australian Hearing</td>
<td>Project Leader R4.3.1, R4.3.4, R4.6.7</td>
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<tr>
<td>A/Prof Greg Leigh</td>
<td>Royal Institute for Deaf and Blind Children</td>
<td>Project Leader R4.5.2</td>
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<tr>
<td>Mr Teck Loi</td>
<td>Australian Hearing</td>
<td>Project Leader C3.1.1, C3.1.2, C3.1.3</td>
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<tr>
<td>Dr Robert Mannell</td>
<td>Macquarie University</td>
<td>Project Leader R2.3.3</td>
</tr>
<tr>
<td>Mr Jorge Meija</td>
<td>Australian Hearing</td>
<td>Project Leader R2.2.1, C2.1, C4.1</td>
</tr>
<tr>
<td>Dr Catherine McMahon</td>
<td>Macquarie University</td>
<td>Project Leader R1.3.1, R4.3.1, R4.6.4, R4.7.2</td>
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<td>Dr Carrie Newbold</td>
<td>The University of Melbourne</td>
<td>Project Leader R3.1.1, R3.2.1</td>
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<td>Dr Pauline Nott</td>
<td>Advisory Council for Children with Impaired Hearing</td>
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<tr>
<td>Prof Stephen O’Leary</td>
<td>The University of Melbourne</td>
<td>Project Leader R2.5.1, R4.4.2</td>
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<td>A/Prof Jim Patrick</td>
<td>Cochlear Ltd</td>
<td>Project Leader R3.5</td>
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<td>Ms Kerrie Plant</td>
<td>Cochlear Ltd</td>
<td>Project Leader C1.1</td>
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<tr>
<td>Ms Colleen Psarros*</td>
<td>Sydney Cochlear Implant Centre</td>
<td>Project Leader R4.3.3b</td>
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<tr>
<td>A/Prof Gary Rance*</td>
<td>The University of Melbourne</td>
<td>Project Leader R1.1.1a</td>
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<tr>
<td>Ms Emma Rushbrooke</td>
<td>Hear and Say Centre for Deaf Children</td>
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<td>Prof Peter Seligman</td>
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<td>Dr Michael Tykocinski</td>
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<tr>
<td>Mr Andrew Vandali</td>
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<td>Dr Bram van Dun*</td>
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<tr>
<td>Dr Andy Zhang</td>
<td>The University of Melbourne</td>
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</tr>
<tr>
<td>Mr Dan Zhou</td>
<td>Australian Hearing</td>
<td>Project Leader R4.3.3</td>
</tr>
</tbody>
</table>

* denotes Project Leaders appointed from June 2010
The HEARing CRC’s research activity is arranged into four Programs, these are supported by the Clinical Trials and Product Development Commercialisation Program.

During the third year of HEARing CRC activity, there has been good progress in each of the four Research Programs and also the Commercialisation/Clinical Trials area; resulting in both clinical applications of technology and identification of new Intellectual Property (IP). Highlights and outcomes are noted below for each Program area.

**RESEARCH PROGRAM R1: BIOMOLECULAR, GENETIC AND PHYSIOLOGICAL SOLUTIONS**

- **Participants**
  - Australian Hearing
  - Macquarie University
  - The University of Melbourne
  - Bionic Ear Institute
  - Murdoch Childrens Research Institute
  - MuriGen Pty Ltd
  - Neuromonics Inc.
  - The University of Queensland
  - Walter and Eliza Hall Institute of Medical Research

The Biomolecular, Genetic and Physiological Solutions Program comprises projects aimed at:

1. design and development of genetic and biomolecular diagnostics, and pharmacological solutions, that address age related (presbycusic) and acquired hearing loss; and  
2. investigation of sound processing by the brain, and how this is affected by central auditory processing disorders (CAPD), tinnitus and hearing loss using magnetoencephalographic (MEG) imaging.

Genetics research has identified 12 novel recessive deafness mouse models in strains of N-ethyl-N-nitrosourea (ENU)-mutagenised mice. The causative gene has been identified in eight of these strains. In seven of these, the mutation was identified in known “deafness” genes, whereas the additional strain harbours a mutation in the novel “deafness” gene, not previously associated with deafness or any other conditions in mice or humans. The effect of noise overstimulation has been investigated in mice carrying one of these mutations, which has shown increased susceptibility to noise induced hearing loss compared to wild type non-carriers.
In parallel, genomics research established a mutagenesis screen to identify mutant mice with hearing loss using a high-throughput, automated, acoustic startle response test. Heritability of 23 mutations was detected in the screen. Future plans are to freeze down many of the mutant strains in anticipation of the availability (and decreasing costs) of Next Generation Sequencing technology for mutation detection (as opposed to the traditional linkage MAPping approach). Models of drug-induced (ototoxic) hearing loss are being assessed for use in a genome-wide screen. This project will look for mutations that protect against the ototoxic properties of cisplatin and aminoglycoside antibiotics.

Preliminary data from auditory brainstem response (ABR) screening of mouse strains with known specific mutations in the apoptotic pathway suggest that such mutations do in fact lead to hearing loss. Extensive characterisation of the effects of loss of proteins Bcl2 and Bim on the auditory system has been completed for publication, and this opens avenues for modulating this pathway to protect against environmentally-induced forms of hearing loss.

Studies of CAPD in adults and children have made significant progress. Based on successful development of the LiSN software for screening CAPD in children, a test software for use with hearing impaired adults has been developed and trialled. The LiSN-S test for children has been licenced to Phonak AG. In parallel, a project to determine the prevalence of spatial processing disorder (SPD) in the adult hearing impaired populations is progressing. Investigations of auditory processing and language impairment in school-aged children is now progressing well, with recruitment of two PhD students.

Magnetoencephalographic (MEG) imaging will be used to compare transmission and processing of acoustic information in the central auditory processing pathways of individuals with normal hearing and those with different types of hearing loss. This information will be used to identify new approaches to prevention, diagnosis and management of CAPD and tinnitus in children and adults. It may also provide new understanding of how to best code temporal aspects of speech.

Having trained in mammalian genetics in Melbourne and neurogenetics in New York, I was recruited to the Hearing CRC in 2008 to develop a program of research to investigate the molecular basis of progressive hearing loss, with a view to identifying drug targets for prevention and treatment of presbycusis. It has been both exciting and challenging to establish a hearing research team at the Walter and Eliza Hall Institute (WEHI). During the process, we’ve developed brilliant collaborations with groups within the CRC and I’ve been delighted by the generosity and utrench of the hearing research community both within Australia and internationally. Somewhat surprisingly, we have also discovered many scientific overlaps with established research programs being conducted at WEHI in the area of cell death biology, and we are capitalising on these strengths. This year has seen many achievements within our team, with several long-term projects maturing and yielding interesting results that will be published during coming months.
RESEARCH PROGRAM R2: INTELLIGENT SOUND PROCESSING

Participants
- Australian Hearing
- Cochlear Ltd
- Macquarie University
- Siemens Hearing Instruments Pty Ltd
- The University of Melbourne
- Bionic Ear Institute
- Royal Victorian Eye and Ear Hospital
- Sydney Cochlear Implant Clinic

The projects within the Intelligent Sound Processing Program are aimed at developing improved sound coding for application in intelligent hearing protectors, hearing aids and cochlear implants.

Successful realisation of this Program will provide improved hearing protection and enhanced communication for users of hearing aids, cochlear implants and hearing protectors to help reduce the productivity losses associated with hearing loss.

A novel binaural signal-processing scheme, which includes a novel bilateral noise reduction algorithm, a novel direction of arrival estimator and a new de-reverberation processing algorithm (all of which have been patented) has been developed. The binaural noise reduction scheme was extended to include a trainable function of directionality, and the new trainable function will be the scope of future research.

Development of bilateral stimulus optimisation for cochlear implants is focused on applying a psychophysical model of electrical sensitivity to interaural timing cues. The model provides a good fit to a number of experimental outcomes in bilateral cochlear implant users. In parallel, migration of the patented peak-derived-timing (PDT) strategy to a commercial platform is progressing. In addition, an alternative noise-reduction algorithm (“minP”) that is computationally less intensive has been developed that may be beneficial in applications in which power consumption is critical. The complex audition laboratory in the Audiology, Hearing and Speech Science building at The University of Melbourne has now been fitted with a highly configurable loudspeaker array.

Studies to improve coding of pitch and music have developed strategy called the e-Tone which enhances temporal cues to pitch in cochlear implants. A patent for this strategy has been filed, and a number of publications submitted. However, the music (pitch/timbre) perception training program is progressing, with a software engine (synthesizer) for construction of stimuli written and a psychophysics training program under construction. To expand this work, a number of PhD students have been recruited.

Studies directly relevant to application of de-noising algorithms in the front-end processing for cochlear implants are also now progressing, and a real-time speech enhancement [noise reduction] algorithm has been implemented and clinically validated in 13 cochlear implant users.

Studies to determine whether the use of neural modelling can increase information transfer at the level of the auditory nerve, and thereby improve cochlear implant speech perception have progressed with development of an auditory nerve fibre model.

In 2001, I commenced work as a research engineer with Bernafon, a supporting Member of CRC HEAR (the previous hearing based CRC) in Brisbane. During my initial years with the CRC I was involved in the research and development of active occlusion reduction technology for hearing aids, which has led to IP and publications of research. In 2004, I commenced work at the National Acoustic Laboratories as a member of their research team looking into hearing and hearing aid devices. At the same time I commenced my PhD at the University of Sydney, under the CRC program. In 2010, I was awarded my PhD by the University of Sydney, based on the work describing binaural noise reduction technology for hearing aid applications. This latter work has led to numerous IP and publications of research, which continues to the present day. My immediate goal within the CRC continues to be research in binaural noise reduction technology as well as publication of past research and commercialisation of the IP created in the last few years.

JORGE MEJIA
The Integrated Bioengineering Projects are focused on developing improved hearing aids and implantable devices through application of innovative biomaterials or surface technologies, and improved hearing protection for application in work/leisure environments and call-centre/telephonics.

A key focus of this program is biosafety of new stimulation paradigms and novel biomaterials. Currently, the biosafety of a dexamethasone-coated array is being investigated in the animal model, as well as investigations of approaches to enhancing the electro-neural interface, including use of passive and active (using conductive polymers developed by the Intelligent Polymer Research Institute) delivery mechanisms for dexamethasone, to control the inflammatory response in the cochlea following insertion of electrode arrays.

A focus of this program is on providing support to Cochlear Ltd’s electrode development studies, including temporal bone and surgical insertion studies, as well as first-time-in human studies (FTIH) of new designs. An example is the development of the Hybrid-L electrode array, which has recently been approved for commercial release by the Australian Therapeutic Goods Administration (TGA) and U.S. Food and Drug Administration (FDA). A number of new designs have reached FTIH studies, and this work will continue in the coming year.

Application of polymer technology to development of an implantable sensor design is progressing, and an international patent has been granted for this technology. This work may lead to a successful non-microphone based design for a totally-implanted cochlear implant or improved middle ear implant.

Research into enhanced bone-anchored hearing aids (BAHA) has trialled a novel incision, surgical placement and longer single-stage screw-in process.

Improvements in comfort, safety and intelligibility of hearing devices and protection have been addressed through the Speech-Reference Limiting (SRL) scheme which has been patented internationally (Project R3.6.1). This scheme has been implemented in a Windows Vista version within the personal computer environment to protect listeners of computer delivered speech from uncontrolled speech sounds. Commercial applications are being actively pursued.

An active noise-control hearing protector (Safears™) has been developed and trialled in a variety of work environments (Project R3.6.3). Commercial development of this Mark I prototype is now progressing. Research work is focusing on implementation of the superdirectional bilateral beamformer in a Mark II prototype, improved damp-proofing and ensuring that the design will meet the Intrinsically Safe standard. Development work on an occlusion-cancelling hearing protector has been postponed to allow for focus on implementation of the beamformer algorithms.
FROM TOP:

Safears A-series electronic earmuffs let users hear people and sounds in their environment while protecting the users’ hearing from loud sounds.

High definition microfocus radiography conducted by the HEARing CRC is critical to surgical input into the design of next generation electrode arrays.

After working at Cochlear Ltd Head Office in Sydney for two and half years, I returned to the HEARing CRC in Melbourne (where I undertook my PhD) to work on the Biosafety Studies and Optimisation of the Electro-Neural Interface projects. It has been a busy year for both projects.

Multiple animal studies were conducted on new electrode designs to improve the efficiency and efficacy of cochlear implants. One such study involved the provision of the steroid dexamethasone to the cochlea. The recorded results showed an improvement in hearing thresholds, suggesting the new electrode design with dexamethasone will be useful for the protection of residual hearing. Strong collaborations with the University of Wollongong and Cochlear Ltd have allowed the material properties of these electrodes to be understood and refined.

Recent work has looked at the effect of stimulation on cells grown on electrodes and is showing very small pores may be forming in the cell surface. Large molecular weight dyes that would normally not penetrate the cell membrane have been found within cells exposed to cochlear implant stimulation. This adds to our understanding of the electrode interface and how its properties change with electrical stimulation. I look forward to further developments within both projects over the next 12 months.
The Clinical Tools, Services and Techniques Program comprises projects aimed at improving and individualising hearing lifecycle management to improve outcomes for people with hearing loss, as well as providing greater clinical efficiencies and improved access to clinical services for patients and families living in rural and remote communities.

Key aspects of this work are studies investigating human behaviour, in particular, identifying barriers to uptake of hearing rehabilitation in older adults; barriers to referral for hearing technology and rehabilitation by professionals; and barriers to noise exposure reduction.

In conjunction with WorkCover NSW, the Construction Safety Alliance, the Road Traffic Authority (RTA), the Hire Association and the Civil Contractors Association, a simple noise-labelling system aimed at being applicable to the majority of plant and machinery used in the workplace has been devised. In co-operation with Work Safe Australia, the HEARing CRC and NAL (National Acoustics Laboratory) are involved in “Getting heard: effective prevention of hazardous occupational noise”. Noise levels in randomly-selected worksites are being measured according to the Australian and New Zealand Standard Industrial Classification (ANZSIC) of work places and workers. Currently about 50 randomly selected workplaces have been measured in Sydney, Melbourne and Brisbane.

Finally, NAL has been involved with the Queensland Mining Health Improvement and Awareness Committee over the past year running several working seminars in Brisbane and Mount Isa to raise the profile of noise as a hearing health hazard.

A series of PhD studies aimed at enhancing habilitation in children is investigating factors including: outcomes for children who receive cochlear implants under the age of 12 months; effects of parental involvement in early language development on later benefits of device use; and outcomes for children educated using different approaches. In parallel, a project is being undertaken in collaboration with a Young Learners Project (co-project of The University of Melbourne and the University of Birmingham), investigating associations between family literacy beliefs and practices and how parents interact with their hearing impaired children.

A number of other projects are specifically aimed at developing improved practices for fitting of hearing aids and cochlear implants with the ultimate aim of reducing clinical time as well as providing better outcomes of patients. Improved fitting will be an important development for industry partners to enable rapid expansion of markets, particularly when coupled with research identifying barriers to device uptake and use. The NAL-NL2 prescription procedure has also been derived, and this is now being licenced to international hearing aid and audiological test equipment manufacturers. Testing of new strategies is also being enhanced by the successful development of a large-scale 3-D sound environment at NAL in Sydney. A new study has been added to the profile, to investigate prescription procedures specifically for hybrid devices incorporating both acoustic and electric hearing in the same ear.
A different approach to overcoming barriers to uptake of technology and services is to create processes that can be remotely delivered. Three projects are investigating the following areas: remote training and supervision of clinicians; remote assessment of hearing; and different approaches to remote MAPping of cochlear implants.

A key issue in medicine is evidence-based criteria to guide candidature and device selection, and the HEARing CRC is consolidating outcome data for cochlear implant recipients, primarily through a number of PhD projects investigating adult cochlear implant recipients with unilateral hearing loss, prelingual deafness, early implantation, or greater residual hearing. A large scale parallel study of outcomes for children with hearing impairment (LOCHI Study) has completed its enrolment of 470 children, and will follow these children long-term. Data from this study is already confirming the benefits of early diagnosis and device fitting. A particular sub-group, children who are diagnosed with auditory neuropathy (AN), are being systematically investigated and outcomes of this study will provide evidence to better diagnose different types of AN and select appropriate evidence-based management strategies.

Use of Cortical Auditory Evoked Potentials (CAEPs) as an objective fitting of hearing aids and cochlear implants for infants is being investigated, particularly in regards to the effects of more rapid CAEP stimulus rates that may create clinical efficiencies in using this technique.

I am the Clinical Director of the Hear and Say Centre in Brisbane and have a clinical background in Audiology and Auditory-Verbal Therapy. In 2007, I commenced a Masters of Philosophy at the University of Queensland (UQ) in collaboration with the HEARing CRC and Hear and Say. My research is investigating the validity of remote MAPping of cochlear implants (CI) in children via the internet through the use of the eHAB® video-conferencing system (developed at UQ) and Remote Desktop (a remote programming software). Through the research, procedures for remote MAPping will be developed and participant satisfaction will also be assessed.

The Internet and the ability to use software that remotely controls existing diagnostic and rehabilitative systems have led to many new opportunities in the area of telehealth. As a clinician working with families from rural and remote Queensland, I have witnessed the challenges faced by families who travel long distances to CI clinics and the significant impact on education, family, work life and finances.

Results to date have been promising, showing no significant differences between MAPs obtained in the remote environment versus the traditional face to face environments. Clinically, the long term goal of this research is to integrate the technology into our existing outreach program at Hear and Say and provide a model for telehealth use in other CI programs – thereby improving equity of access.

EMMA RUSHBROOKE

FROM TOP:
Remote cochlear implant MAPping of a child in Samoa by an SCIC audiologist in Sydney. Local Samoan professionals have been trained to facilitate the remote MAPping process with paediatric cochlear implant recipients.

An audiologist in Sydney uses her laptop to send test signals to the headphones on the client (shown on the screen) who is in a health clinic outside Darwin. The linkup also allows for two way conversation between the audiologist and the client during the test.

Remote MAPping of a child with a cochlear implant via the internet using Remote Desktop software and the eHAB® tele-rehabilitation system.
COMMERCIALISATION PROGRAM C1: CLINICAL TRIALS AND PRODUCT DEVELOPMENT

Participants

- Australian Hearing
- Cochlear Ltd
- Siemens Hearing Instruments Pty Ltd
- The University of Melbourne
- Attune Hearing Ltd Pty
- Royal Victorian Eye and Ear Hospital
- Sydney Cochlear Implant Clinic
- The University of Sydney

The Clinical Trials and Product Development Program enables the efficacy of novel HEARing CRC approaches and products to be tested through single or multi-centre feasibility and clinical trials as the first step in the commercialisation process.

A number of new cochlear implant devices, processors, sound coding strategies and arrays have been tested on small groups of subjects. For example, the new Modiolar Research Array (MRA) features a new design which facilitates improved positioning in the cochlear and has been implanted in seven subjects. In addition, research into use of residual hearing in implanted ears has demonstrated improved localisation ability, speech perception in noise, and musical and sound quality ratings in cochlear implant patients using Hybrid L24, the Contour Advance and MRA devices. This work has contributed to Australian TGA and European regulatory approval.

Hearing aid studies were commenced to investigate active occlusion reduction to improve own-voice sound quality, an approach aimed at improving wearability of hearing devices.

A related set of projects addressed the commercialisation of HEARLab hardware and software. This instrument under development with Frye Electronics Inc. can be used to perform aided cortical assessments and cortical threshold evaluation.

Cochlear’s new Modiolar Research Array (MRA)

I have been working with Cochlear Limited for 17 years in clinical research and am the Project Leader for the HEARing CRC C1.1 project, Clinical Trials and Product Validation. This involves conducting clinical studies such as evaluating new sound coding strategies, input processing algorithms, new implant designs, programming procedures, and parameter adjustments to improve hearing outcomes with the cochlear implant. I have recently commenced a multi-centre study to evaluate clinical outcomes for recipients with acoustic hearing, to investigate the factors that may predict clinical outcomes. This is an important area of research in that it will provide guidance to cochlear implant clinicians and recipients as to whether to proceed with a cochlear implant, as well as provide information to assist with device selection where there is acoustic hearing in the ear to be implanted. Highlights of the past year include the evaluation of a number of algorithms and programming recommendations which will be implemented in the next generation sound processor to be developed by Cochlear Limited.
RESEARCH ACTIVITIES

The Members involved with each of the HEARing CRC’s Research and Commercialisation Programs are noted in tables at the start of each Program summary.

Within each Research Program, projects involve multiple Members, either directly in providing personnel or infrastructure, or as advisors providing specific advice.

In order to develop broad understanding and cooperative linkages between projects, the HEARing CRC organised the following:

- In May 2010, Project Leaders were invited to an annual two-day research review at the HEARing CRC headquarters in Melbourne. All project leaders attended this review to present the latest developments on their projects and gather for an informal conference dinner.

- Project leaders were introduced to collaboration tools available through the Australian Research Collaboration Service and were encouraged to utilise these tools to facilitate cross site communications and collaborations including:
  - EVO: a desktop, video collaboration tool
  - DataFabric: a data sharing tool

- Travel funds were made available to members of the project teams to enable face to face communication between researchers in different geographic regions.

- Management team members travel regularly to Melbourne, Sydney and Brisbane to visit individual research partners in their local environments.

- Research Project Coordinators have been appointed and are placed at the University of Melbourne, Macquarie University and the National Acoustic Laboratories to facilitate cohesive collaboration of researchers spread geographically across a number of sites through regular project meetings.

The HEARing CRC has a strong, ongoing collaborative relationship with Cochlear Ltd, one of its core Members, and this association includes:

- hosting four-day Cochlear Implant Training Workshops (this also includes The University of Melbourne and the Royal Victorian Eye and Ear Hospital)
- supporting the Visiting Implant Specialists to Australia (VISTA) Program and Technology Research Laboratories (this also includes The University of Melbourne, Bionic Ear Institute and the Royal Victorian Eye and Ear Hospital)
- presentations on surgical themes

These activities assist with the development of Cochlear Ltd’s market in both Australia and the Asia-Pacific region, helping to maintain and expand its world position.

INTERNATIONAL RESEARCH COLLABORATORS:

The HEARing CRC has a number of international collaborating parties:

- Biotextix
  United States of America
- Kanazawa Institute of Technology
  Japan
- Medizinische Hochschule Hannover
  Germany
- New York University Medical Centre
  United States of America
- The Chinese University of Hong Kong
  Hong Kong
- The University of Auckland
  New Zealand
- The University of Birmingham
  United Kingdom
- The University of California (Irvine)
  United States of America
- The University of Freiburg Cochlear Implant Centre
  Germany
- The University of Toronto Sick Children’s Hospital
  Canada
- The University of Washington
  United States of America
- The University of Wisconsin (Madison)
  United States of America
- Washington University School of Medicine
  (St Louis)
  United States of America

ICA 2014
23 - 27 March
Sydney, Australia
XXXII International Congress of Audiology
www.audiology.asn.au
www.hearingcrc.org

The HEARing CRC, in collaboration with Audiology Australia, is co-hosting the XXXII World Congress of Audiology to be held in Sydney in 2014.
The HEARing CRC research projects operate under a clearly written Project Charter, which includes an identified commercialisation and utilisation strategy. This strategy is updated annually and approved by the Board. In most cases, this anticipates commercialisation through the industry partners directly involved as project participants, or through clinical uptake and use achieved through the network of end-user clinical and professional partners.

The HEARing CRC has adopted a number of strategies to drive end-user uptake of technology, either through interfacing with industry partners, clinical end-users (i.e. audiologists or other hearing healthcare professionals) or through direct contact with adults and children using the technology.

Specific activities within this strategy include:

- promoting practical improvements to clinical procedures that can be easily implemented by clinicians working in the field. These are designed to provide savings in terms of clinical time and cost efficiencies for health services through use of our partner websites, conferences and publications, and specifically through presentations as part of the Continuing Professional Development Program of our core Member, Audiology Australia;
- providing technological innovations under licence to Cochlear Ltd or to Siemens Hearing Instruments Pty Ltd that will lead to commercial products with enhanced performance, new function, or improved process for manufacture;
- providing research reports to Cochlear Ltd which disseminate research project outcomes to a worldwide audience;
- providing technological innovations more widely through direct sales and licensing by HEARworks Pty Ltd, through partnership with our parties (e.g. Australian Hearing) in joint activities, or through the involvement of third parties such as Polaris Communications Pty Ltd;
- providing professional training to surgeons and clinicians through our Cochlear Implant Training Workshop and Visiting Implant Specialist to Australia (VISTA) Program as an additional means of ensuring that research outcomes reach our target audience and are used, and also to facilitate the development and expansion of markets for hearing technology and clinical practice;
- specifically aiming our collaborative professional educational activities to assist our parties in developing new markets, particularly the Asia Pacific region; and
- establishment of HEARnet.

TECHNICAL REPORTS TO PARTIES

Research outcomes in the field of cochlear implants are directly licensed to Cochlear Ltd for worldwide application, providing a global market for Australian research. In many cases, IP is not of a nature that can be codified into patent applications, but rather forms know-how and show-how which is provided as Technical Reports to assist Cochlear Ltd’s research and development. Technical reports are also provided to industry partner Siemens.

FROM TOP:

HEARLab, a new concept in provision of computer-based audiological testing is being commercially released by U.S.-based Frye Electronics Corp.

Soundshield, providing call-centre operators with protection from acoustic shock injury is commercially manufactured and distributed by the Victorian company Polaris Communications.
COMMERCIAL ARRANGEMENTS WITH INDUSTRY

A number of licensing arrangements were concluded with industry in the 2009-10 year. In addition, HEARworks is currently negotiating several licences for use of NAL-NL2 with international hearing aid and audiological test equipment manufacturers.

The following table shows returns from existing licensing activities of HEARworks Pty Ltd during 2009-10.

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<th>TECHNOLOGY</th>
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<td>Molecular Therapeutic</td>
<td>Murigen</td>
<td>First rights licenced</td>
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<td>Speech tests used in LISN-S</td>
<td>NAL - Phonak</td>
<td>Royalty from licence</td>
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<td>HEARLab and NAL-ACA ABR module</td>
<td>Frye Electronics</td>
<td>Royalty from licence</td>
<td>$4k</td>
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<td>NAL-NL2</td>
<td>Siemens</td>
<td>Royalty from licence</td>
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<td>Computer-Aided Speech and Language Assessment software (CASALA)</td>
<td>Multiple individual and group licencees</td>
<td>Royalty from licence</td>
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HEARCooperativeResearchCentre

Annual Report 2009/10
PATENTS

The following table shows patents taken out by HEARworks Pty Ltd and HEARip Pty Ltd during 2008/09.

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<td>AU2009903730</td>
<td>System and method for a spatially tuneable direction of arrival estimator</td>
<td>HEAR IP</td>
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<td>USA 11/576175</td>
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<td>Advanced envelope encoded tone sound processor and system</td>
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<td>Bilateral beamformer for assistive listening devices</td>
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</table>

SPIN-OFF COMPANIES

Microphones Pty Ltd: Established in 2001, Microphones Pty Ltd holds IP developed by the previous CRC HEAR. HEARworks holds 100% of the equity of Microphones. Microphones Pty Ltd has not actively traded since 2007/08 and was formally wound up in 2009. All IP from the company was assigned to HEARworks.

INTELLECTUAL PROPERTY MANAGEMENT

The HEARing CRC is focused on achieving maximum value and impact from its intellectual property, and follows National Principles of IP Management for Publicly Funded Research as promulgated by the Australian Research Centre and IP Australia.

Individual Project Leaders are directly responsible for preparing invention disclosure information that is filed quarterly with their Project Updates. The Annual Project Review provides a checkgate to ensure that registrable and/or intangible intellectual property is properly disclosed and recorded.
The HEARing CRC has:

**a POSTGRADUATE EDUCATION PROGRAM**
that aims to enhance the postgraduate learning experience in order to deliver industry-ready graduates to the field. This is achieved through:

- active involvement of supervisors from non-university CRC partners
- introducing students to non-traditional subject areas such as IP and project management as part of their day to day research.

Our approach will result in improved awareness of the needs of industry in applied research and enhanced employment opportunities for our graduate researchers.

From the opposite perspective, the HEARing CRC is also involved in various industry programs (predominantly through the collaborative relationship with Cochlear Ltd described in ‘4.2 Research Collaborations’) that include elements designed to encourage industry uptake of graduates.

**Participants**

- The University of Melbourne
- Macquarie University
- Australian Hearing Services
- The University of Sydney
- The University of Queensland
- The University of Wollongong

**a PROFESSIONAL EDUCATION PROGRAM**
that aims to increase clinical capacity for the hearing healthcare industry, this is achieved through provision of innovative professional programs and courses for:

- Australia
- Asia Pacific
- World-wide

Our professional education activities help to ensure uptake of new, more efficient technology and clinical practices in the fields of cochlear implants and hearing aids, both in Australia and internationally.

**Participants**

- Cochlear Ltd
- The Royal Victoria Eye and Ear Hospital
- The University of Melbourne
- Audiology Australia

**POSTGRADUATE EDUCATION**

During the 2009-10 reporting period, the HEARing CRC had:

- 25 PhD students (22 in progress, 3 completed); with five new PhD students currently enrolling at their administrative institutes and three further positions under recruitment.
- 1 MPhil student
- 20 Masters of Clinic Audiology and Masters of Engineering project students.

Of these, 11 PhD students and 15 MPhil / Masters project students were newly recruited. One PhD student submitted their thesis during the 2009-10 year, but has not yet graduated; this student has continued his role as a key researcher at the National Acoustics Laboratories with HEARing CRC support.

The current level of student participation is greater that the HEARing CRC’s expected milestone of 22 PhD students by June 2010. Recruitment is on target for 32 PhD students by June 2012.

**Activities**

On the 10th March 2010, Macquarie University held a ‘HEARing CRC Student Research Day’ for all of the Sydney-based CRC students. This provided an opportunity for each of the students to present their research and to network with their local peers. Attended by supervisors and member of the management team, this excellent day also provided an opportunity to discuss the CRCs postgraduate education program.
A similar event was planned for the Melbourne-based PhD students on the 7th June 2010; however this was delayed in favour of a wider gathering of all the CRC students in October 2010. Students will attend a one day workshop titled “presenting scientific information to different audiences” – considering the needs of commercial, academic and lay audiences. Each of the students will then have the opportunity to practice their skills at the inaugural HEARing CRC student symposium on the following day. This event will also encourage networking between students past and present, key note speakers and expert panel members.

Although the HEARing CRC did not offer any direct training courses for its postgraduate students in 2009-10, information was gathered from students and their supervisors about both the type of training that could be accessed through administrative institutes, and topics/areas that would be valuable for the HEARing CRC to focus on. Key findings from this survey indicated that the following areas would be of particular interest for future training:

- Presenting to different audiences
- IP and clinical trials
- Time and project management
- Career development

**Non PhD related activities**

A/Prof Robert Cowan delivers a basic audiology lecture series for The University of Melbourne medical students and also inputs to the University’s Masters in Clinical Audiology training. In July 2010, A/Prof Cowan also provided a series of lectures to the Masters in Clinical Audiology training program at the University of Western Australia.

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### Postgraduate Students Status

<table>
<thead>
<tr>
<th>CRC PROJECT NO.</th>
<th>Name</th>
<th>University</th>
<th>F/P time</th>
<th>Funding</th>
<th>Supervisor(s) (*Supervisor with industry connection)</th>
<th>Status</th>
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</thead>
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<td>R1.1.1b</td>
<td>Helen Glyde</td>
<td>Queensland</td>
<td>P</td>
<td>HEARing CRC staff support (40%)</td>
<td>L Hickson, S Cameron, H Dillon*</td>
<td>Enrolling 09-10</td>
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<tr>
<td>R1.1.3</td>
<td>Dani Tomlin</td>
<td>Melbourne</td>
<td>P</td>
<td>HEARing CRC staff support (40%)</td>
<td>G Rance*, R Cowan*, M Sharma</td>
<td>Enrolling 09-10</td>
</tr>
<tr>
<td>R1.1.3</td>
<td>Pia Glydenkaerne</td>
<td>Macquarie</td>
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<td>HEARing CRC full scholarship</td>
<td>M Sharma, H Dillon*</td>
<td>In progress (new 09-10)</td>
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<tr>
<td>R1.1.3</td>
<td>Imran Dhamani</td>
<td>Macquarie</td>
<td>F</td>
<td>HEARing CRC full scholarship</td>
<td>R Mannell*, M Sharma</td>
<td>In progress (new 09-10)</td>
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<tr>
<td>R2.2.2</td>
<td>Aswin Wijetillake</td>
<td>Melbourne</td>
<td>F</td>
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<td>R van Hoesel, R Cowan*</td>
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<tr>
<td>R2.3.1</td>
<td>Andrew Vandali</td>
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<tr>
<td>R2.3.3</td>
<td>Shuo Wang</td>
<td>Macquarie</td>
<td>F</td>
<td>Macquarie Research Excellence Scheme</td>
<td>R Mannell*, C McMahon* and IPRS</td>
<td>In progress (new 07-08)</td>
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<tr>
<td>R2.3.3</td>
<td>Vijay Marimuthu</td>
<td>Macquarie</td>
<td>F</td>
<td>HEARing CRC full scholarship</td>
<td>R Mannell*, W Thompson</td>
<td>In progress (new 09-10)</td>
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<tr>
<td>R3.2.1</td>
<td>Binbin Zhang</td>
<td>Wollongong</td>
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<tr>
<td>R4.1.1</td>
<td>Andrea Caposseco</td>
<td>Queensland</td>
<td>P/F</td>
<td>HEARing CRC full scholarship</td>
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<tr>
<td>R 4.2.2</td>
<td>Rebecca Summons</td>
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<td>F</td>
<td>Macquarie Research Excellence Scheme</td>
<td>C McMahon*, J McGregor</td>
<td>In progress (new 07-08)</td>
</tr>
<tr>
<td>R 4.2.2</td>
<td>Jamie Leigh</td>
<td>Melbourne</td>
<td>P</td>
<td>IPRS</td>
<td>R Dowell*, S Dettman</td>
<td>In progress (new 07-08)</td>
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<tr>
<td>R4.2.2</td>
<td>Coleen Holt</td>
<td>Melbourne</td>
<td>F</td>
<td>IPRS</td>
<td>S Dettman, J Fletcher, R Dowell*</td>
<td>In progress (new 08-09)</td>
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</table>
### Postgraduate Students Status (cont.)

<table>
<thead>
<tr>
<th>CRC PROJECT NO.</th>
<th>Name</th>
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<th>Supervisor(s) (*Supervisor with industry connection)</th>
<th>Status</th>
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<tr>
<td>R4.2.2</td>
<td>Ennur Ersabi Yanbay</td>
<td>Queensland</td>
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<td>HEARing CRC full scholarship</td>
<td>L Hickson, D Dornan</td>
<td>In progress [new 09-10]</td>
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<tr>
<td>R4.2.2</td>
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<td>Melbourne</td>
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<td>HEARing CRC full scholarship</td>
<td>S Dettman</td>
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<tr>
<td>R4.4.2</td>
<td>Christopher Wong</td>
<td>Sydney</td>
<td>F</td>
<td>Garnett Passe and Rodney Williams Memorial Foundations and HEARing CRC top up scholarship</td>
<td>S O’Leary*, I Curthoys, A Jones*</td>
<td>In progress [new 08-09]</td>
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<tr>
<td>R4.6.1</td>
<td>Isabelle Boisvert</td>
<td>Macquarie</td>
<td>F</td>
<td>Macquarie Research Excellence Scheme and HEARing CRC top up scholarship</td>
<td>C McMahon*, B Lyxell</td>
<td>In progress [new 08-09]</td>
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<tr>
<td>R4.6.1</td>
<td>Alex Rouset</td>
<td>Melbourne</td>
<td>F</td>
<td>IPRS</td>
<td>R Dowell, G Rance*, D Sly</td>
<td>In progress [new 09-10]</td>
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<tr>
<td>R4.6.4</td>
<td>Kirsty Gardiner-Berry</td>
<td>Sydney</td>
<td>F</td>
<td>IPRS</td>
<td>H Dillon*, S Purdy, S Carlile*</td>
<td>In progress [new 07-08]</td>
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<tr>
<td>R4.6.4</td>
<td>Karen Bate</td>
<td>Macquarie</td>
<td>P</td>
<td>IPRS</td>
<td>C McMahon*</td>
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<tr>
<td>R4.6.4</td>
<td>Aseel Almeqbel</td>
<td>Macquarie</td>
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<td>HEARing CRC full scholarship</td>
<td>C McMahon*</td>
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<tr>
<td>R4.6.5</td>
<td>Kate Crowe</td>
<td>Charles Sturt</td>
<td>P</td>
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<td>T Ching</td>
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</table>

My research project, *The Outcomes of Cochlear Implantation in a Sound Deprived Ear* stemmed from a recurring dilemma I faced as an audiologist for the Quebec cochlear implant program in Canada. The dilemma was choosing which ear to implant for people who had not had any hearing in one ear for many years. Some clinicians support the implantation of the recently stimulated ear, following the assumption that this would lead to higher outcomes with the implant. Others support the preservation of the remaining hearing in the non-deprived ear and thus prefer implanting the sound-deprived ear. I elaborated on a multi-centre research project, with a retrospective and prospective component, to compare the outcomes of implantation in the sound-deprived ear and in the non-deprived ear. In addition to the usual tests done in clinics, the project included testing of cognitive abilities that could be related to the outcomes and objective electrophysiology tests. I was awarded a scholarship at Macquarie University, began my PhD in 2009 and joined the HEARS research group in Sweden doing research on hearing and deafness.

I joined the Hearing CRC soon after, which gave me invaluable academic, organisational and financial support to strengthen the quality of the research. This help has been of great importance as the project has evolved to include data from seven clinics located in three countries. The main part of the data collection is now done and the beginning of its analysis has stirred up motivation to try and understand underlying processes involved in the outcomes of implantation.

**ISABELLE BOISVERT**

*continued on page 31*
### Postgraduate Students Status (cont.)

#### PHD

<table>
<thead>
<tr>
<th>CRC PROJECT NO.</th>
<th>Name</th>
<th>University</th>
<th>F/P</th>
<th>Funding</th>
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<td>R4.6.6</td>
<td>Paola Incerti</td>
<td>Melbourne</td>
<td>P</td>
<td>HEARing CRC staff support (60%)</td>
<td>T Ching, R Cowan*</td>
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<tr>
<td>R4.7.1</td>
<td>Fabrice Bardy</td>
<td>Macquarie</td>
<td>F</td>
<td>HEARing CRC full Scholarship and Oticon Foundation sponsorship</td>
<td>C McMahon, H Dillon*, B van Dun</td>
<td>Enrolling 09-10</td>
</tr>
<tr>
<td>C1.1.1</td>
<td>Kerrie Plant</td>
<td>Melbourne</td>
<td>P</td>
<td>HEARing CRC staff support (100%)</td>
<td>R Cowan*</td>
<td>In progress (new 09-10)</td>
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<td>E6</td>
<td>Jorge Mejia</td>
<td>Sydney</td>
<td>P</td>
<td>CRC HEAR staff support (National Acoustics Laboratories)</td>
<td>S Carlile*, H Dillon*</td>
<td>Handed in thesis 09-10; not yet graduated</td>
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<tr>
<td>E9</td>
<td>George Raicevich</td>
<td>Swinburne</td>
<td>P</td>
<td>CRC HEAR staff support (National Acoustics Laboratories)</td>
<td>P Seligman*, A Klein, R Cowan</td>
<td>Completed 08-09</td>
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<tr>
<td>E11</td>
<td>Brett Swanson</td>
<td>Melbourne</td>
<td>P</td>
<td>Cochlear Ltd staff support to CRC HEAR</td>
<td>P Blamey, High McDermott, J Patrick*</td>
<td>Completed 08-09</td>
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<tr>
<td>E13</td>
<td>Andy Zhang</td>
<td>Melbourne</td>
<td>P</td>
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#### MPhil

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<td>4.5.3</td>
<td>Emma Rushbrooke</td>
<td>Queensland</td>
<td>P</td>
<td>Hear and Say Centre</td>
<td>L Hickson, B Henry</td>
<td>In progress (new 07-08)</td>
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</table>
6: EDUCATION AND TRAINING

PROFESSIONAL EDUCATION

The HEARing CRC is involved in a number of Professional Education activities, including:

Specialist Certificate in Clinical Research
With A/Prof Robert Cowan as the coordinator, the HEARing CRC has continued to support The University of Melbourne’s Specialist Certificate in Biomedical Research Management, offered through Melbourne Consulting and Custom Programs.

The course is run once a year, in two four-day blocks (usually August and October), open to all potential attendees. It is aimed at developing the skills required to be an effective biomedical research manager – covering areas that such individuals must be conversant with and make decisions about in order to develop sound biomedical research project plans and budgets. The course also tackles proactive management and communication of projects where uncertainty is ‘the norm’. Course assessment is built around demonstrating the ability to apply skills learned to a real work based project. Feedback has been very positive.

International Cochlear Implant Training workshops
The HEARing CRC has continued to conduct four-day Cochlear Implant Training Workshops for surgeons and clinicians from Australia and Asia Pacific regions. The Program, started in 1992, is an effective means of helping to develop the necessary infrastructure in Australia and key developing markets, such as Asia Pacific, to promote better uptake of cochlear implant and hearing aid technology.

Two Workshops were held during the reporting period and details of which are shown below. There are usually three workshops held per year, but due to slight changes in timing, a third and forth workshop fell into the 2010/11 financial year.

<table>
<thead>
<tr>
<th>JULY 2009</th>
<th>ADVANCED PROBLEM SOLVING</th>
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<tr>
<td>14 attendees</td>
<td>5 countries</td>
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<table>
<thead>
<tr>
<th>OCTOBER 2009</th>
<th>GENERAL WORKSHOP</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 attendees</td>
<td>9 countries</td>
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</table>

ATTEES CAME FROM THE FOLLOWING COUNTRIES

- Australia
- China
- India
- Korea
- Malaysia
- New Zealand
- Philippines
- Saudi Arabia
- Singapore
- South Korea

The workshops are coordinated by the HEARing CRC in collaboration with staff from:

- Cochlear Ltd
- Royal Victorian Eye and Ear Hospital
- The University of Melbourne
- The Royal Australasian College of Surgeons

General Cochlear Implant Training Workshop
- for surgeons, clinicians and other healthcare professionals working with adults, attendees include:
  - researchers and professionals seeking to gain a generalised knowledge of cochlear implant technology and management
  - surgeons or clinicians embarking on new cochlear implant programs with adult patients
  - experienced clinicians wishing to review procedures and management techniques / update their knowledge of hardware and speech processing

The Workshop is conducted through a mix of formats including lectures, small group discussions and tutorials. Individual sessions cover history of the development and underpinning research, candidacy, cochlear implant system hardware and function, programming, medical/surgical considerations, habilitation, outcomes evaluation and new directions in research. The Workshop includes programming tutorials providing direct experience with implant users. A series of comprehensive audiovisual presentations (including interactive video link to a live cochlear implant surgery) and an extensive reference manual are provided.

The optional temporal bone/surgical Workshop for surgeons runs in concurrent sessions over days two and three. This Program includes a hands on temporal bone workshop, plus tutorial-format discussion of surgical technique and medical management issues with experienced surgeons.
6: EDUCATION AND TRAINING

‘I REALLY ENJOYED THE CASE STUDIES - THEY GAVE US ‘REAL LIFE’ EXPERIENCE OF WORKING THROUGH A CASE AND I FOUND THESE INVALUABLE.’

‘THE WORKSHOP HELPED ME TO UPDATE MY SKILLS AND ALSO PROVIDED ME WITH PRACTICAL SOLUTIONS FOR THE PROBLEMS WHICH I FACE IN MY CLINIC.’

‘AS A CLINICIAN, I FOUND THE PRESENTATION VERY INFORMATIVE AND USEFUL.’

Feedback from attendees of the October 2009 Cochlear Implant Training Workshop

Advanced Problem Solving Workshop - allows experienced clinicians and surgeons to explore difficult programming, surgical and clinical management issues through case study examples and discussions.

The Advanced Problem Solving Workshop caters for the needs of experienced surgeons and clinicians looking for more detailed information and expertise relevant to the management of the more difficult patient, including those with cochlear abnormalities, complex ENT/medical problems, programming problems or issues requiring individual or specialised management, rehabilitation or evaluation.

The Workshop specifically addresses some of the issues relevant to the variability in outcomes across patients, and provides examples of the means for dealing with specific problem cases. Attendees are encouraged to bring their own cases for discussion.

Audiology Australia – Continuing Professional Development (CPD)

Various HEARing CRC Members and individual Project Leaders contribute to Audiology Australia’s CPD events and are involved in activities that are endorsed through their established CPD Program.

One particular session of note was hosted by Adjunct Prof Harvey Dillon and colleagues (Bram Van Dun, Louise Carter and Kirsty Gardner-Berry) during the Audiology Australia National Conference (May 2010). This hearing aid symposium titled “Specialised evaluation of hearing aid fitting to infants using assessment of evoked cortical responses” addressed ability in infants to detect speech. Simply, this ability (or lack of ability) can be assessed by measuring the cortical potentials evoked by speech sounds at conversational levels, while the child wears hearing aids or cochlear implant(s).

Visiting Implant Specialists to Australia (VISTA) and Technology Research Laboratory

The VISTA Program is run in conjunction with Cochlear Ltd and provides the opportunity for ENT surgeons from around the world to receive updated information regarding research and development in the field of cochlear implants and to exchange ideas and strategies during a week long tour in Sydney and Melbourne.

The Technology Research Laboratory is also run in association with Cochlear Ltd. This program is similar to VISTA but includes a temporal bone workshop.

In November 2009, VISTA was held for a European group and in February 2010, a second VISTA group from Chile attended. In May 2010, a very successful Technology Research Laboratory was held.

Sponsorship

The HEARing CRC sponsored the 2nd Asia-Pacific Symposium on Nanobionics, held in Wollongong on 9-11 June 2010. In addition, through donation of A/Prof Cowan’s time, the HEARing CRC also sponsored Audiology Australia’s biennial national conference in May 2010. Investment in such events supports knowledge transfer in the field as well as providing valuable opportunity to networking, building collaborations and career development.

In September 2009, HEARWorks sponsored the Deafness Foundation by providing a painting by artist Peter Churcher for auction. The auction was held to raise money for the Deafness Foundation’s Financial Grants Program which supports research projects as well as other projects that benefit the deaf and hearing impaired.
A fundamental tenet of the HEARing CRC’s clinical research is that communication is essential to an individual’s ability to interface with and contribute to our society. As such, hearing loss affects the individual by limiting communication. Similarly for the HEARing CRC, communication is fundamental to achievement of outcomes, particularly given our diverse stakeholder group.

**EXTERNAL COMMUNICATIONS**

The HEARing CRC has actively pursued opportunities to raise awareness of its activity in the audiology research and wider research fields, as well as to government decision makers and the public. These opportunities included:

- launching a new look website in November 2009
- publishing articles in Member’s and industry newsletters and magazines
- commenting in local, national and international media
- applying for prominent awards/prizes; and
- contributing to public events, such as National Hearing Week and Science Week.

**INTERNAL COMMUNICATIONS**

Given the geographical separation of our Member organisations and hence some of our project team members, internal communication is strongly supported and encouraged. Regular teleconferences or video conferences, organised by the Research Project Coordinators, have been assisted by the utilisation of the Australian Research Collaboration Service’s “EVO”, a desktop video collaboration tool.

Other communication activities included:

- project leaders being invited to an annual two-day research review at the HEARing CRC headquarters in May 2010 where they presented the latest developments on their projects and gathered for an informal conference dinner
- scheduling meetings in both Melbourne and Sydney, so that our Board and Executive members have the opportunity to visit individual partners in their home environments

**KNOWLEDGE TRANSFER**

Knowledge transfer of research findings and outcomes are a vital element of the HEARing CRC communication strategy, this occurs primarily through:

- conference presentations and invited keynote addresses at Australian and international scientific meetings
- publication of peer-reviewed journal articles and conference proceedings
- publication in Member’s and other relevant organisation’s newsletters and magazines

Communication with, and knowledge transfer to, discrete stakeholder groups is made possible via our close working relationships with Members, for example:

- Results of clinical studies in relation to cochlear implants are distributed to clinical specialists, product managers and marketing staff within Cochlear Ltd via Technical Reports for training purposes and to address product related issues
- Similarly, outcomes of hearing aid and clinical activities are widely disseminated through Australian Hearing’s clinical services and through Audiology Australia (the professional association of audiologists). These communications reach clinicians working with end-users of hearing rehabilitation technology and services
Through these activities, as well as Continuing Professional Development (CPD) activities in support of Audiology Australia, the HEARing CRC has developed and nurtured links with clinicians in the fields of cochlear implants and hearing aids. Building this reputation is also a fundamental element of the Education and Training Program, providing commercial and professional input to the teaching Program for surgeons, clinicians and other healthcare professionals.

**HEARNET**

The HEARing CRC launched the HEARing Education and Research Network (HEARnet) during the 2007-08 year. The development of the HEARing CRC website, which launched this year, has created an ideal platform for this resource. HEARnet will aim to:

- enhance the translation of research outcomes into clinical practice for the benefit of adults, children and their families managing hearing loss
- improve community knowledge of the risks of noise induced hearing loss
- provide a new mechanism for the HEARing CRC to develop linkages by identifying parties with aligned interests and research

**END-USER INVOLVEMENT AND CRC IMPACT ON END-USERS**

The HEARing CRC works with Cochlear Ltd to host Cochlear Implant Training Workshops, presentations on surgical themes and supervised cochlear implant surgeries in India and China to assist with development of this market. The CRC also actively supports Cochlear Ltd’s Visiting Implant Specialists to Australia (VISTA) Program, providing vital assistance in maintaining and expanding its world position.

Outcomes of clinical studies are disseminated in peer-reviewed publications, Technical Reports, Research Reports and special papers produced by Cochlear Ltd and Australian Hearing. These are distributed to clinical specialists, product managers and marketing staff within Cochlear Ltd for training purposes and to address product issues.

**EXCELLENCE IN INNOVATION**

In May 2010, the HEARing CRC received a CRC Association Award for Excellence in Innovation at the CRC Association conference in Alice Springs.

The award was in recognition of the HEARing CRC’s contribution to the successful development of Cochlear Limited’s Cochlear™ Hybrid™ System, in particular for the development of the Hybrid-L electrode array. The award recognised the contributions of the HEARing CRC, and its Members Cochlear Limited, The University of Melbourne and the Royal Victorian Eye and Ear Hospital - Cochlear Implant Clinic.
<table>
<thead>
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<th>Term</th>
<th>Definition</th>
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<tr>
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<td>Three-dimensional</td>
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<tr>
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<td>Australian Business Number / Australian Company Number</td>
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<tr>
<td>CT</td>
<td>Computed Tomography</td>
</tr>
<tr>
<td>DIISR</td>
<td>Department of Innovation, Industry, Science and Research</td>
</tr>
<tr>
<td>Di-EL</td>
<td>Diary of Early Learning</td>
</tr>
<tr>
<td>ENT</td>
<td>Ear, Nose and Throat</td>
</tr>
<tr>
<td>ENU</td>
<td>N-ethyl-N-nitrosourea</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>F&amp;A Committee</td>
<td>Finance and Audit Committee</td>
</tr>
<tr>
<td>FAL</td>
<td>Francis Abourizk Lightowlers</td>
</tr>
<tr>
<td>FDA</td>
<td>Food and Drug Administration (USA)</td>
</tr>
<tr>
<td>HEARnet</td>
<td>Hearing Education and Research Network</td>
</tr>
<tr>
<td>IP</td>
<td>Intellectual Property</td>
</tr>
<tr>
<td>MEG</td>
<td>Magnetoencephalographic imager</td>
</tr>
<tr>
<td>MClInAud</td>
<td>Masters of Clinical Audiology</td>
</tr>
<tr>
<td>MPhil</td>
<td>Masters of Philosophy</td>
</tr>
<tr>
<td>MRA</td>
<td>Modiolar Research Array</td>
</tr>
<tr>
<td>N&amp;A Committee</td>
<td>Nominations and Appointments Committee</td>
</tr>
<tr>
<td>PhD</td>
<td>Doctor of Philosophy</td>
</tr>
<tr>
<td>QC</td>
<td>Queens Counsel</td>
</tr>
<tr>
<td>SRL</td>
<td>Speech Referenced Limiting</td>
</tr>
<tr>
<td>TGA</td>
<td>Therapeutic Goods Administration</td>
</tr>
<tr>
<td>VISTA</td>
<td>Visiting Implant Specialists to Australia</td>
</tr>
</tbody>
</table>
PEER REVIEWED JOURNAL ARTICLES (PUBLISHED)


CONFERENCE PRESENTATIONS


2: Beach, EWilliams, WGilliver, M. Earplugs for Clubbers: ‘Once you get used to them, you can’t do without them’. Audiology Australia 19th National Conference 2010, Sydney, Australia, May 2010.


17: Carpinelli M, Bouillet P, Burt R. Bcl-2 and Bak but not Bim are required during auditory system development. Lorne Cancer Conference 2010, Lorne, Vic, Australia, February 2010.


19: Ching TYC. Language development of children with bimodal fitting or bilateral cochlear implants. 1st Phonak Virtual Ear Foundation Conference, Online, September 2009.


26: Convery E, Keidser G. **The perceptibility, acceptability, and benefit of gain transitions among experienced hearing aid users with moderately severe to profound hearing loss.** The Absolutely Audiology videoconference for Australian Hearing Adult Specialists, Sydney, Australia, December 2009.


28: Convery E, Keidser G. **The perceptibility, acceptability, and benefit of transitioning to new gain targets in experienced hearing aid wearers with moderately severe to profound hearing loss.** The 30th International Congress of Audiology 2010, Sao Paulo, Brazil, March 2010.


30: Cowan R. **Pathways to effective deployment of end-user driven research.** Innovation 2009: Business & Higher Education Round Table Conference, Sydney, Australia, September 2009.


34: Cowan R. **Impact and application of new technologies & innovation to cochlear implants.** The 30th International Congress of Audiology 2010, Sao Paulo, Brazil, March 2010.

35: Cowan R. **Impact and application of new technologies & innovation to cochlear implants.** The 30th International Congress of Audiology 2010, Sao Paulo, Brazil, March 2010.


37: Cowan R. **Impact of new technology on options for hearing remediation.** 8th National Deafblind Conference, Melbourne, Australia, April 2010.


67: Gardner-Berry K, Purdy SC, Dillon H. Can a gap detection response be measured in babies with normal hearing using cortical auditory evoked potentials (CAEPs) and is the response symmetric between left and right ears?. 21st Biennial Symposium of the International Evoked Response Audiometry Study Group (IERASG), Rio de Janeiro, Brazil, July 2009.


69: Gilliver M, Williams W. Hear no evil: Encouraging construction workers to reduce their noise exposure. Colloquium of the ISSA (International Section for Research on Prevention), Dresden, Germany, October 2009.


75: Keidser G, Dillon H, Ching TYC, Flax M. NAL-NL2. 9th Connexx Pro Workshop, Nyborg Strand, Denmark, August 2009.


83: Maiorca M, Stevenson D, O’Leary S. A conventional CT-based method for imaging the intracochlear position of cochlear implant electrodes in the clinic. 11th International Conference on Cochlear Implants and other Implantable Auditory Technologies, Stockholm, Sweden, July 2010.


### PUBLICATIONS

<table>
<thead>
<tr>
<th>Number</th>
<th>Title</th>
<th>Details</th>
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</thead>
<tbody>
<tr>
<td>106</td>
<td>Williams W.</td>
<td>Health effects and the surveillance of noise-induced hearing loss. Queensland Mining Health Improvement and Awareness Committee, Brisbane, Australia, September 2009.</td>
</tr>
<tr>
<td>107</td>
<td>Williams W.</td>
<td>Health effects and the surveillance of noise injury - the importance of early prevention. Seminar on Noise in Mining Assessment and Control, Woolloongabba, Qld, Australia, September 2009.</td>
</tr>
</tbody>
</table>
### CONFERENCE PROCEEDINGS (PUBLISHED)


### BOOKS


Changes in biphasic electrode impedance with protein adsorption and cell growth

Carrie Newbold1, 2, Rachael Richardson3, Rodney Wilson5, 6, 7, 8, Christelle Huang9, Danus Milojkovic9, Robert Shepher10, and Robert Cowan11

1. The Hearing CRC, CRL, Australia
2. Department of Otolaryngology, University of Melbourne, Melbourne, Australia
3. Cochlear Ltd, Lane Cove, Australia

Abstract

This study was undertaken to assess the contribution of protein adsorption and cell growth to increases in electrode impedance that occur immediately following implantation of cochlear implant electrodes and other neural stimulation devices. An in vivo model of the extracochlear tissue interface was used. Radiopharmaceutical in phosphate buffered saline was added to phase gold electrodes and electrode impedance measured using a charge-balanced biphasic current pulse. The polarisation impedance component increased with protein adsorption, while no change in access resistance was observed. The maximum level of protein adsorption was measured at 8.5 g/ml, indicating a tightly packed monolayer of albumin molecules on the gold electrode and steel substrate. Different cell types were grown on the electrodes, including cell line 2774, dispersed aferent and efferent cell line 8990, and all of which exhibited an increase in electrode impedance. As cell adhesion and cell growth increased, there was a corresponding increase in the initial rise in voltage, suggesting that cell cover would markedly contribute to the access resistance of the electrode. Only a small increase in the polarization component of impedance was seen with cell cover.

Introduction

Following implantation of any foreign substance, the body responds to the invader and removes any debris from the area. With large biomaterial implants such as cochlear implants and other neural devices, where removal is not possible, foreign tissue is formed that effectively seals the foreign body, separating it from the rest of the body.

Studies in several animal models have shown a correlation between changes in extracellular electrode impedance and the degree of tissue growth around the electrode array (Oliver et al., 1998, No et al., 1997).Chairman of the Surgeons (1998), Shepher et al., 1998). This has also been observed in other implantable electrodes such as cardiac pacemakers and subcutaneously implanted electrodes (Oberlin et al., 1995, Ord and Marriott, 1999). A fine version of the Melbourne/Cochlear Ltd electrode array with extracellular surface area of around 6.36 mm² was used to assess impedance changes following implantation in the cochlea (Oliver et al., 1997, Shepher et al., 1998). Prior to implantation, the total electrode impedance measured at 2.3 and 3.3 k2. These values were observed to increase over time by varying amounts following extracellular implantation, from 2.3 to 6.4 k2. One case showed an increase in access resistance of over 12 k2. A correlation was found between the rise in impedance and the tissue vascular capacity and the incidence of inflammatory cells near the array (No et al., 1992).

There are two methods of describing the changes in electrode impedance of cochlear implant electrodes. In this paper, we use total impedance (Z1) as a measure of the impedance of the array to the loss of the cochlear implant.
The HEARing CRC Ltd was established for the purposes of managing and conducting the activities of the HEARing Cooperative Research Centre, established and funded under the Commonwealth of Australia Cooperative Research Centres Program. The HEARing CRC Ltd is established and operates under its Constitution, and a Members’ Agreement amongst its five Core Members and 21 Support Members. Under the terms of this Agreement, the composition of the Board includes the Chairman, one nominee director from each of the five Core Members (namely Australian Hearing, Cochlear Limited, Macquarie University, Siemens Hearing Instruments Pty Ltd, and The University of Melbourne), the CEO and a number of independent directors. In addition, each of the five nominee directors have rights to appoint an Alternate to the Board.

The directors of the Company at any time during or since the end of the reporting period are:

- **Richard Searby**
  AO QC MA(Oxon) HonLLD(Deakin)
  Chairman
  Independent

- **Robert Cowan**
  BSc (Hons) MBA PhD(Melb) DipAud GrCertHealth Economics GrDipTechMgt FAudSA(CCP) MAICD
  Director and Chief Executive Officer

- **Michele Allan**
  BSc PhD GAICD FAICD
  Director
  Independent
  Appointed 8th December 2009.

- **Robin Evans**
  BE PhD(Newcastle)
  Director
  Nominee Director (The University of Melbourne)

- **Kathryn Greiner**
  AO BSoCWork
  Director
  Nominee Director (Australian Hearing)

- **Neville Mitchell**
  BComm CA(SA) CA
  Director
  Nominee Director (Cochlear Limited)

- **Jim Piper**
  BSc(Hons) PhD(Otago)
  Director
  Nominee Director (Macquarie University)

- **Barry Roberts**
  FCPA FCIS
  Director
  Nominee Director (Siemens Instruments Pty Ltd)

- **Lisa Springer**
  BSc PhD GAICD
  Director
  Independent
  Appointed 14th December 2009.

- **Dominic Jenkins**
  Bachelor of Economics
  Alternate director (for Mr Barry Roberts)

- **Jim Patrick**
  BSc MSc MIE(AUST) CPE(Biomed) FTSE
  Alternate director (for Mr Neville Mitchell)

- **Steven Grundy**
  DIP(MaritimeStudies) DIP(BusAdmin)
  Alternate director (for Ms Kathryn Greiner)

Note: the biographies of Directors, included in the Annual Report and forming part of this report, have been provided on pages 10-11 of this report.
2: COMPANY SECRETARY

The Company Secretary as at 30 June 2010 was Mrs Lisa Norden, who also acts as Chief Financial Officer (CFO) of the Company.

Mrs Norden has 20 years of financial experience in industry and not-for-profit organisations. Her qualifications include Certified Practicing Accountant (CPA), Chartered Secretaries Australia Corporate Governance Graduate Diploma and Australian Institute of Company Directors Course Diploma. Mrs Norden was appointed Company Secretary on 10 April 2009.

3: DIRECTORS’ MEETINGS

The number of directors’ meetings (including meetings of Board committees of directors) and number of meetings attended by each of the directors of the Company during the financial reporting period are as shown in the following table:

Table of Meetings

<table>
<thead>
<tr>
<th>Director</th>
<th>Board Meetings</th>
<th>Finance &amp; Audit Committee Meetings</th>
<th>Nominations &amp; Appointments Committee Meetings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>Richard Searby – Chairman</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Robert Cowan</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Michele Allan</td>
<td>1</td>
<td>2</td>
<td>n/a</td>
</tr>
<tr>
<td>Robin Evans</td>
<td>4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Kathryn Greiner</td>
<td>3</td>
<td>3</td>
<td>n/a</td>
</tr>
<tr>
<td>Neville Mitchell</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Jim Piper</td>
<td>3</td>
<td>4</td>
<td>n/a</td>
</tr>
<tr>
<td>Barry Roberts</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Lisa Springer</td>
<td>2</td>
<td>2</td>
<td>n/a</td>
</tr>
<tr>
<td>Dominic Jenkins (Alternate)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Steven Grundy (Alternate)</td>
<td>1</td>
<td>1</td>
<td>n/a</td>
</tr>
<tr>
<td>Jim Patrick (Alternate)</td>
<td>0</td>
<td>0</td>
<td>n/a</td>
</tr>
</tbody>
</table>

A  Number of meetings attended
B  Number of meetings held during the time the director held office during the year
*  Whilst the CEO is not a member of the Finance & Audit Committee, it is Company practice for the CEO and CFO to be in attendance at all F&A meetings.
**4: CORPORATE GOVERNANCE**

The Board of Directors is accountable to the Commonwealth Government and to the Members for the governance, management and control of the activities, business and affairs of the Company.

Currently the Board comprises an independent Chair, nominee Directors for each of the five Core Members of the HEARing CRC (Australian Hearing Services, Cochlear Limited, Siemens Hearing Instruments Pty Ltd, Macquarie University and The University of Melbourne), two independent non-executive directors and its Chief Executive Officer (CEO). In 2008, the HEARing CRC Ltd Constitution was amended to allow appointment of alternate directors for the five nominee directors, consistently with the terms of the HEARing CRC Members’ Agreement.

The HEARing CRC operates under the terms and guiding doctrines of: its Constitution, the Member’s Agreement for the establishment and operation of the HEARing Cooperative Research Centre, an agreement amongst each of the individual Members and the HEARing CRC Ltd; and the agreement between the Commonwealth of Australia and the HEARing CRC Ltd (Commonwealth Agreement). The HEARing CRC follows good practice as recommended by ASX corporate governance practices.

To assist the Board in fulfilling its duties, it has established two committees: [1] Finance and Audit; and [2] Nominations and Appointments. Details of each of these committees are stated below. The day-to-day management of the Company has been delegated to the CEO and through him, the Management Team.

The HEARing CRC has also clarified the structure of its intellectual property trusts and management arrangements with its commercial arm HearWorks Pty Ltd. In respect of this, the Members and HEARing CRC Ltd have signed a Deed of Revocation and Appointment in July 2009 to terminate HearWorks Pty Ltd as Trustee of the HEARing CRC Intellectual Property (IP) Trust, and to appoint Hear IP Pty Ltd (ACN 134 173 854) as Trustee, to operate the HEARing CRC IP Trust under the terms of the HEARing CRC IP Trust Deed.

HearWorks Pty Ltd is the Trustee for the CRC HEAR Intellectual Property Trust.

HearWorks Pty Ltd is the commercial arm of the HEARing CRC, and manages commercial activities in regards to the commercialisation of intellectual property held in both the CRC HEAR Intellectual Property Trust and the HEARing CRC Intellectual Property Trust.

**4.1: Finance and Audit Committee**

The Finance and Audit Committee assists the Board by providing oversight of the financial operations and affairs of the Company. This Committee also oversees the relationship with the external auditor, and the process of identification and management of business, commercial and financial risks. For the reporting period this committee met four times and the members’ attendance record is disclosed in the table of meetings. It is Company practice that the CEO attends meetings of this Committee.

The members of the Finance & Audit Committee during the period were:

- Mr Barry Roberts (Chair)
- Mr Richard Searby (ex officio)
- Prof Robin Evans
- Mr Neville Mitchell

**4.2: Nominations and Appointments Committee**

The Nominations and Appointments Committee assists the Board by making recommendations on the appointment and remuneration of directors of the HEARing CRC and HearWorks Pty Ltd. If required, this Committee also assists in the appointment of a Chairman, or CEO, and in making recommendations on the remuneration of these officers. For the reporting period this committee met four times and the members’ attendance record is disclosed in the table of meetings. It is Company practice that the CEO attends meetings of this Committee.

The members of the Nominations and Appointments Committee during the year were:

- Ms Kathryn Greiner (Chair)
- Mr Barry Roberts
- Mr Richard Searby (ex officio)
4.3: Risk management

Oversight of the risk management system

The Board oversees the establishment, implementation and annual review of the Company’s Risk Management System, coordinated through the Finance and Audit Committee. The Chief Executive Officer and the Chief Financial Officer have advised the Board, that the financial reporting risk management and associated compliance and controls have been assessed and found to be operating efficiently and effectively. A risk review will take place in the coming weeks.

4.4: Communication with members

The Company’s Members have met on one occasion (AGM 2009) during the reporting period to review the Company’s establishment and activities.

Informal communication with Members occurs on a regular basis by means of an integrated email network, and by regular face-to-face meetings with the CEO, management team members and project leaders. A travel budget for this activity has been provided. Internal news is provided to the Members by email and a full annual report of activities is provided to the Members once per annum.

In addition, the “HEARing Education and Research Network of Australia” (HEARnet), has been established to increase communication amongst the Members, and with other research agencies and the public who have an interest in HEARing research. This is a primary technology transfer activity which will assist in ensuring that the wider community is informed of developments of HEARing CRC research, and increases the potential that clinical developments will achieve widespread uptake and use.

5: PRINCIPAL ACTIVITIES

The principal activities of the HEARing CRC are to undertake collaborative research into hearing loss prevention and mitigation leading to innovative products, processes and services that address the economic impact of hearing loss on the Australian economy.

Through education and commercialisation of research findings, the HEARing CRC and its Members aim to reduce the incidence of hearing loss and increase the effectiveness of treatments for hearing loss and associated disorders.

Its research program comprises a range of collaborative research projects in the following areas:

1: Biomolecular/Genetic/Physiological solutions to hearing loss;
2: Intelligent Sound Processing;
3: Integrated Bio-engineering; and
4: Clinical Tools, Services and Techniques.

The HEARing CRC is recognised as a health promotion charity by the Australian Taxation Office.

6: REGISTERED OFFICE

550 Swanston Street
Audiology, Hearing and Speech Sciences
The University of Melbourne
Victoria 3010

7: OPERATING AND FINANCIAL REVIEW

Total income for the year was $24,563,000 (2009: $20,200,000), which is matched by expenditure, resulting in a nil result for the year. The income for the period includes all cash contributions of the Members to the HEARing CRC and we take this opportunity to thank these Members.

8: ENVIRONMENTAL REGULATIONS

As a clinical research entity, the HEARing CRC is subject to clinical regulatory requirements and legislation governing such activity in Australia.

The Company is aware of and abides by National Health and Medical Research Council (NH&MRC) guidelines, Australian Research Council (ARC) guidelines and Australian Research Ethics Committee (AREC) guidelines. The Company’s operations are not subject to any significant environmental regulation under either Commonwealth or State legislation. However, the Board believes that the Company has adequate systems in place for the management of its environmental obligations and requirements, and is not aware of any breach of those requirements as they apply to the Company.
9: DIVIDENDS

The HEARing CRC is limited by guarantee and has no share capital. The directors of the HEARing CRC are precluded by the Company’s Constitution from declaring a dividend.

10: EVENTS SUBSEQUENT TO REPORTING DATE

The directors are not aware of any matters or circumstance, subsequent to the reporting period that has significantly affected the activities of the Company, its performance and state of affairs.

11: LIKELY DEVELOPMENTS

It is not foreseen that the Company will undertake any change in its general direction during the coming year. The Company will continue to operate as detailed earlier in the report.

Further information about likely developments in the operation of the Company and the expected results of those operations in future financial years have not been included in this report because disclosures of the information would be likely to result in unreasonable prejudice to the Company.

12: INDEMNIFICATION AND INSURANCE OF OFFICERS

The HEARing CRC had and continues to hold directors’ and officers’ insurance in respect to these persons whilst legitimately performing their duties.

The Company indemnifies its directors and officers against any liability incurred during the course of executing their duties on behalf of the Company with the exception if the director or officer is found to be in breach of his/her obligations under the Corporations Law.

Insurance premiums

During and since the end of the financial year, the company has paid a premium under a contract insuring the past or present directors and certain officers of the company against liabilities incurred in those capacities except where the liability arises out of a wrongful act as defined by the policy. Particulars of the directors and officers insurance cannot be disclosed without the permission of the insurer.

13: AUDITOR’S INDEPENDENCE DECLARATION

The auditor’s independence declaration is set out on page 76 and forms part of the directors’ report for reporting year ended 30 June 2010.

14: ROUNDBLING OFF

The Company is of a kind referred to in ASIC Class Order 98/100 dated 10 July 1998 and in accordance with that Class Order, amounts in the financial report and directors’ report have been rounded off to the nearest thousand dollars, unless otherwise stated.

This report is made with a resolution of the directors of the Company:

Mr Richard Searby, AO, QC
Chairman
Dated at Melbourne this 11th day of October 2010.

Associate Professor Robert Cowan
Chief Executive Officer
Dated at Melbourne this 11th day of October 2010.
## STATEMENT OF COMPREHENSIVE INCOME

<table>
<thead>
<tr>
<th></th>
<th>Note</th>
<th>2010 ($'000)</th>
<th>2009 ($'000)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td>24,563</td>
<td>20,200</td>
</tr>
<tr>
<td><strong>Expenditure</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contributions – In-kind by members</td>
<td></td>
<td>(17,744)</td>
<td>(14,473)</td>
</tr>
<tr>
<td>Contributions to members for salaries</td>
<td></td>
<td>(5,029)</td>
<td>(4,058)</td>
</tr>
<tr>
<td>Research consumables</td>
<td></td>
<td>(569)</td>
<td>(826)</td>
</tr>
<tr>
<td>Consultants and seconded staff</td>
<td></td>
<td>--</td>
<td>(54)</td>
</tr>
<tr>
<td>Rent</td>
<td></td>
<td>(175)</td>
<td>(39)</td>
</tr>
<tr>
<td>Other</td>
<td>7c</td>
<td>(1,191)</td>
<td>(903)</td>
</tr>
<tr>
<td><strong>Deficit from operating activities</strong></td>
<td>7a</td>
<td>(145)</td>
<td>(153)</td>
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<tr>
<td><strong>Finance income</strong></td>
<td>7b</td>
<td>145</td>
<td>153</td>
</tr>
<tr>
<td><strong>Net finance income</strong></td>
<td></td>
<td>145</td>
<td>153</td>
</tr>
<tr>
<td><strong>Surplus/(deficit) before income tax</strong></td>
<td></td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Income tax expense</strong></td>
<td></td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Surplus/(deficit) for the period</strong></td>
<td></td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Other comprehensive income</strong></td>
<td></td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Total comprehensive income for the year</strong></td>
<td></td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

The notes on pages 55 to 73 are an integral part of these financial statements.
**STATEMENT OF FINANCIAL POSITION**

<table>
<thead>
<tr>
<th>Note</th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$ ('000)</td>
<td>$ ('000)</td>
</tr>
<tr>
<td><strong>Assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td>9a</td>
<td>3,783</td>
</tr>
<tr>
<td>Trade and other receivables</td>
<td>8</td>
<td>184</td>
</tr>
<tr>
<td><strong>Total current assets</strong></td>
<td></td>
<td>3,967</td>
</tr>
<tr>
<td>Property, plant and equipment</td>
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<td>384</td>
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<tr>
<td><strong>Total non-current assets</strong></td>
<td></td>
<td>384</td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td></td>
<td>4,351</td>
</tr>
<tr>
<td><strong>Liabilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trade and other payables</td>
<td>13</td>
<td>1,567</td>
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<tr>
<td>Deferred income</td>
<td>12</td>
<td>2,776</td>
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<tr>
<td>Employee benefits</td>
<td>14</td>
<td>8</td>
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<tr>
<td><strong>Total current liabilities</strong></td>
<td></td>
<td>4,351</td>
</tr>
<tr>
<td><strong>Total liabilities</strong></td>
<td></td>
<td>4,351</td>
</tr>
<tr>
<td><strong>Net assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Equity</strong></td>
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<td></td>
</tr>
<tr>
<td>Retained earnings</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total equity</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The notes on pages 55 to 73 are an integral part of these financial statements.*
### STATEMENT OF CHANGES IN EQUITY

<table>
<thead>
<tr>
<th>ATTRIBUTABLE TO EQUITY HOLDERS OF THE COMPANY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Share capital</td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>2010</td>
</tr>
<tr>
<td>Balance at 1 July</td>
</tr>
<tr>
<td>Total comprehensive income for the year</td>
</tr>
<tr>
<td>(Loss)/Profit for the year</td>
</tr>
<tr>
<td>Other comprehensive income for the year</td>
</tr>
<tr>
<td>Total comprehensive income for the year</td>
</tr>
<tr>
<td>Transactions with owners, recorded directly in equity</td>
</tr>
<tr>
<td>Issuance of shares</td>
</tr>
<tr>
<td>Total transactions with owners</td>
</tr>
<tr>
<td>Balance at 30 June</td>
</tr>
</tbody>
</table>

The notes on pages 55 to 73 are an integral part of these financial statements.
# Statement of Cash Flows

For the year ended 30 June 2010

<table>
<thead>
<tr>
<th>Note</th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$ ('000)</td>
<td>$ ('000)</td>
</tr>
<tr>
<td><strong>Cash flows from operating activities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash receipts from members and government</td>
<td>6,270</td>
<td>8,330</td>
</tr>
<tr>
<td>Cash paid to suppliers and employees</td>
<td>(7,421)</td>
<td>(7,291)</td>
</tr>
<tr>
<td>Interest received</td>
<td>145</td>
<td>153</td>
</tr>
<tr>
<td><strong>Net cash from/ (used in) operating activities</strong></td>
<td>9b</td>
<td>(1,006)</td>
</tr>
<tr>
<td><strong>Cash flows from investing activities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquisition of property, plant and equipment</td>
<td>(180)</td>
<td>--</td>
</tr>
<tr>
<td><strong>Net cash from/ (used in) investing activities</strong></td>
<td>(180)</td>
<td>--</td>
</tr>
<tr>
<td><strong>Cash flows from financing activities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repayment of loans</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Net cash from/ (used in) financing activities</strong></td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Net increase in cash and cash equivalents</strong></td>
<td>(1,186)</td>
<td>1,192</td>
</tr>
<tr>
<td>Cash and cash equivalents at the beginning of the period</td>
<td>4,969</td>
<td>3,777</td>
</tr>
<tr>
<td><strong>Cash and cash equivalents at 30 June</strong></td>
<td>9a</td>
<td>3,783</td>
</tr>
</tbody>
</table>

The notes on pages 55 to 73 are an integral part of these financial statements.
NOTES TO THE FINANCIAL STATEMENTS

1: REPORTING ENTITY

The financial report covers HEARing CRC Limited as an individual entity. The Company is limited by guarantee, incorporated and domiciled in Australia. The HEARing CRC Limited is recognised by the ATO as a health promotion charity and is therefore income tax exempt.

The financial statements were approved by resolution of the Board of Directors on 11th October 2010.

2: BASIS OF PREPARATION

(a) Statement of compliance

The financial report is a general purpose financial report which has been prepared in accordance with Australian Accounting Standards (including Australian Interpretations) adopted by the Australian Accounting Standards Board (AASB) and the Corporations Act 2001.

(b) Basis of measurement

The financial statements have been prepared on the historical cost basis except for the following:

- financial instruments at fair value through profit or loss are measured at fair value.

The methods used to measure fair values are discussed further in note 4.

(c) Functional and presentation currency

These financial statements are presented in Australian dollars, which is the Company’s functional currency.

The Company is of a kind referred to in ASIC Class Order 98/100 dated 10 July 1998 and in accordance with that Class Order, all financial information presented in Australian dollars has been rounded to the nearest thousand unless otherwise stated.

(d) Use of estimates and judgements

The preparation of financial statements requires management to make judgements, estimates and assumptions that affect the application of accounting policies and the reported amounts of assets, liabilities, income and expenses. Actual results may differ from these estimates.

Estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to accounting estimates are recognised in the period in which the estimate is revised and in any future periods affected.

(e) Financial period

The current financial period is the 12 months ended 30 June 2010.

(f) Changes in accounting policies

As a result, the Company presents in the statement of changes in equity all owner changes in equity (of which there were $nil in 2010 and 2009), whereas all non-owner changes in equity are presented in the Statement of comprehensive income. Comparative information has been re-presented so that it also is in conformity with the revised standard.

3: SIGNIFICANT ACCOUNTING POLICIES

The accounting policies set out below have been applied consistently to all periods presented in these financial statements. Certain comparative amounts have been reclassified to conform with the current year’s presentation.

(a) Income Tax

The Company has been approved for tax exemption status under Division 50-B of the Income Tax Assessment Act 1997 as a not-for-profit entity. The Company has prepared these accounts based on this approval being granted, as its objectives are to maximise hearing health outcomes and to foster research collaboration.

(b) Foreign currency transactions

Transactions in foreign currencies are translated to the respective functional currencies of the Company at exchange rates at the dates of the transactions. Monetary assets and liabilities denominated in foreign currencies at the reporting date are retranslated to the functional currency at the foreign exchange rate at that date.
The foreign currency gain or loss on monetary items is the difference between amortised cost in the functional currency at the beginning of the period, adjusted for effective interest and payments during the period, and the amortised cost in foreign currency translated at the exchange rate at the end of the period. Foreign currency differences arising on retranslation are recognised in Statement of comprehensive income.

(c) Financial instruments

Non-derivative financial instruments

Non-derivative financial instruments comprise trade and other receivables, cash and cash equivalents, deferred income and trade and other payables.

A financial instrument is recognised if the Company becomes a party to the contractual provisions of the instrument. Financial assets are derecognised if the Company’s contractual rights to the cash flows from the financial assets expire or if the Company transfers the financial asset to another party without retaining control or substantially all risks and rewards of the asset.

Purchases and sales of financial assets are accounted for at trade date, i.e., the date that the Company commits itself to purchase or sell the asset. Financial liabilities are derecognised if the Company’s obligations specified in the contract expire or are discharged or cancelled.

Non-derivative financial instruments are initially measured at cost on trade date, which includes transaction costs, when the related contractual rights or obligations exist. Subsequent to initial recognition these financial instruments are measured as described below.

(d) Property, plant and equipment

(i) Recognition and measurement

Items of property, plant and equipment are measured at cost less accumulated depreciation and accumulated impairment losses.

Cost includes expenditure that is directly attributable to the acquisition of the asset. Borrowing costs related to the acquisition, construction or production of qualifying assets are recognised in profit or loss as incurred.

When parts of an item of property, plant and equipment have different useful lives, they are accounted for as separate items (major components) of property, plant and equipment.

Gains and losses on disposal of an item of property, plant and equipment are determined by comparing the proceeds from disposal with the carrying amount of property, plant and equipment and are recognised net within “other income” in profit or loss. When revalued assets are sold, the amounts included in the revaluation reserve are transferred to retained earnings.

(ii) Subsequent costs

The costs of replacing part of an item of property, plant and equipment is recognised in the carrying amount of the item if it is probable that the future economic benefits embodied within the part will flow to the Company and its cost can be measured reliably. The carrying amount of the replaced part is derecognised. The costs of the day-to-day servicing of property, plant and equipment are recognised in profit and loss as incurred.

(iii) Depreciation

Depreciation is recognised in profit or loss on a straight-line basis over the life of the CRC.

The estimated useful life for the current and comparative periods is as follows:

(a) Fixtures and fittings – 5 years

Depreciation methods, useful life and residual values are reviewed at each reporting date.

(e) Impairment of assets

A financial asset is assessed at each reporting date to determine whether there is any objective evidence that it is impaired. A financial asset is considered to be impaired if objective evidence indicates that one or more events have had a negative effect on the estimated future cash flows of that asset.

An impairment loss in respect of a financial asset measured at amortised cost is calculated as the difference between its carrying amount, and the present value of the estimated future cash flows discounted at the original effective interest rate. An impairment loss in respect of an available-for-sale financial asset is calculated by reference to its fair value.
Individually significant financial assets are tested for impairment on an individual basis. The remaining financial assets are assessed collectively in groups that share similar credit risk characteristics.

All impairment losses are recognised in profit or loss. Any cumulative loss in respect of an available-for-sale financial asset recognised previously in equity is transferred to profit or loss.

An impairment loss is reversed if the reversal can be related objectively to an event occurring after the impairment loss was recognised. For financial assets measured at amortised cost and available-for-sale financial assets that are debt securities, the reversal is recognised in profit or loss. For available-for-sale financial assets that are equity securities, the reversal is recognised directly in equity.

(f) Research and development

Expenditure on research and development activities, undertaken with the prospect of gaining new scientific or technical knowledge and understanding, is recognised in the year when incurred. Members of the HEARing CRC directly employ research staff.

(g) Employee benefits

Short-term benefits

Short-term employee benefit obligations are measured on an undiscounted basis and are expensed as the related service is provided.

A liability is recognised for the amount expected to be paid under short-term cash bonus or profit-sharing plans if the Company has a present legal or constructive obligation to pay this amount as a result of past service provided by the employee and the obligation can be estimated reliably.

(h) Revenue

Revenue from services rendered is recognised in proportion to the stage of completion of the transaction at the reporting date.

Interest income

Interest income and other sundry income are brought to account when the Company controls a right relating to the consideration payable.

Cash contributions received from the members

Income arising from cash contributions received from the Members is recognised when the Company is in control of or has the right to receive the contributions.

Government grants

Government grants are recognised as revenue when the entity obtains control over the assets comprising the contribution. Where the Company considers the funds to be reciprocal in nature, the grant is treated as deferred income. This income is tied to specific research and other activities. All government grants are initially recorded as deferred income until which time the Company complies with the conditions associated with the grants.

In-kind contributions

In-kind contributions from Members are brought to account as revenue and expenditure incurred in accordance with AASB 1004. These in-kind contributions are measured at fair value based on the dollar value provided by each Member in their reporting to the Company consistent with the valuation principles agreed under the terms of the HEARing CRC Member's Agreement.

(i) Lease payments

Payments made under operating leases are recognised in profit or loss on a straight-line basis over the term of the lease. Lease incentives received are recognised as an integral part of the total lease expense, over the term of the lease.

(j) Goods and services tax

Revenue, expenses and assets are recognised net of the amount of goods and services tax (GST), except where the amount of GST incurred is not recoverable from the taxation authority. In these circumstances, the GST is recognised as part of the cost of acquisition of the asset or as part of the expense.

Receivables and payables are stated with the amount of GST included. The net amount of GST recoverable from, or payable to, the ATO is included as a current asset or liability in the Statement of financial position.

Cash flows are included in the Statement of cash flows on a gross basis. The GST components of cash flows arising from investing and financing activities which are recoverable from, or payable to, the ATO are classified as operating cash flows.

(k) Finance income and expenses

Finance income comprises interest income on funds invested. Interest income is recognised as it accrues in the Statement of comprehensive income.
NOTES TO THE FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2010

1: New standards and interpretations not yet adopted
The following standards, amendments to standards and interpretations have been identified as those which may impact the entity in the period of initial application. They are available for early adoption at 30 June 2010, but have not been applied in preparing this financial report:

AASB 9 Financial Instruments includes requirements for the classification and measurement of financial assets resulting from the first part of Phase 1 of the project to replace AASB139 Financial Instruments: Recognition and Measurement. AASB 9 will become mandatory for the Company’s 30 June 2014 financial statements. Retrospective application is generally required, although there are exceptions, particularly if the entity adopts the standard for the year ended 30 June 2012 or earlier. The Company has not yet determined the potential effect of the standard.

AASB 124 Related Party Disclosures (revised December 2009) simplifies and clarifies the intended meaning of the definition of a related party and provides a partial exemption from the disclosure requirements for government-related entities. The amendments, which will become mandatory for Company’s 30 June 2012 financial statements, are not expected to have any impact on the financial statements.

AASB 2009-5 Further amendments to Australian Accounting Standards arising from the Annual Improvements Process affect various AASBs resulting in minor changes for presentation, disclosure, recognition and measurement purposes. The amendments, which become mandatory for the Company’s 30 June 2011 financial statements, are not expected to have a significant impact on the financial statements.

2: Determination of fair values
A number of the Company’s accounting policies and disclosures require the determination of fair value, for both financial and non-financial assets and liabilities.

Fair values have been determined for measurement and / or disclosure purposes based on the following methods. Where applicable, further information about the assumptions made in determining fair values is disclosed in the notes specific to that asset or liability.

(a) Property, plant and equipment
The market value of property is the estimated amount for which a property could be exchanged on the date of valuation between a willing buyer and a willing seller in an arm’s length transaction after proper marketing wherein the parties had each acted knowledgeably, prudently and without compulsion. The market value of items of plant, equipment, fixtures and fittings is based on the quoted market prices for similar items.

(b) Trade and other receivables
The fair value of trade and other receivables is estimated as the present value of future cash flows, discounted at the market rate of interest at the reporting date.

(c) In-kind contributions
The fair value of in-kind contributions is as per the terms of the Member’s Agreement.

3: Financial risk management
Overview
The Company has exposure to the following risks from their use of financial instruments:

(a) credit risk
(b) liquidity risk
(c) market risk

This note presents information about the Company’s exposure to each of the above risks, their objectives, policies and processes for measuring and managing risk, and the management of capital. Further quantitative disclosures are included throughout this financial report.

The Board has overall responsibility for the establishment and oversight of the risk management framework. The Board has established the Finance & Audit Committee, which is responsible for developing and monitoring risk management policies. The Committee reports regularly to the Board on its activities.

Risk management policies have been established to identify and analyse the risks faced by the Company, to set appropriate risk limits and controls, and to monitor risks and adherence to limits. Risk management policies and systems are reviewed regularly to reflect changes in market conditions and the Company’s activities. The Company through its training and management standards and procedures aims to develop a disciplined and constructive control environment in which all employees understand their roles and obligations.
(a) Credit risk
Credit risk is the risk of financial loss to the Company if a customer fails to meet its contractual obligations, and arises principally from the Company’s receivables from customers and investment securities.

Trade and other receivables
The Company’s credit exposure throughout the year was primarily (approximately 75%) to the Government followed by some of its research participants (24%) with which it has a close working relationship. The majority of the credit exposure is limited to Australia. The Finance & Audit Committee and management monitor the credit exposure throughout the year.

Investments
The Company limits its exposure to credit risk by only investing in liquid securities. All its securities have throughout the year been held with an Australian Bank.

(b) Liquidity risk
Liquidity risk is the risk that the Company will not be able to meet its financial obligations as they fall due. The Company has all cash investments which it can draw on when required. The Company’s approach to managing liquidity is to ensure, as far as possible, that it will always have sufficient liquidity to meet its liabilities when due, under both normal and stressed conditions, without incurring unacceptable losses or risking damage to the Company’s reputation.

The Company has no overdraft facilities or loans taken out at year end.

(c) Market risk
Market risk is the risk that changes in market prices, such as interest rates, will affect the Company’s income or the value of its holdings of financial instruments. The Company has limited market risk as it does not directly trade and holds all investments in cash. The Company’s interest rate risk all relates to variable rates.

6: CAPITAL MANAGEMENT
There were no changes in the Company’s approach to capital management during the year.

7: INCOME AND EXPENSES

7(a) Income

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$('000)</td>
<td>$('000)</td>
</tr>
<tr>
<td>Commonwealth government CRC program grants</td>
<td>5,219</td>
<td>4,176</td>
</tr>
<tr>
<td>Contributions from members – cash contributions</td>
<td>1,527</td>
<td>1,395</td>
</tr>
<tr>
<td>Contributions from members – in-kind contributions</td>
<td>17,744</td>
<td>14,473</td>
</tr>
<tr>
<td>Other income</td>
<td>73</td>
<td>156</td>
</tr>
<tr>
<td><strong>Total income</strong></td>
<td><strong>24,563</strong></td>
<td><strong>20,200</strong></td>
</tr>
</tbody>
</table>
### 7(b) Finance income

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest</td>
<td>145</td>
<td>153</td>
</tr>
</tbody>
</table>

### 7(c) Other expenses

<table>
<thead>
<tr>
<th></th>
<th>2010 ('000)</th>
<th>2009 ('000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal</td>
<td>19</td>
<td>78</td>
</tr>
<tr>
<td>Patents &amp; licensing</td>
<td>80</td>
<td>51</td>
</tr>
<tr>
<td>Travel</td>
<td>106</td>
<td>86</td>
</tr>
<tr>
<td>Audit</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>Other</td>
<td>949</td>
<td>651</td>
</tr>
<tr>
<td><strong>Total other expenses</strong></td>
<td><strong>1,191</strong></td>
<td><strong>903</strong></td>
</tr>
</tbody>
</table>

### 7(d) Personnel expenses

Personnel costs associated with wages and salaries during the reporting period were disclosed as part of contributions to Members for salaries in the Statement of comprehensive income.

<table>
<thead>
<tr>
<th></th>
<th>2010 ('000)</th>
<th>2009 ('000)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contributions to Members for salaries</strong></td>
<td><strong>4,524</strong></td>
<td><strong>4,058</strong></td>
</tr>
</tbody>
</table>
8: TRADE AND OTHER RECEIVABLES

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trade receivables</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Other receivables due from related parties</td>
<td>137</td>
<td>196</td>
</tr>
<tr>
<td>Other receivables</td>
<td>47</td>
<td>--</td>
</tr>
<tr>
<td>Total receivables</td>
<td>184</td>
<td>196</td>
</tr>
</tbody>
</table>

The Company's exposure to credit risk and impairment losses related to trade and other receivables are disclosed in note 15.

9: CASH

9(a) Cash and cash equivalents

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank balances</td>
<td>(44)</td>
<td>2,041</td>
</tr>
<tr>
<td>Call deposits</td>
<td>3,827</td>
<td>2,928</td>
</tr>
<tr>
<td>Cash and cash equivalents in the statement of cash flows</td>
<td>3,783</td>
<td>4,969</td>
</tr>
</tbody>
</table>

The Company’s exposure to interest rate risk and a sensitivity analysis for financial assets are disclosed in note 15.
### 9(b) Reconciliation of cash flows from operating activities

<table>
<thead>
<tr>
<th></th>
<th>2010 ('000)</th>
<th>2009 ('000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash flows from operating activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surplus for the period</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Add back: non-cash – depreciation</td>
<td>96</td>
<td>-</td>
</tr>
<tr>
<td>Operating profit before changes in working capital and provisions</td>
<td>96</td>
<td>-</td>
</tr>
<tr>
<td>Change in trade and other receivables</td>
<td>12</td>
<td>549</td>
</tr>
<tr>
<td>Change in trade and other payables</td>
<td>18</td>
<td>(1,002)</td>
</tr>
<tr>
<td>Change in deferred income</td>
<td>(1,131)</td>
<td>1,636</td>
</tr>
<tr>
<td>Change in employee benefits</td>
<td>(1)</td>
<td>9</td>
</tr>
<tr>
<td><strong>Net cash from operating activities</strong></td>
<td><strong>(1,006)</strong></td>
<td><strong>1,192</strong></td>
</tr>
</tbody>
</table>
## 10: PROPERTY, PLANT AND EQUIPMENT

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Furniture and fittings</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opening balance</td>
<td>300</td>
<td>--</td>
</tr>
<tr>
<td>Net additions/(disposals)</td>
<td>180</td>
<td>300</td>
</tr>
<tr>
<td>Closing balance</td>
<td>480</td>
<td>300</td>
</tr>
<tr>
<td><strong>Accumulated depreciation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opening balance</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Depreciation for the year</td>
<td>[96]</td>
<td>--</td>
</tr>
<tr>
<td>Closing balance</td>
<td>[96]</td>
<td>--</td>
</tr>
<tr>
<td><strong>Net book value</strong></td>
<td>384</td>
<td>300</td>
</tr>
</tbody>
</table>

| **Total property, plant and equipment** |       |      |
| Cost                                | 480   | 300  |
| Accumulated depreciation            | [96]  | --   |
| **Total written down amount**       | 384   | 300  |
11: CAPITAL AND RESERVES

Share capital

<table>
<thead>
<tr>
<th></th>
<th>2010 ('000)</th>
<th>2009 ('000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>On issue at 30 June 2009 and 30 June 2010</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

The Company is a public company limited by guarantee.

12: DEFERRED INCOME

<table>
<thead>
<tr>
<th></th>
<th>2010 ('000)</th>
<th>2009 ('000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unexpended government grants</td>
<td>1,476</td>
<td>2,234</td>
</tr>
<tr>
<td>Funds in advance</td>
<td>1,300</td>
<td>1,673</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,776</strong></td>
<td><strong>3,907</strong></td>
</tr>
</tbody>
</table>

The Company has utilised revenue from the Members’ cash contributions, the NSW OSMR grant and from bank interest to fund activities as agreed under the HEARing CRC Member’s Agreement and initial Operational Plan. Commonwealth CRC Program grants have been applied to the activities as agreed under the HEARing CRC Commonwealth Agreement (and its associated Schedules), and the unexpended government grants represent activities not yet undertaken.

Hearworks Pty Ltd paid its seven years commitment in 2009. Unexpended funds represent activities not yet undertaken.

The Company’s exposure to liquidity risk is disclosed in note 15.
### 13: TRADE AND OTHER PAYABLES

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$('000)</td>
<td>$('000)</td>
</tr>
<tr>
<td>Trade payables</td>
<td>496</td>
<td>149</td>
</tr>
<tr>
<td>Other payables</td>
<td>122</td>
<td>400</td>
</tr>
<tr>
<td>Other payables owed to related parties</td>
<td>949</td>
<td>1,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1,567</td>
<td>1,549</td>
</tr>
</tbody>
</table>

The Company’s exposure to liquidity risk related to trade and other payables is disclosed in note 15.

### 14: EMPLOYEE BENEFITS

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$('000)</td>
<td>$('000)</td>
</tr>
<tr>
<td>Employee entitlements</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>
15: FINANCIAL INSTRUMENTS

The Company’s financial instruments consist of cash held in banks, accounts receivable and payable. During the reporting period it did not trade in and as at 30 June 2010 had no exposure to derivative instruments.

CREDIT RISK

The carrying amount of the company’s financial assets represents the maximum credit exposure. The company’s maximum exposure to credit risk at the reporting date was:

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$ ('000)</td>
<td>$ ('000)</td>
</tr>
<tr>
<td>Financial assets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receivables</td>
<td>184</td>
<td>196</td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td>3,783</td>
<td>4,969</td>
</tr>
<tr>
<td>Total financial assets</td>
<td>3,967</td>
<td>5,165</td>
</tr>
</tbody>
</table>

None of the Company’s receivables are past due and no impairment losses were recognised at 30 June 2010.

The Company’s exposure to credit risk for trade receivables at the reporting date by geographic region was:

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$ ('000)</td>
<td>$ ('000)</td>
</tr>
<tr>
<td>Australia</td>
<td>184</td>
<td>196</td>
</tr>
<tr>
<td>Total receivables</td>
<td>184</td>
<td>196</td>
</tr>
</tbody>
</table>

The Company’s most significant customer outstanding amount is $137,500 (2009: $189,750) as at 30 June 2010. This debt was settled prior to issue of these financial statements.
LIQUIDITY RISK

The Company’s exposure to liquidity risk is as follows:

<table>
<thead>
<tr>
<th></th>
<th>30 June 2010</th>
<th>30 June 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CARRYING AMOUNT</td>
<td>CARRYING AMOUNT</td>
</tr>
<tr>
<td></td>
<td>($'000)</td>
<td>($'000)</td>
</tr>
<tr>
<td></td>
<td>CONTRACTUAL</td>
<td>CONTRACTUAL</td>
</tr>
<tr>
<td></td>
<td>CASH FLOWS</td>
<td>CASH FLOWS</td>
</tr>
<tr>
<td></td>
<td>$'000</td>
<td>$'000</td>
</tr>
<tr>
<td></td>
<td>6 MONTHS OR LESS</td>
<td>6 MONTHS OR LESS</td>
</tr>
<tr>
<td></td>
<td>$'000</td>
<td>$'000</td>
</tr>
<tr>
<td>Non-derivative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>financial liabilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payables</td>
<td>1,567</td>
<td>1,549</td>
</tr>
<tr>
<td>Deferred income</td>
<td>2,776</td>
<td>3,907</td>
</tr>
<tr>
<td>Non-derivative</td>
<td>4,343</td>
<td>5,456</td>
</tr>
<tr>
<td>total financial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>liabilities</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Company’s policy is that all contracted cash flows are paid within 6 months or less.
MARKET RISK

Interest rate risk

The Company does not hold any fixed rate financial assets and liabilities. All interest is applied to the funding of the Activities only, and is therefore not “retained” by the Company if unspent.

Investments in short-term receivables and payables are not exposed to interest rate risk.

As at reporting date, the interest rate profile of the Company’s interest-bearing financial instruments was:

<table>
<thead>
<tr>
<th>CARRYING AMOUNT</th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$ ('000)</td>
<td>$ ('000)</td>
</tr>
<tr>
<td>Variable rate instruments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td>3,783</td>
<td>4,969</td>
</tr>
</tbody>
</table>

Cash flow sensitivity analysis for variable rate instruments

A change of 100 basis points in interest rates at the reporting date would have increased (decreased) equity and the surplus or deficit by the amount shown below. The analysis assumes that all other variables remain constant.
### Fair Values

#### Fair values versus carrying amounts

The fair values of financial assets and liabilities are equivalent to the carrying amounts shown in the Statement of financial position as set out in notes 8, 9, 12 and 13.

<table>
<thead>
<tr>
<th>2009</th>
<th>CARRYING AMOUNT</th>
<th>-1%</th>
<th>+1%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Surplus (’000)</td>
<td>Equity (’000)</td>
<td>Surplus (’000)</td>
</tr>
<tr>
<td>Variable rate instruments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash and cash equivalents</td>
<td>4,969</td>
<td>(49)</td>
<td>(49)</td>
</tr>
<tr>
<td>Total increase / (decrease)</td>
<td></td>
<td>(49)</td>
<td>(49)</td>
</tr>
</tbody>
</table>
16: RELATED PARTIES

(a) Individual directors and executives compensation disclosures

During the reporting period, the following were key governance and management personnel of the Company.

Non-Executive directors:

Mr Richard Searby
Dr Michele Allan
Mr Barry Roberts
Mr Dominic Jenkins (Alternate)
Professor Rob Evans
Ms Kathryn Greiner
Mr Steven Grundy (Alternate)
Mr Neville Mitchell
Associate Professor Jim Patrick (Alternate)
Professor Jim Piper
Dr Lisa Springer

Executive directors:

Associate Professor Robert Cowan
Compensation paid to individual directors and executives was as follows:

<table>
<thead>
<tr>
<th></th>
<th>2010 ('000)</th>
<th>2009 ('000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short term employee benefits</td>
<td>260</td>
<td>240</td>
</tr>
<tr>
<td>Total</td>
<td>260</td>
<td>240</td>
</tr>
</tbody>
</table>

Key management personnel costs are listed under "other expenses" and "contributions to members for salaries" in the Statement of comprehensive income.

Apart from the details disclosed in this note, no director has entered into a material contract with the Company for this financial period and there were no material contracts involving directors’ interests existing at the end of the financial reporting period. Nominee directors and their alternates do not receive compensation.

(b) Associates - HearWorks Pty Ltd

During the year ended 30 June 2010, all related parties’ transactions were made at market prices and in commercial terms. Outstanding balances at year-end were unsecured, interest free and settlement occurs in cash. No guarantees were provided or received for any related party receivable or payable.

<table>
<thead>
<tr>
<th></th>
<th>2010 ('000)</th>
<th>2009 ('000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income – cash contribution to HEARing CRC (Note 7 “cash from members – cash contributions”)</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Trade receivables – owing (refer Note 8)</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Trade payables – owed (refer Note 13)</td>
<td>80</td>
<td>85</td>
</tr>
</tbody>
</table>
17: SUBSEQUENT EVENT

No matters or circumstances have arisen since the end of the financial period which significantly affected or may significantly affect the operations of the company, the results of those operations, or the state of affairs of the company in future financial years.

18: AUDITOR’S REMUNERATION

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ (’000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audit services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auditors of the Company</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KPMG Australia:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audit and review of financial reports</td>
<td>28,215</td>
<td>28,215</td>
</tr>
<tr>
<td>Other regulatory audit services</td>
<td>8,360</td>
<td>8,360</td>
</tr>
<tr>
<td></td>
<td>36,575</td>
<td>36,575</td>
</tr>
</tbody>
</table>
19: MEMBERS GUARANTEE

The Company is a company limited by guarantee. If the Company is wound up each Member may be required to contribute a maximum of $1.00 towards meeting any outstanding obligations of the Company. There were 24 Members of the Company as at 30 June 2010.

20: OPERATING LEASES

Non-cancellable operating lease rentals are payable as follows:

<table>
<thead>
<tr>
<th></th>
<th>2010 ('000)</th>
<th>2009 ('000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than one year</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Between one and five years</td>
<td>600</td>
<td>1,000</td>
</tr>
<tr>
<td>More than five years</td>
<td>--</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td><strong>800</strong></td>
<td><strong>1,200</strong></td>
</tr>
</tbody>
</table>
DIRECTORS’ DECLARATION

1: In the opinion of the directors of HEARing CRC Ltd (‘the Company’):

(a) the financial statements and notes set out on pages 55 to 73, are in accordance with the Corporations Act 2001, including:

(i) giving a true and fair view of the Company’s financial position as at 30 June 2010 and of its performance, for the financial year ended on that date; and

(ii) complying with Australian Accounting Standards (including the Australian Accounting Interpretations) and the Corporations Regulations 2001;

(b) there are reasonable grounds to believe that the Company will be able to pay its debts as and when they become due and payable.

Signed in accordance with a resolution of the directors:

Mr Richard Searby, AO, QC
Chairman

Dated at Melbourne this 11th day of October 2010.

Associate Professor Robert Cowan
Chief Executive Officer

Dated at Melbourne this 11th day of October 2010.
INDEPENDENT AUDITOR’S REPORT TO THE MEMBERS OF HEARING CRC LIMITED

We have audited the accompanying financial report of HEARing CRC Limited (the company), which comprises the Statement of financial position as at 30 June 2010, and the Statement of comprehensive income, Statement of changes in equity and cash flow statement for the year ended on that date, a summary of significant accounting policies and other explanatory notes 1 to 20 and the directors’ declaration set out on pages 55 to 74.

Directors’ responsibility for the financial report

The directors of the company are responsible for the preparation and fair presentation of the financial report in accordance with Australian Accounting Standards (including the Australian Accounting Interpretations) and the Corporations Act 2001. This responsibility includes establishing and maintaining internal control relevant to the preparation and fair presentation of the financial report that is free from material misstatement, whether due to fraud or error; selecting and applying appropriate accounting policies; and making accounting estimates that are reasonable in the circumstances.

Auditor’s responsibility

Our responsibility is to express an opinion on the financial report based on our audit. We conducted our audit in accordance with Australian Auditing Standards. These Auditing Standards require that we comply with relevant ethical requirements relating to audit engagements and plan and perform the audit to obtain reasonable assurance whether the financial report is free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial report. The procedures selected depend on the auditor’s judgement, including the assessment of the risks of material misstatement of the financial report, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity’s preparation and fair presentation of the financial report in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity’s internal control.

An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by the directors, as well as evaluating the overall presentation of the financial report.

We performed the procedures to assess whether in all material respects the financial report presents fairly, in accordance with the Corporations Act 2001 and Australian Accounting Standards (including the Australian Accounting Interpretations), a view which is consistent with our understanding of the Company’s financial position and of its performance.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Independence

In conducting our audit, we have complied with the independence requirements of the Corporations Act 2001.

Auditor’s opinion

In our opinion the financial report of HEARing CRC Limited is in accordance with the Corporations Act 2001, including:

(a) giving a true and fair view of the Company’s financial position as at 30 June 2010 and of its performance for the year ended on that date; and

(b) complying with Australian Accounting Standards (including the Australian Accounting Interpretations) and the Corporations Regulations 2001.

KPMG

Donald K Abell
Partner

Dated at Melbourne this 11th day of October 2010.
AUDITOR’S INDEPENDENCE DECLARATION UNDER SECTION 307C OF THE CORPORATIONS ACT 2001

To: the directors of HEARing CRC Limited

I declare that, to the best of my knowledge and belief, in relation to the audit for the financial year ended 30 June 2010 there have been:

≥ no contraventions of the auditor independence requirements as set out in the Corporations Act 2001 in relation to the audit; and

≥ no contraventions of any applicable code of professional conduct in relation to the audit.

KPMG

Donald K Abell
Partner

Dated at Melbourne this 11th day of October 2010.
THE HEARING CRC COMMUNICATES RESEARCH OUTCOMES TO A DIVERSE RANGE OF STAKEHOLDERS

Tiki – Research Breakthrough in Invisible Hearing

After a decade of research, the first human implant that brings the totally implantable cochlear implant (TICI) a step closer to a device that enables invisible hearing.

Commercially available cochlear implants have successfully restored hearing sensation for people with a profound hearing loss. Now, a new device for totally implantable cochlear implants (TICI) research program shows that TICI active濡音 enables hearing in stationary and virtually any environment.

The research program promises a major cosmetic advantage, with the elimination of external hearing hardware and significantly reduces the potential for earpiece infections, associated with implantation.

Unlike conventional CI systems that require visible, external components or body and head to be worn or shown, a TICI-research system features an internal microphone, an implantable microphone (IMIC), and a low-power processor. However, significant design challenges must be addressed to achieve a TICI system. The research team explored various surgical techniques and the delivery of hearing performances equivalent to traditional cochlear implant systems.

Collaborations with Cochlear and the Hearing Cooperative Research Centre (CRC) delivered the first phase of TICI research to the investigation of multiple aspects of CI technology, including implantable microphones, the impact of body mass, and internal rechargeable batteries and optimal speech-processing schemes. These adaptors made the implant very versatile and suitable for different environmental conditions, providing the development of an integrated CI research system for first human implantation.

The TICI-research system is a world-first technology that could provide greater freedom of movement and speech. The TICI-research system is a groundbreaking advancement that could lead to improved hearing experiences for those with hearing loss.