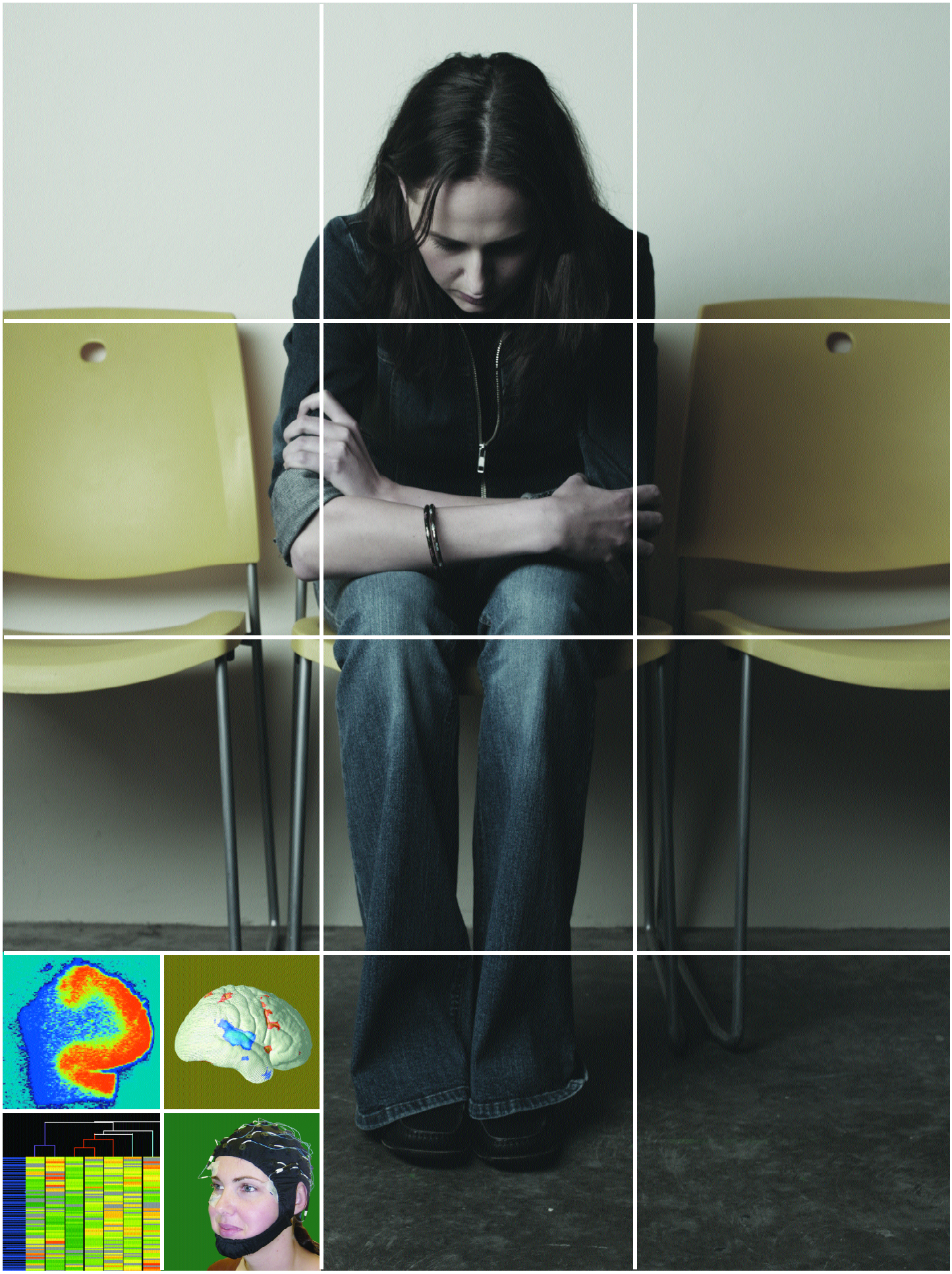
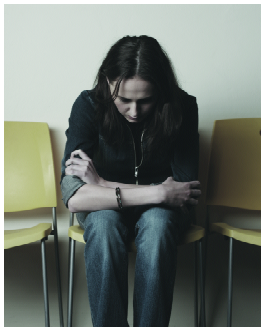


ANNUAL REPORT

2004

NISAD
Schizophrenia Research

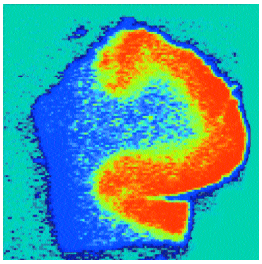


Schizophrenia is a biological brain disease that permanently disables more young people than any other illness. 1 in every 100 people will develop schizophrenia in their lifetimes, most between the ages of 15 and 25. Around 10% will suicide, making schizophrenia a major cause of youth suicide.

Schizophrenia can affect any family and in most cases arises where there is no previous history of the illness. It often leads to long-term disability, unemployment, drug and alcohol abuse, family trauma, homelessness, crime and imprisonment. It costs the Australian community around $2 billion each year.

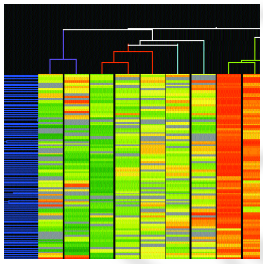
Since inception in 1996, NISAD has developed a powerful research network integrating clinical research, neurobiology, neuroimaging and genetics in the quest to find a cure.

Some Research Highlights 2003-2004



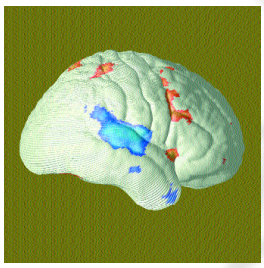
■ Discovery of significant alterations to cannabinoid, muscarinic, glutamate and serotonin receptors in the cingulate cortex, a brain region suggested to be a site of primary pathological change in schizophrenia. The relationship and interaction between these multiple receptor systems is under further investigation.

◀ *NISAD's Beta Imager at Wollongong University is the only one of its kind in the Southern Hemisphere. This image shows abnormal numbers of cannabinoid neuroreceptors (red tint) in a postmortem brain tissue sample from a schizophrenia subject.*



■ Discovery that blood lymphocytes can be used to identify distinct gene expression profiles within schizophrenia, which may be useful in the development of a biological basis for diagnosis and subtype classification for the disorder.

◀ *NISAD's research team at the University of Newcastle is using DNA profiles of schizophrenia subjects and their relatives, and the latest microarray 'gene-chip' technology to identify the genes responsible for increased risk of schizophrenia.*



■ Discovery of similar patterns of reduced brain activation in first episode schizophrenia patients and chronic cannabis users during performance of a planning task, suggesting the possibility of a shared pathology in these conditions.

◀ *NISAD introduced to Australia the LONI processing technique of fMRI brain images in order to identify abnormalities in brain function caused by schizophrenia. The image shown shows the active brain areas of a subject performing a mental task.*

■ Following the discovery by NISAD-affiliated scientists of 'mismatch negativity' (MMN), abnormalities in auditory system processing in patients with schizophrenia, research is now aiming to provide further information on the nature, locus and progression of brain abnormalities underlying MMN. This may provide the opportunity to identify biological markers of increased vulnerability for the development of schizophrenia.

◀ *An 'electrocap' used in MMN research to measure the brain's responses to sound input.*

CONTENTS

BACKGROUND

NISAD Schizophrenia Research is an innovative independent Australian medical research organisation undertaking world class studies to find the means to prevent and cure schizophrenia.

Formed in 1996 and funded by State Government, corporate and private donations, it is an "institute without walls" which utilises research and infrastructure facilities located in teaching hospitals, universities and research institutes throughout New South Wales, as well as domestic and international collaborations, in driving its proactive research agenda.

This means that rather than investing valuable funds in bricks and mortar, efforts are directed into research initiatives aimed at improving the lives of those affected by the disease, and at discovering the means of preventing its onset in others.

From its central management office in Sydney, NISAD Schizophrenia Research manages and coordinates a multi-disciplinary research program led by scientists of world standing in their fields, harnessing cutting-edge technology and state-of-the-art techniques.

Activities include investigating the functional disorders causing the symptoms of schizophrenia, the effects of the disease on brain cells, the genes expressed when it develops, and how schizophrenia affects the brain's processing of thoughts and feelings.

NISAD Schizophrenia Research also plays a key public awareness role in promoting an environment where families living with the disease do not have to suffer in silence but instead receive the acceptance and help they need. It also fuels support for more intensive research as the only long-term solution.

NISAD's ambitious research agenda can only progress with the support of Government, the private sector, and generous individuals. To enable this, the Institute undertakes fund-raising and public education activities to increase awareness of the impact of schizophrenia on families and on the community. In particular, these educational programs aim at increasing awareness of schizophrenia as a major cause of permanent disability, and suicide in young people.

SCIENTIFIC HIGHLIGHTS

RESEARCH FINDINGS

■ Discovery of significant alterations to cannabinoid, muscarinic, glutamate and serotonin receptors in the cingulate cortex, a brain region suggested to be a site of primary pathological change in schizophrenia. The relationship and interaction between these multiple receptor systems is under further investigation.

■ Discovery that blood lymphocytes can be used to identify distinct gene expression profiles within schizophrenia, which may be useful in the development of a biological basis for diagnosis and subtype classification for the disorder.

■ Discovery of a range of common genes altered by different drug treatments for bipolar disorder. This may provide information on the causes of bipolar disorder as well as identifying novel targets for the development of new treatments.

■ Initiation of NISAD's first studies in schizophrenia using advanced proteomics techniques. As it is known that most medications work by affecting proteins, this research aims to provide important information about schizophrenia and anti-psychotic medication.

■ Commencement of behavioural research in an animal model of schizophrenia using a neuregulin gene knockout. Neuregulin is a candidate gene for the development of schizophrenia. Resultant information from this research could provide benefits to schizophrenia patients through better understanding of how developmental changes lead to symptoms and how these may be better treated.

■ The first study to link deficits in brain structure (i.e. gray matter thickness) to brain function (i.e. reduced brain activation) during performance of a planning task in young people experiencing their first episode of schizophrenia.

■ Discovery of similar patterns of reduced brain activation in first episode schizophrenia patients and chronic cannabis users during performance of a planning task, suggesting the possibility of a shared pathology in these conditions.

■ Demonstration of a distributed neural system for fear perception using advanced neuroimaging techniques. Breakdowns in these interactions may give rise to emotion-related symptoms observed in disorders such as schizophrenia.

■ First international research grant awarded to NISAD employee. Dr Carmel Loughland was successful in obtaining a US-based NARSAD Young Investigator Award to take forward her promising line of research examining visual processing in schizophrenia.

■ Discovery of abnormal processing of social contextual information when interpreting the meaning of facial expressions in schizophrenia. This research aims to contribute to the development of remediation strategies to improve interpersonal communication and vocational functioning in schizophrenia.

■ A study of pathways to care in early psychosis demonstrated significant delays and missed opportunities for appropriate treatment in first-episode patients. Co-morbid substance abuse further lengthened the time to receive appropriate treatment.

■ Demonstration that modifications to the 'At Risk Mental State' assessment criteria, a clinical tool that predicts the transition to first-episode psychosis, would improve its accuracy from 50% to 85%.

■ Development of a new model of the psychological processes of recovery in schizophrenia - the 'stage model of recovery'. The model may provide a framework for training and research into recovery from mental illness.

RESEARCH OUTPUTS

■ 31 publications of NISAD-supported research in peer-reviewed scientific journals (increase of 75% compared to 2002-2003) with an average impact factor of 4.0. A further 4 manuscripts are in revision and 18 under editorial review.

■ A NISAD-supported study published in the *Australian and New Zealand Journal of Psychiatry* was rated by an international panel as one of the top articles published by the journal in 2003.

■ 81 presentations (including 8 invited) of NISAD-supported schizophrenia research at scientific conferences held in Australia, New Zealand, Italy, Canada, Switzerland, Cuba, Ireland, Hungary, Russia, UK and USA (increase of 88% compared to 2002-2003).

■ NISAD Scientific Director Professor Vaughan Carr presented the Novartis Oration at the 2003 Australasian Society for Psychiatric Research Conference.

■ 32 grants, with a total value of approximately $6.7M, were awarded to NISAD and/or NISAD-affiliated scientists to support schizophrenia research initiatives, equipment and travel costs (increase of over $3M compared to 2002-2003).

■ Award of 6 research higher degrees to NISAD-supported students. A further 4 theses were submitted and are under review.

RESEARCH INFRASTRUCTURE

■ The NISAD Register achieved a significant milestone with volunteer number 1,000 joining in the past year. Over half of the 1,100 volunteers on the database have now participated in a research study, with 16 such studies supported in 2003-2004.

■ The Hunter DNA Bank for Schizophrenia and Allied Disorders was officially launched in November 2003, and has recruited 100 volunteers in its first six months of operation.

■ The NSW Tissue Resource Centre (TRC) supported 15 neuropsychiatric research studies in Australia (New South Wales, Queensland, Victoria) and Japan, including many first time users of the facility. The NSW TRC now holds over 220 cases.

■ The 'Gift of Hope' and 'Using our Brains', NISAD-supported brain donor programs, have now recruited over 1,700 volunteers Australia-wide. The screening of Australia's first television brain donor community service announcement provided high levels of exposure for these programs.

■ NISAD supported the initiation of two further important infrastructure facilities - the NISAD Virtual Brain Bank and the Animal Behavioural Research Facility at the Garvan Institute of Medical Research.

RESEARCH PERSONNEL

■ NISAD employed 26 permanent positions (21.6 FTE) and 3 casual positions. This represents an overall increase from 2002-2003 of 6 permanent positions.

■ Continued investment in training, with NISAD support for 43 postgraduate students undertaking schizophrenia research. This is a 30% increase compared to 2002-2003 and recognises the need to develop young schizophrenia researchers, as they are the scientists who will provide the discoveries of the future.

■ Further growth in scientific participation on NISAD research panels, with affiliation of 8 new scientists.

RESEARCH SITES AND COLLABORATIONS

■ Initiation of national collaborative NISAD-supported research with researchers from the Black Dog Institute, Prince of Wales Medical Research Institute, University of New England, Royal Prince Alfred Hospital, Clinical Research Unit for Anxiety Disorders, Mental Health Research Institute of Victoria and the NSW Institute of Psychiatry for the first time.

■ New international schizophrenia research collaborations commenced with scientists from Hannover Medical School (Germany), University of Cambridge (UK), Kings College (UK) and Fukushima Medical University (Japan).

OTHER RESEARCH HIGHLIGHTS

■ Provision of support for important scientific meetings with a schizophrenia focus including: Newcastle Conference on Animal Models in Mental Health Research, and the Australian Psychosis Research Network Scientists Meeting.

■ Finalisation of formal research agreements between NISAD and the University of Newcastle, and Hunter Medical Research Institute.

■ Negotiations with University of Wollongong regarding the NISAD-funded Beta-Imager resulted in a five-year University-funded Research Fellow position in schizophrenia research being initiated.

■ NSW Health awarded $500,000 per annum recurrent funding for NISAD to establish the first Australian Chair of Schizophrenia Research. Review of NISAD's research program commenced with the view of developing a more focused direction in 2005.

FUNDRAISING/AWARENESS HIGHLIGHTS

■ Continued development and expansion of the NSW Health/NISAD Partnership Project and NISAD's other fundraising, education and awareness activities to support the research work of the Institute.

■ Total fundraising by NISAD Schizophrenia Research once again matched funding provided by NSW Health in 2003-2004. Research expenditure increased by 9% (compared with 2002-2003) whilst expenditure on administration/marketing/fundraising decreased by 20%.

■ Successful staging of a major black tie gala dinner 'A Spark of Genius' that raised approximately $165,000 for NISAD research. Other major events included the second annual NSW Club Industry Golf Championship for NISAD, and the Institute being the official charity for the Holroyd CityFest in 2004.

■ Support from new three-year sponsors: Ron & Peggy Bell Foundation, Australand Holdings, Tony Bleasdale & Associates, Chubb Fire Safety, Baulderstone Hornibrook, AbiGroup, Leighton Holdings, Lundbeck Australia and Paynter Dixon. The annual value of the sponsorships grew by 30% in 2003-2004 taking the total annual value to $230,000.

■ Completion of the Beta-Imager fundraising campaign for NISAD's research centre at the University of Wollongong. $200,000 was raised by the South Coast community, which included local government, unions, media, business, clubs and the broader community.

■ Significantly enhanced awareness and education activities with more than 150 information sessions held across a variety of workplaces and community settings. Three editions of the NISAD newsletter ‘HeadLines’ were distributed to NISAD's ever-growing readership of approximately 12,000.

■ 'Understanding Mental Illness', a collaborative public seminar organised by the Garvan Institute and NISAD proved to be a particularly successful event, filling the Garvan Auditorium with over 300 people.

■ Funded by NSW Health, NISAD produced a public awareness poster about schizophrenia, which describes the disease, symptoms and current treatments. The aim of the poster is to alert parents to the early warning signs of schizophrenia and to provide them with information about the disorder. The poster will be distributed to general practices, local government and community organisations in 2004-2005.

CHAIRMAN'S REPORT

Even by NISAD's standards of innovation and productivity, 2003-2004 stands as an outstanding year for scientific output, infrastructure expansion, and fundraising creativity.

The year started auspiciously with the launch of the new Beta Imager at the NISAD Centre in the University of Wollongong. The only one of its kind in the Southern Hemisphere, the $200,000 machine is now delivering research results in days that used to take months. The 2-year fundraising project that made it possible was led by Don McDonald, and supported by the South Coast Union movement, corporate leaders, Wollongong City Council, Rotary Clubs, regional media and the broader community. To match the local community's efforts, the University of Wollongong initiated a new 5-year post-doctorate Fellowship in schizophrenia research - the first such position to be funded by any NSW university.

The Hunter DNA Bank for Schizophrenia and Allied Disorders was officially opened in November 2003 at the John Hunter Hospital, Newcastle. This new resource will provide DNA samples from volunteer patients and their relatives to researchers to help them seek the genetic key to schizophrenia.

Expanding on the year's theme of establishing new structures for research, New South Wales Minister for Health, the Hon. Morris Iemma announced a Government pledge of $500,000 towards NISAD establishing Australia's first Chair of Schizophrenia Research. Supported by fundraising activities, this figure has the potential to reach $1 million. The announcement was made at NISAD's 'Spark of Genius' dinner at New South Wales Parliament House in March 2004. Managed by Lee Drury, this innovative event raised $145,000.

NISAD Schizophrenia Research has increased its scientific staff, including affiliated scientists, by fifteen percent. As part of NISAD's long-term commitment to schizophrenia research we are supporting an increasing number of PhD students. These students are Australia's research future, and in particular Australia's future in schizophrenia research.

The hard work in establishing key research infrastructure early in NISAD's life is now paying off: this year has seen a seventy percent increase in NISAD publications in peer-reviewed journals - a very impressive result.

The chief architect of these ongoing scientific advances, Professor Philip Ward, stepped down from his Scientific Directorship in March 2004. All scientists, Directors and staff applaud Philip's efforts which allowed for a sustainable future for NISAD Schizophrenia Research.

Professor Vaughan Carr, an eminent scientist with strong historical ties to NISAD, has accepted the position of Scientific Director. As founding Director of the Hunter Institute for Mental Health, and past President of the Australasian Society for Psychiatric Research, Professor Carr is well qualified to pilot the Institute to new achievements.

The Board was also delighted when Debbie Willcox accepted the position of Executive Director. Her previous experience as Chief of Staff to the Deputy Premier of NSW has equipped her well for the task of taking NISAD Schizophrenia Research forward.

Supporting the hard science productivity of 2003-2004, NISAD's fundraising and awareness activities have recorded equally high performance rates. Total fundraising has once again matched funding provided by NSW Health - while administration/marketing expenditure was reduced by twenty percent compared to last Financial Year.

Once again we have been heartened by the generosity of our many individual donors and corporate sector sponsors.

Awareness and educational activities included 150 information sessions held in a variety of workplaces and community settings. Three editions of the NISAD newsletter HeadLines were distributed to NISAD's ever-growing readership of approximately 12,000.

'Understanding Mental Illness', a collaborative public seminar organised by the Garvan Institute and NISAD, filled the Garvan Auditorium with over 300 people.

Funded by NSW Health, NISAD produced a public awareness poster that describes the symptoms and current treatments of schizophrenia. Its purpose is to alert parents to the onset signs, and to provide a contact source of early intervention treatment. The poster will be distributed to general practices, local government and community organisations, and will be offered to mental health authorities around Australia.

Since July 2003, a number of Directors have stepped down from the Board, and others have generously accepted invitations to join. I thank Dymphna Rees Peterson and Peter Young for their valuable services, and welcome Graham Shaw, Matthew Cullen, Rita Mallia, Christos Pantelis and Alexandra Rivers.

Such a productive year would certainly not have been possible without the skilful supervision and management of the NISAD Central Office team: Manager, Corporate & Community Partnerships Lee Drury; Research Manager Daren Draganic; Accountant Genevieve Hemsley-Wilken; Communications Director Alan Tunbridge; Office Manager Annette Carter, and Administration/IT Support Officer Julie Barlow.

Peter Dempsey

Chairman

SCIENTIFIC DIRECTOR'S REPORT

The year 2003-2004 has been one of major changes in NISAD, and a period of considerable growth in both resources and productivity. The changes include the appointment of a new Executive Director, Debbie Willcox, and a new Scientific Director following the departure of Philip Ward from this position. There have also been departures and new arrivals in relation to Board membership and a significant turnover in research employees. The upheaval and uncertainty that change brings can be unsettling for the people that remain and can put the work of NISAD at risk. Fortunately, these changes are now behind us, the rocky path has smoothed, and there has been a renewed focus on the main tasks of NISAD via widespread engagement in a process of consultation that is leading to a redefinition of NISAD's scientific agenda.

Change aside, growth is the word that best captures NISAD's achievements this year. In terms of resources, there have been substantial increases in the numbers of research employees, graduate students and affiliated scientists, as well as expansion of research infrastructure and the development of new state, national and international collaborations too numerous to mention here. An outstanding boost was the award of $500,000 per annum from NSW Health towards the establishment of Australia's first Chair in Schizophrenia Research, which we anticipate being filled in 2005.

In parallel with resource growth we have seen much growth in scientific productivity. There has been a marked upswing in scientific journal publications based on NISAD-supported research as well as a similarly dramatic increase in the numbers of presentations reporting this research at national and international conferences. External grants, awarded either directly to NISAD or to affiliated scientists working with NISAD infrastructure support, have also increased in both number and value, amounting to $6.7 million in the past year.

Some of the scientific highlights of the past year included the Hunter launch of the DNA Bank for Schizophrenia and Allied Disorders. This collection of DNA from volunteer donors is intended for genetic studies using the new microarray technology. Two other important infrastructure facilities initiated last year, with support from NISAD, were the Virtual Brain Bank, a collection of some 250 brain images being developed in collaboration with scientists in the USA, and an Animal Behavioural Research Facility at the Garvan Institute. The latter will be used for systematic studies of animal phenotypes of relevance to schizophrenia. Surprising as it may seem to some, animal research and the study of cell lines in culture promise to be major sources of new knowledge about schizophrenia in the future. In February NISAD supported a conference with Australian and international speakers that focused exclusively on animal models of mental illness as a way of exploring new directions for schizophrenia research.

Other highlights included the NISAD Schizophrenia Register achieving a significant milestone by reaching a total of 1,000 volunteers for schizophrenia related research; 16 separate studies were conducted last year using this resource. The NISAD-supported NSW Tissue Resource Centre supported 15 different studies across Australia and in Japan. Related to this important resource, the NISAD-supported donor programs, 'Gift of Hope' and 'Using our Brains', have now recruited over 1,700 volunteers, greatly aided by the screening of Australia's first television brain donor community service announcement.

Each of the highlights listed represents infrastructure, an investment for the future. That is, they do not of themselves produce immediate results. Instead they provide a source of scientific capital that will pay dividends in the form of future research investigations - research that would not be possible without this infrastructure. Scientific advances do not occur overnight, new knowledge requires a firm foundation on which to build, and the growing NISAD research infrastructure is the foundation for new discoveries of the future.

What of some of the discoveries of NISAD-supported research in the past year? It is not possible to do justice to them all here and a broad overview must suffice. Alterations to several chemical receptors in the cingulate cortex of the brains of people with schizophrenia have been described, alterations of gene expression in blood cells have been demonstrated in schizophrenia, and the first successful study showing a linkage between reduced cortical grey matter and reduced brain activation during a planning task in schizophrenia has been completed. NISAD researchers have commenced their first advanced proteomics studies of schizophrenia, work has commenced on a schizophrenia-related genetic model in laboratory animals, similarities between the effects of marijuana on the brain and first-episode schizophrenia patients have been demonstrated, and alterations in the neural system involved in fear perception in schizophrenia have been described. Research has also been conducted on gene expression altered by drug treatment, social context processing, pathways to care, identification of young people at high risk of schizophrenia and the psychological processes of recovery from schizophrenia.

Whilst we can all feel proud of the achievements of the past year, it is important to keep in mind that they have all been built on the dedication and hard work of many people associated with NISAD over recent years. Success in building - like success in research - does not come overnight, and at a time of rapid growth and exciting opportunities for the future we must not be blind to the fact that a debt of gratitude is owed especially to Philip Ward, the former Scientific Director, and Daren Draganic, the Research Manager. Without their commitment over past years NISAD would not be where it is today.

Professor Vaughan Carr
Scientific Director

Research Council

Professor Vaughan Carr
Convenor, Psychopharmacology and Therapeutics Research Panel; Scientific Director (Chair, from April 2004).

Mr Daren Draganic
NISAD Research Manager

Professor Clive Harper
Convenor, Tissue Resource Infrastructure Panel

Professor Graham Johnston
Co-Convenor, Neurobiology Research Panel

Dr Carmel Loughland
Convenor, Clinical Research Infrastructure Panel

Professor Pat Michie
NISAD Board Representative

Associate Professor Ulrich Schall
Convenor, Cognitive Neuroscience Research Panel

Professor Peter Schofield
Co-Convenor, Neurobiology Research Panel

Dr Paul Tooney
NISAD Scientific Employee Representative

Associate Professor Philip Ward
Scientific Director (Chair, until April 2004)

EXECUTIVE DIRECTOR'S REPORT

It was with great excitement that in May this year I accepted the position of Executive Director, NISAD Schizophrenia Research, and Director of the NISAD/NSW Health Partnership Project. While I have only been in the position for a short time I have already been completely taken by the calibre of the team, the breadth of research activity and the enormous support NISAD Schizophrenia Research receives from the community and corporate sector.

Working with Professor Vaughan Carr, Daren Draganic and Lee Drury, I can see very exciting times ahead for NISAD Schizophrenia Research.

The coming year is a particularly important one for NISAD - the appointment of the Chair in Schizophrenia Research is paramount. There is also a growing interest in neuroscience and mental health research within both State and Federal Government, which offers great opportunity for the organisation.

I am keen to build on the strong relationship that exists with Government and the corporate sector and will work hard to ensure NISAD's scientific achievements are communicated to our supporters and to the broader community.

I look forward to the coming year and getting to know everyone involved with this organisation. I thank the Board for my appointment and the entire head office team for making me so welcome in these early weeks.

Deborah Willcox
Executive Director

NISAD/NSW HEALTH PARTNERSHIP PROJECT REPORT

One of many significant events of the year was the retirement of Don McDonald as Director of the NISAD/NSW Health Partnership Project. Don's critical role in the inception and development of NISAD was celebrated at 'A Spark of Genius', a gala black tie dinner held at NSW Parliament House. It was a fitting farewell for Don, attended by senior members of Government, senior union officials, and industry leaders. The night was an outstanding success raising $165,000. Thanks to the staff at Telstra Friends and St. George Bank, NISAD plans to make 'A Spark of Genius' the Institute's official annual gala event.

The year has been a positive one with the continued development and expansion of the NISAD/NSW Health Partnership Project, along with NISAD's other fundraising, education and awareness activities - all aimed at supporting the scientific research. Importantly, NISAD's own fundraising activities has once again matched funding provided by NSW Health in 2003-2004.

NISAD welcomed support from new three-year sponsors: Ron & Peggy Bell Foundation, Australand Holdings, Tony Bleasdale & Associates, Chubb Fire Safety, Baulderstone Hornibrook, Abigroup, Leighton Holdings, Lundbeck Australia and Paynter Dixon.

3-year sponsorships are a critical component of our fundraising streams, providing a secure funding base for NISAD. The annual value of our 3-year sponsorships grew by 30% in 2003-2004 taking the total annual value to $230,000 per annum.

NISAD also are delighted to be part of the successful workplace giving programs of both ABN AMRO and Insurance Australia Group - both managed by the Australian Charities Fund.

It is the continuing generosity of communities that heartens the NISAD team. There are too many individuals, groups and activities to mention individually. However, a few highlights include:

• The completion of the Beta-Imager fundraising campaign for NISAD's Wollongong research centre. $200,000 was raised from the South Coast Community, which involved obtaining support from local government, unions, media, business, clubs and the general community. This was a remarkable effort. The imager has significantly increased the productivity of the work at Wollongong - reducing research time from months to days.

• The completion of the 'Building Workers on Jackson's Landing', Bovis Lend Lease / Construction Forestry Mining Energy Union (CFMEU) car park initiative raising over $100,000 for NISAD.

• NISAD being selected as the official charity for Holroyd CityFest 2004 - thanks to the support of Holroyd Council with the assistance of the CFMEU NSW Branch.

• NSW Club Industry 2nd Annual Charity Golf Championship for NISAD.

An important part of NISAD's role is also educating and raising community awareness about schizophrenia. More than 150 information sessions were held across a variety of work-places and community settings in 2003-2004. 'Understanding Mental Illness', a collaborative public seminar organised by the Garvan Institute and NISAD proved to be a particularly successful event, with over 300 people in attendance. Marilyn Mitchell, who spoke on the day, has received an award at NSW Parliament House for her tireless work in raising awareness of schizophrenia and support of NISAD's research.

Funded by NSW Health, NISAD has produced a public awareness poster about schizophrenia, which describes the disease, symptoms and current treatments. We hope it will help parents, siblings and friends who are concerned about a loved one - early intervention is critical in managing this disease. The poster will be distributed to general practices, local government and community organisations in 2004-2005.

NISAD's newsletter 'HeadLines' remains a key plank in sharing our research successes with an ever-increasing readership. Three editions were produced this year and distributed to a readership of around 12,000.

We sincerely thank everyone involved with NISAD for a very successful year. We look forward to working with you in the coming years as we continue to build on our strong foundations and find new and innovative ways to increase both funds and awareness.

As Professor Stan Catts, founding Chairman of NISAD Schizophrenia Research said:

"Patients with psychotic disorders will not ask us to do this for them, it is up to us to make sure there is no delay in finding the means to prevent and cure these diseases."

Lee Drury
Manager, Corporate and Community Partnerships

NEUROBIOLOGY RESEARCH PANEL REPORT

Panel Members
Associate Professor Loris Chahl
University of Newcastle
Professor Vaughan Carr
NISAD Scientific Director (from April 2004)
Dr Albert Chetcuti
NISAD Research Officer
Dr Mary Collins
University of Sydney
Dr Irina Dedova
NISAD Research Officer (from June 2004)
Dr Chao Deng
University of Wollongong (from November 2003)
Dr Gavin Dixon
NISAD Research Officer
Mr Daren Draganic
NISAD Research Manager
Professor Peter Dunkley
University of Newcastle
Professor Clive Harper
University of Sydney
Dr Jasmine Henderson
University of Sydney
Dr Tina Hinton
University of Sydney
Associate Professor Xu-Feng Huang
University of Wollongong
Professor Graham Johnston (Co-Convenor)
University of Sydney
Dr Tim Karl
NISAD Research Officer (from February 2004)
Associate Professor Izuru Matsumoto
University of Sydney
Professor George Paxinos
University of New South Wales
Dr Fraser Ross
University of Newcastle (from May 2004)
Professor Peter Schofield (Co-Convenor)
The Garvan Institute of Medical Research & Prince of Wales Medical Research Institute
Professor Rodney Scott
University of Newcastle
Dr Paul Tooney
NISAD Senior Research Officer
Dr Bryce Vissel
The Garvan Institute of Medical Research
Associate Professor Philip Ward
NISAD Scientific Director (until April 2004)
Dr Katerina Zavitsanou
NISAD Senior Research Officer (until June 2004), Australian Nuclear Science and Technology Organisation (from June 2004)

The Neurobiology Research Panel targets specific human and animal brain systems to identify the abnormally functioning neurons and neurotransmitters that could be responsible for the hallucinations, delusions, thought disorders and other symptoms of schizophrenia, as well as isolating the defects in gene action which may be the cause of the disease. The Panel also develops and undertakes behavioural studies of animal models of schizophrenia.

School of Biomedical Sciences, University of Newcastle

GENETIC STUDIES OF SCHIZOPHRENIA

The main focus of the Newcastle centre's research in 2003-2004 has involved application of the cutting-edge microarray 'gene chip' technology to the investigation of schizophrenia, using blood samples and human post-mortem brain tissue. Whilst it is known that there is a genetic component in the development of schizophrenia, the nature of these genetic changes remain unknown.

One of the problems facing clinicians is the lack of a definitive biological basis for the diagnosis and classification of disease subtypes of schizophrenia. Using microarray techniques, NISAD-supported PhD student Ms Nikola Bowden, Dr Paul Tooney and colleagues have examined the gene expression profiles from peripheral blood lymphocytes of individuals with schizophrenia and healthy controls. To date there have been no published reports on the use of gene expression profiling to identify subtypes of schizophrenia. Preliminary results have demonstrated a range of genes whose expression has been altered in schizophrenia, and five of these genes, known to be expressed in the brain or to have a brain related function, have been selected for further in-depth analysis. Interestingly, by including age and symptoms as parameters in the analysis, distinct gene expression profiles were observed that identified subgroups within these parameters. This study suggests that peripheral blood lymphocytes can be used to identify distinct gene expression profiles within schizophrenia, which may be useful in the development of a biological basis for diagnosis and subtype classification of this disorder.

Researchers at the centre are also examining two brain regions that have been implicated in schizophrenia using post-mortem human tissue. Ms Judith Weidenhofer, Ms Nikola Bowden, Dr Paul Tooney and colleagues are investigating gene expression in the amygdala and superior temporal gyrus, regions that have not been analysed in this way previously. Genes involved in presynaptic function, myelination, cellular signalling and metabolism were identified as being consistently dysregulated in these regions in schizophrenia and the protein products of some of the dysregulated genes are now being examined for expression changes related to schizophrenia. Future research will determine whether these genetic changes can also be observed in lymphocytes from people with schizophrenia and whether

they are due to anti-psychotic medication. These studies may provide new information about the genes that predispose a person to developing schizophrenia.

SCHIZOPHRENIA AND SENSORY DEPRIVATION

Previous research suggests that schizophrenia may result from developmental abnormalities that occur either in utero or soon after birth. It is possible that these abnormalities occur due to problems with sensory input pathways, which would affect processing in the brain of all input information. If this is the case it could explain the wide range of symptoms and the varying severity of the disorder experienced by those with schizophrenia. NISAD-supported PhD scholar Ms Penny Newson, under the supervision of A/Prof. Loris Chahl, has commenced a study that is developing an animal model to test the hypothesis that sensory deprivation during development and continuing into adult life results in schizophrenia.

Departments of Pathology and Pharmacology, University of Sydney

CORTICO-THALAMIC DYSFUNCTION IN SCHIZOPHRENIA

Researchers at NISAD's Sydney Centre have continued an integrated program of research investigating the role of the Papez circuit, and the neurotransmitter GABA, in schizophrenia. Led by Dr Gavin Dixon, the research program is investigating this circuit of interconnected brain regions that includes the anterior thalamus, posterior cingulate cortex and mamillary bodies. Specific memory deficits have been correlated with Papez circuit damage and previous research has demonstrated memory dysfunction in schizophrenia. GABA is the principle neurotransmitter mediating inhibition in the mammalian CNS and is known to be affected by schizophrenia. The key findings have included: (1) No evidence for selective GABAergic interneuron deficits in the anterior thalamic complex of patients with schizophrenia; (2) Preliminary evidence suggesting a lack of schizophrenia-specific alterations in GABAergic neurons in the posterior cingulate cortex, and (3) The first report of GABAergic neurons in the mamillary bodies of the normal human brain (with a non-significant increase in total GABAergic neuron numbers in schizophrenia).

PROTEOMIC INVESTIGATION OF SCHIZOPHRENIA AND ANTI-PSYCHOTIC DRUG TREATMENT

A team of NISAD scientists including Dr Irina Dedova, A/Prof. Izuru Matsumoto, Ms Sonja Schleimer, Dr Jasmine Henderson and Prof. Graham Johnston have commenced a collaborative program of research using proteomics - as it is known that most medications work by affecting proteins - to study schizophrenia and the effects of anti-psychotic treatment, using human post mortem tissue and animal models. This first study is investigating chronic anti-psychotic treated animal models, to correlate changes in protein expression profile in the brain with therapeutic effects and side effects of anti-psychotic drugs. At the same time a study examining cerebral cortical areas and striatum from human post mortem schizophrenia cases (who have been treated with anti-psychotic drugs) will be conducted. This will allow proteomics data obtained from human studies and studies of animal models to be compared. By applying this approach the research team aims to: (1) gain a better understanding of schizophrenia pathogenesis and aetiology by separating the effects of anti-psychotic medication from the pathology of the disease, (2) identify molecular mechanisms involved in side effects of anti-psychotic medication and, (3) identify potential biological precursors for an early diagnosis of anti-psychotic side effects.

THE ROLE OF THE GABA NEUROTRANSMITTER/RECEPTOR SYSTEM IN SCHIZOPHRENIA

Abnormal GABA neurotransmission in schizophrenia may lead to a deficit in inhibitory processes. This deficit has been suggested to account for some of the symptoms of schizophrenia. NISAD-supported researchers Dr Tina Hinton, Ms Sonja Schleimer, Dr Jasmine Henderson, Prof. Graham Johnston and colleagues at the Sydney Centre have continued to investigate the GABA system in an attempt to understand its molecular composition in the CNS and role in schizophrenia.

In the past year a study focusing on a group of proteins that transport GABA across neuronal and glial cell membranes has been undertaken as it was hypothesized that deficiencies in these GABA 'transporters' may be the cause of abnormal GABAergic brain activity. Focusing on the pre-frontal cortex, the NISAD team found that the schizophrenia tissue contained significantly altered levels of these transporters, which provides a promising path for future research. In a further study, the research group is examining $GABA_A$ receptor subunits, which have been shown to be differentially altered in post-mortem schizophrenia brain previously. This study is investigating the effects of anti-psychotic drugs at various $GABA_A$ receptor subtypes to determine whether differential changes in $GABA_A$ receptor subtype expression are due to drug administration in schizophrenia or the disease itself.

Department of Biomedical Science, University of Wollongong

THE ROLE OF THE CINGULATE CORTEX AND SUPERIOR TEMPORAL GYRUS IN SCHIZOPHRENIA

The cingulate cortex, including anterior (ACC) and posterior (PCC) divisions, is a brain area that has been suggested to be a site of primary pathological change in schizophrenia. Using human post-mortem brain tissue, researchers at NISAD's Wollongong Centre have previously reported significant alterations in serotonin, glutamate, cannabinoid and muscarinic receptor levels in the ACC of schizophrenia. Similarly, numerous

studies by other groups have observed functional and structural abnormalities in the superior temporal gyrus (STG) in schizophrenia.

In the past year the research group has commenced investigations into the role of the PCC in schizophrenia. Preliminary results have shown a significant decrease in muscarinic (M1/M4) receptors and a significant increase in GABAA receptors in schizophrenia. These results are consistent with previous studies in the ACC. The group also commenced investigation of the muscarinic, serotonin and glutamate receptor systems in the STG in schizophrenia. Preliminary results have shown a significant decrease in density of M1/M4 and M2 muscarinic receptors in the superior temporal gyrus in schizophrenia. Further analysis of other receptor systems in the STG has commenced. In the coming year the group aims to investigate the relationship and interaction between these multiple receptor systems in schizophrenia. This will be the first time this kind of research will be undertaken in the investigation of alterations of neurotransmitters and receptors in patients with schizophrenia.

ANIMAL MODELS OF SCHIZOPHRENIA

Last year A/Prof. Xu-Feng Huang and colleagues developed a new animal model of schizophrenia medication induced obesity and related metabolic disorders. Obesity occurs as a major side effect of anti-psychotic drug therapy and leads to a number of life threatening diseases such as cardiovascular disease and type II diabetes. Importantly, many patients cannot tolerate such severe side effects and are forced to cease treatment. Using these animals, NISAD-supported PhD student Ms Mei Han, commenced a study to investigate the mechanisms of action of anti-psychotic drugs as well as the neurological origin of the metabolic side effects that they can produce. Studies examining gene and receptor binding changes in the hypothalamus (metabolic relevance), cortex and limbic system (advanced brain function relevance) have also commenced. The first receptors under investigation are the 5-HT_{2A} and 5-HT_{2C} receptors. Dr Katerina Zavitsanou has also used these animals to examine muscarinic receptors in the rat brain. Preliminary results indicate an up regulation of M1/M4 muscarinic receptors in anti-psychotic treated animals.

Dr Katerina Zavitsanou, Ms Kelly Newell and colleagues have also investigated the effects of phencyclidine (PCP) on brain chemistry. Administration of PCP to humans induces a broad range of schizophrenia-like symptoms and previous research also suggests that PCP administration may induce some of the behavioural symptoms of schizophrenia in animals. However, to date, no detailed study has examined the effects of PCP on neurotransmitter receptors and messenger RNA (mRNA) expression. Preliminary results indicate that chronic PCP produces hypo-locomotion in mice. This is a new finding and is thought to potentially represent negative symptoms of schizophrenia. Subsequently, in both chronic and acute PCP-models, the animals have been treated with anti-psychotic drugs, and further behavioural and neurobiological (mRNA and neurotransmitter-receptor interactions) studies are underway. These studies will provide important information in understanding the mechanisms underlying the PCP actions and potentially the mechanisms underlying psychosis.

THE ROLE OF MEMBRANE PHOSPHOLIPID COMPOSITION IN SCHIZOPHRENIA

Whilst the aetiology of schizophrenia remains unknown there is an emerging body of evidence that suggests membrane phospholipid composition (MPC) is altered in schizophrenia. Slight changes in fatty acid composition of the membrane has significant effects on ion channels, membrane bound proteins, receptors and neurotransmitters. Previous research has also shown that fatty acid supplementation can significantly improve symptoms experienced by schizophrenia patients. The Wollongong team led by A/Prof. Xu-Feng Huang commenced studies investigating the MPC in the anterior cingulate cortex, superior temporal gyrus and hypothalamus using post-mortem human brain tissue. Preliminary results have demonstrated significant differences in the level of monounsaturated fatty acids and saturated fatty acids in the anterior cingulate region in schizophrenia. A further study is examining how membrane composition affects serotonin/muscarinic receptors and transporters in several brain regions in animal models that have been fed high/low fat diets. The study aims to provide information on the behavioural and physiological aspects of schizophrenia as well as the action of anti-psychotics.

Neurobiology Program, The Garvan Institute of Medical Research

GENETIC RESEARCH IN SCHIZOPHRENIA AND BIPOLAR DISORDER

Previous research has demonstrated a genetic component in the development of schizophrenia and bipolar disorder. However, the nature of these genetic changes remains unknown. The many similarities between psychiatric diseases such as bipolar disorder and schizophrenia make the study of one complementary to the other. The discovery of susceptibility genes for either disorder will likely be of benefit to all psychiatric disorders. NISAD scientists Prof. Peter Schofield, Dr Albert Chetcuti and colleagues have commenced a series of studies using the latest microarray 'gene chip' technology, that aim to provide more information about the genetic changes that occur with these disorders.

The first study aims to identify genetic changes produced via the treatment of normal mice with anti-manic drugs. To date limited medications have been used in the treatment of bipolar disorder. Lithium carbonate has been used successfully since the 1950s, yet its underlying mechanism of action is unknown. Newer drugs, such as valproate, are also frequently prescribed. The fact that these two chemically distinct drugs display similar

anti-manic effects on bipolar patients has prompted this study to determine whether these drugs act via overlapping biochemical pathways. The hypothesis is that genes commonly altered by lithium and valproate would be likely to have an important role in bipolar disorder. Preliminary results have shown a range of common genes to be significantly altered by the drug treatments and a subset of these have been selected for more detailed analysis. Subsequently, a further study was initiated to identify molecular changes produced via the treatment of normal mice with anti-psychotic drugs. It is hoped that genes identified in both studies may lead to the identification of potential molecular and cellular pathways responsible for schizophrenia and bipolar disorder as well as the identification of novel targets for the development of new treatments.

ANIMAL MODELS OF SCHIZOPHRENIA

While schizophrenia is a uniquely human disorder, many important features (e.g. schizophrenia-like behaviours and pathologies) can be recreated in animal models. Animal models of disease are a powerful tool to assess candidate genes and exposures. Understanding of many human diseases has been advanced through the use of experimental animal models (e.g. diabetes, Alzheimer's, multiple sclerosis). The resultant behavioural and genetic information obtained from these models could provide substantial benefits to sufferers of schizophrenia through the development of better diagnosis, new treatments and preventative strategies. For these reasons NISAD has collaborated with the Garvan Institute to develop a world-class animal behavioural research facility with equipment to test behavioural domains such as locomotion/exploration, motor functions, memory and learning, anxiety and social domains such as aggression or maternal behaviour. NISAD also appointed Dr Tim Karl, an experienced animal behaviouralist, to take forward this line of research.

The first study to utilise this facility has been the collaboration between NISAD and the Queensland Centre for Mental Health Research to develop a shared platform related to the use of animal models in schizophrenia research. Initially the collaboration is focusing on two animal models of schizophrenia. The Queensland group is working on a vitamin D-depletion model of brain development in rats. The NISAD arm of this study involves a systematic behavioural phenotyping of neuregulin (NRG1) knockout mice. NRG1 regulates the activation and expression of neurotransmitter receptors such as the NMDA receptor, plays a central role in neural development and is most likely involved in synaptic plasticity. Additionally, recent research has shown that deficits in NRG1 signalling may be involved in schizophrenia. A comprehensive and multi-tiered strategy for behavioural phenotyping of this model includes: control for neurophysiological reflexes and sensory abilities, locomotion/exploration, motor function/coordination, general motor activity, memory and learning, anxiety and social behaviours such as aggression or social attention. Following the behavioural phenotyping the effects of drug treatment, environmental factors (such as housing conditions, so-called enrichment), genetic background and neurobiological brain analyses will be performed. Combining these various levels of data (behaviour, brain structure, protein and gene expression) adds enormous value to the power of the study. This shared platform of coherent research will allow the two research groups to quickly evaluate various genetic and non-genetic candidate risk factors that may have a role in causing schizophrenia.

COGNITIVE NEUROSCIENCE RESEARCH PANEL REPORT

Panel Members
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University of Newcastle
Dr Michael Breakspear
University of Sydney
Professor Vaughan Carr
NISAD Scientific Director (from April 2004)
Dr Martin Cohen
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Mr Gavin Cooper
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Dr Allison Fox
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Professor Paul Thompson
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Associate Professor Philip Ward
University of New South Wales
Associate Professor Leanne Williams
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The Cognitive Neuroscience Research Panel focuses on research in cognition, computational modelling, and cognitive neuroscience as it applies to understanding the neural systems implicated in schizophrenia and associated disorders (covering the full range of methodologies, including radionuclide, MR-based, electrophysiological, and additional techniques not currently available or widely used e.g. transcranial magnetic stimulation, magnetoencephalography, optical imaging).

Schizophrenia Research Unit, Liverpool Hospital;
Centre for Mental Health Studies & Functional Neuroimaging Laboratory, University of Newcastle

Note: The majority of the studies undertaken at these three centres are collaborative.

STRUCTURAL AND FUNCTIONAL DEFICITS IN FIRST EPISODE SCHIZOPHRENIA PATIENTS

This study used structural and functional MRI to investigate potential relationships between grey matter thickness and functional brain anomalies in first episode schizophrenia patients via the latest analysis techniques developed by the Laboratory of Neuro-Imaging (LONI), UCLA. Data was collected in Australia and Germany and results demonstrated a widespread grey matter reduction in cortical regions in schizophrenia. FMRI activation in the temporal cortices and the dorsolateral prefrontal cortex was significantly associated with grey matter thickness.

Therefore, this study found that reductions in grey matter thickness in first episode schizophrenia patients could predict reductions in fMRI activation compared to healthy controls.

These findings suggest that a subtle reduction of regional grey matter in first-episode schizophrenia patients is associated with impaired brain function when performing a planning task. The results also support the notion of impaired executive attention and working memory in schizophrenia. This is the first study to link deficits in grey matter thickness to reduced brain activation during performance of a planning task in young people experiencing their first episode of schizophrenia. The study has now been expanded to examine the cerebellar cortex in first episode schizophrenia patients.

BRAIN IMAGING STUDIES OF AUDITORY PROCESSING DYSFUNCTIONS IN SCHIZOPHRENIA

Abnormalities in the auditory system have long been suspected to be present among people who suffer from schizophrenia, due in part to the high prevalence of auditory hallucinations amongst these patients. Over the last decade a core group of NISAD scientists including A/Prof. Philip Ward, A/Prof. Ulrich Schall and Prof. Pat Michie have identified an index of auditory information processing called mismatch negativity (MMN) that is abnormal in patients with schizophrenia, and their biological relatives. In the past year these research groups have collaborated on a range of studies investigating this phenomenon.

Two NHMRC-funded studies examining MMN in schizophrenia have continued in 2003-2004. The first project is using electrophysiological (ERP) and magneto-encephalography (MEG) measures of MMN to answer several crucial questions regarding the origin of abnormal auditory function in schizophrenia. In particular the study aims to provide clarification of unresolved issues regarding the nature, locus and progression of brain abnormalities underlying MMN reduction in schizophrenia. The second project is utilising fMRI to identify the specific brain regions that are active during auditory information processing, and linking these to the sources of the scalp recorded measures in schizophrenia patients. This functional measure will be examined in relation to the volume of brain tissue, measured from MRI scans using the LONI analysis technique, that enables the identification of subtle changes in brain anatomy. By examining patients who have recently developed schizophrenia, those who are chronic patients, and their close relatives, this study will provide the opportunity to identify biological markers of increased vulnerability for the development of schizophrenia.

A range of other studies have been initiated that are investigating auditory processing in schizophrenia. These include: (1) Dr Juanita Todd and colleagues who are extending previous MMN research to examine changes in processing auditory information between brain hemispheres; (2) NISAD-supported PhD student Ms Natasha Matthews who is exploring the ability of patients to locate the position of a sound in space, which is critically important for attention and information integration, abilities that are known to be compromised in schizophrenia; and (3) NISAD-supported PhD student Ms Amy Richards who is investigating the contribution of contextual processing problems to reduced MMN in schizophrenia, that is, exploring the hypothesis that individuals with schizophrenia have problems in utilising the context in which an event occurs to guide their behaviour.

AUDITORY TEMPORAL PROCESSING DEFICITS IN THE CENTRAL AUDITORY SYSTEM IN SCHIZOPHRENIA

Auditory temporal processing, or the ability to process rapid changes in sound, is essential for coherent perception.

Dysfunction in auditory brain mechanisms responsible for temporal processing is thought to underlie auditory sensory deficits and MMN reduction in schizophrenia. NISAD scientist Dr Bill Budd and colleagues have utilised advanced fMRI and auditory psychophysical techniques to investigate the perceptual and neural basis of the auditory sensory deficits identified in schizophrenia. Preliminary results have identified patterns of activity in auditory sensory regions of the brain associated with an individual's ability to perceive temporal changes in sounds. This new evidence is being used to determine whether this brain activity is altered in schizophrenia. High-field fMRI will also be used to determine whether these techniques may resolve activity within deep brain structures associated with auditory temporal processing in schizophrenia. This research will provide important new information regarding the neuropathology of schizophrenia and the relationship between brain function and auditory perceptual processes.

VISUAL SCANPATH STUDIES TO FACES AND FACIAL EXPRESSIONS IN SCHIZOPHRENIA

Dr Carmel Loughland has continued her research program examining visual scanpaths (as a psychophysiological marker of visual attention) in response to different facial expressions in schizophrenia. Dr Loughland's previous research has shown that people with schizophrenia have markedly restricted visual scanpath strategies when viewing faces and facial expressions of emotion, and tend to avoid salient facial features (i.e., eyes and mouth). Further, this restricted visual scanning is paralleled to a lesser degree in the biological first-degree relatives of schizophrenia patients. In 2003-2004, Dr Loughland was successful in attracting a prestigious US-based NARSAD Young Investigator Award to investigate whether visual scanpath deficits to faces in schizophrenia are associated with dysfunction in information sequencing and/or retention/integration of facial information, and whether a familial transmission component is involved. The information obtained from this research could be used to develop treatment and rehabilitation strategies to assist people with schizophrenia to optimise their social communication and to reduce their social disability. Findings in first-degree relatives might help to further elucidate the trait versus state based nature of visual scanpath disturbances in schizophrenia, and assist with development of a screening tool for use in 'at risk' populations.

FACIAL EMOTION RECOGNITION DEFICITS IN SCHIZOPHRENIA

Patients with schizophrenia have been shown to have problems in recognising displays of facial emotion. Previous research suggests that this deficit is restricted to the recognition of negative emotions (fear, anger, disgust, sadness) implying that schizophrenia may be associated with aberrant processing in neural structures (e.g. the amygdala and insula) specifically involved in the recognition of negative emotions. An alternative view suggests a generalised deficit whose effects may be present at the earliest stages of (structural) encoding of facial stimuli. According to this view the poor recognition of negative emotion faces may reflect initial discrepancies in task difficulty. If processing deficits occur at the earliest stages of face processing these are likely to have flow on effects to later stages of processing. NISAD-affiliated scientist Mr Patrick Johnston conducted a study that used psychophysiological measures (ERPs) and brain imaging (fMRI) while patients performed a facial emotion recognition task. The results demonstrated a significant reduction in a particular ERP potential as well as significant reduction in brain activation in the fusiform, inferior frontal, middle temporal and middle occipital gyrus as well as in the amygdala brain regions. Correlation analyses revealed that this ERP potential predicted the reduction in fusiform gyrus activation. Taken together these results suggest a deficit in the early (structural) encoding of faces, thus supporting a generalised model.

CORTICAL NETWORKS RESPONSIBLE FOR BEHAVIOURAL INHIBITION IN SCHIZOPHRENIA

The aim of this project is to investigate a form of behavioural inhibition known to be deficient in schizophrenia: the ability to inhibit on-going action. Patients have difficulty in triggering the inhibitory mechanism that stops motor plan processing before response execution. This study, being undertaken by NISAD-supported PhD student Mr Matthew Hughes, aims to compare brain activity during such cognitive processing in people with schizophrenia. Research in healthy controls has commenced and the study will be extended to schizophrenia patients in 2004-2005. The significance of the project lies in understanding how the brain controls inhibition of action and the potential for understanding what underpins the difficulties of patients.

TASK SWITCHING IN SCHIZOPHRENIA

Dr Frini Karayanidis, Prof. Pat Michie and NISAD-supported PhD student Ms Rebecca Hannan, have initiated a program of research that aims to identify the higher-order cognitive control processes involved when a person is required to switch their attention from one task to another. Previous research has suggested that individuals with schizophrenia show poor performance on tasks that require switching between different tasks. The research group identified an electrophysiological component associated with active preparation processes for an impending switch in task. Specifically, a differential positivity (D-Pos) was initiated in controls but not patients when it was identified that the following trial would require a switch in task. These results support previous evidence that individuals with schizophrenia show less efficient use of internally driven cues to guide behaviour. Further research using behavioural, electrophysiological and functional brain imaging measures to explore the functional and structural organisation of the D-Pos component in individuals with schizophrenia will be initiated in the coming year.

THE NISAD VIRTUAL BRAIN BANK

NISAD, in collaboration with the Centre for Mental Health Studies, has commenced the establishment of a schizophrenia MRI brain data collection that is based on the latest cutting edge imaging technology, developed by the Laboratory of Neuro Imaging of UCLA, and brought to Australia by NISAD. Over the next three years, about 250 brains of people suffering from schizophrenia at various stages of their disease, as well as cannabis users (with and without psychosis), and healthy volunteers will be analysed using this novel technique. Once analysed, these brains can be grouped together and subtle regional changes in the structural integrity of the cortex can be detected with the highest accuracy. This will provide the basis to investigate important research questions such as the effect of gender, age of onset, duration of illness, and cannabis use on cortex integrity in schizophrenia.

School of Psychiatry, University of NSW; Mood Disorders Unit, Black Dog Institute; Mayne Clinical Research Imaging Unit, Prince of Wales Medical Research Institute

COGNITIVE GENERATION OF AFFECT IN BIPOLAR DEPRESSION AND HYPOMANIA: AN FMRI STUDY

Previous NISAD-supported research undertaken by Dr Gin Malhi, Dr Jim Lagopoulos and colleagues, used fMRI to identify brain regions associated with the cognitive generation of affect in bipolar depressed patients. The results found that bipolar depressed patients utilise a separate functional route to process affective information, recruiting sub-cortical limbic regions. This substantiates the notion that a more primitive subcortical limbic system of emotional evaluation is recruited when more advanced prefrontal cortical processing can no longer be engaged. Subsequently this group conducted an fMRI study to identify the key brain regions in hypomanic patients associated with the generation of emotion. Clinically, mania and hypomania are unique to bipolar disorder and as such a better understanding of these mood states is likely to provide valuable insight into its pathophysiology. The results from this study found that hypomanic patients also recruit additional subcortical limbic systems (i.e. caudate, thalamus) for emotional evaluation when advanced prefrontal cortical processing is no longer sufficient. The differential patterns of activation provide information about bipolar disorder and may have potential diagnostic and therapeutic significance.

Brain Dynamics Centre, Westmead Hospital

PATHWAYS FOR FEAR PERCEPTION

When humans express fear, anger or disgust, they show different patterns of autonomic response, yet it is not known how autonomic and other neural systems interact during perception of danger signals. This is especially relevant to schizophrenia patients, as it is known that these individuals process emotional stimuli differently to unaffected individuals. The NISAD supported group at the Brain Dynamics Centre, have conducted a range of studies examining the pathways for fear perception.

A/Prof. Lea Williams, Dr Pritha Das and colleagues undertook a study using fMRI to record neural activity, with simultaneous skin conductance measures to record autonomic arousal in healthy controls. Facial signals of fear, anger and disgust elicited distinct response profiles including large skin conductance responses with amygdala activity to the fear stimulus. These findings suggest that fear, anger and disgust perception may engage distinct responses within the arousal systems for 'fight and flight', 'effort' and motivationally-determined 'activation', respectively.

A further study, conducted by Dr Pritha Das, A/Prof. Lea Williams and colleagues, used fMRI to examine the functional connect--ivity within thalamus, amygdala and sensory (inferior occipital, fusiform) cortices, and the modulation of these networks by the anterior cingulate cortex. Previous research has indicated that incoming sensory signals of fear are modulated by these regions but their functional connectivity has not been examined using neuroimaging. FMRI data was acquired from healthy control subjects during a fear perception task. Results confirmed that these regions are part of a distributed neural system for fear perception. These findings suggest that the interactions in thalamus, amygdala and cortical regions involve a dynamic interplay, with functional differentiation in both lateralized and ventral/dorsal gradients. Breakdowns in these interactions may give rise to affect-related symptoms seen in a range of neuropsychiatric disorders. The study will now be expanded to examine schizophrenia patients.

DIFFERENTIATION OF FRONTO-LIMBIC AND AUTONOMIC DYSJUNCTIONS IN THREAT-RELATED SIGNALS IN SCHIZOPHRENIA

Previous research by this group has shown that paranoid schizophrenia patients show disruptions to the neural systems for negative emotion perception as well as abnormal skin conductance arousal for emotion stimuli. A/Prof. Lea Williams, Dr Pritha Das, Dr Anthony Harris and colleagues conducted a study that used a technique for concurrent fMRI and skin conductance recording to determine whether these disturbances reflect a dysjunction in central and autonomic responses to negative emotions. During scanning, schizophrenia (paranoid and non-paranoid) and healthy control subjects viewed expressions of fear, anger and disgust. Skin conductance responses (SCRs) were acquired simultaneously. For controls, 'with-SCR' responses were associated with valence-specific activity for fear (amygdala), disgust (insula) and anger (anterior cingulate), together with medial prefrontal cortex engagement. Schizophrenia patients displayed abnormally increased SCRs to each emotion, but concomitant reductions in these valence-

specific regions and in the medial prefrontal cortex. This dysjunction was most pronounced in paranoid patients. These findings suggest that paranoid schizophrenia is characterised by a heightened autonomic sensitivity to facial signals of danger, yet lack the neural machinery for effective appraisal of these signals. This dysjunction in central-autonomic emotion systems may contribute to the exacerbation of paranoid symptoms.

EFFECT OF ATYPICAL ANTI-PSYCHOTICS ON AMYGDALA-PREFRONTAL AND AROUSAL DYSREGULATION IN SCHIZOPHRENIA

Previous research by this group has shown that amygdala and medial prefrontal disturbances in schizophrenia are particularly apparent during phasic increases in arousal, which are excessive in this group. This was the first study to use a technique for simultaneous functional MRI and skin conductance arousal recording to evaluate the effects of atypical anti-psychotic drugs on limbic-prefrontal function in schizophrenia, using facial emotion stimuli known to activate the limbic-frontal systems. Preliminary results show that atypical treatments are related to changes in brain function only when there are corresponding changes in arousal, highlighting the importance of concurrent arousal for enhancing the sensitivity of treatment evaluation.

SPATIO-TEMPORAL DISCONNECTION IN SCHIZOPHRENIA

This study, led by Dr Michael Breakspear, is furthering the comprehensive investigation of disconnectivity in schizophrenia, by developing a new technique for connectivity analysis. For any connectivity study, it is important to determine whether correlations between two selected brain regions are statistically significant or only chance effects due to non-specific correlations present throughout the data. This approach uses wavelet procedures to examine both spatial and temporal connectivity of brain networks, and the interaction between them. This technique may be applied to both functional MRI and EEG data, providing a means to subsequently bring these data together in the framework of a spatio-temporal biophysical model of the brain. This method is designed to test the hypothesis that such interactions are disturbed in schizophrenia.

Macquarie Centre for Cognitive Science, Macquarie University

FACE PROCESSING IN SOCIAL CONTEXTS IN SCHIZOPHRENIA

People with schizophrenia have difficulty interpreting the meaning of facial expressions, and make biased inferences about other people's mental-states or intentions (e.g., thinking that other people intend them harm). Poor context processing is thought to contribute to social communication difficulties in schizophrenia. For example, an image of a person with a furrowed brow and pursed lips (who may actually be expressing 'determination') may be misinterpreted as angry or threatening if social contextual information is not processed efficiently. Dr Melissa Green, Prof. Max Coltheart and colleagues commenced a study using visual scanpath technology that aimed to determine whether poor context processing contributes to social communication deficits in schizophrenia. Preliminary results suggests that people with schizophrenia may spend less time looking at contextual information compared to controls when making decisions about some types of mental states. Furthermore, the observation of reduced context processing in social situations in this study concurs with previous research indicating that schizophrenia is associated with a reduction in the use of contextual information during non-social information processing tasks. A long-term aim of the research is to develop remediation strategies to improve interpersonal communication and social skills in schizophrenia.

ATTRIBUTIONAL BIASES FOR EMOTIONAL STATES IN DELUSION-PRONE INDIVIDUALS

Deluded individuals exhibit a tendency to attribute negative experiences to external causes, specifically placing blame upon other people rather than situational factors. Dr Melissa Green conducted a study that investigated the presence of such a bias when attributing causes to negative emotional states (fear, anger, sadness), using facial expressions of emotion. Attributional biases in deluded participants were demonstrated for threat-related emotional expressions (anger, fear), and deluded schizophrenia participants were less likely to attribute feelings of anger to the actions of other people, or feelings of fear to situational factors, compared to controls. The pattern of attributions across negative expressions was not consistent with an overall 'external-personalising' bias in deluded schizophrenia. However, attributions for fear suggested that deluded individuals are less likely to consider situational factors contributing to feeling frightened, consistent with reduced appreciation of contextual information in schizophrenia.

SOCIAL ATTENTION AND REASONING IN SCHIZOPHRENIA

Many prominent schizophrenia symptoms (e.g. social dysfunction/persecutory delusions) have been attributed to an impaired ability to infer, monitor, and take appropriate account of other people's mental states (e.g. other people's thoughts, feelings etc). This capacity has come to be termed theory-of-mind. Although schizophrenia patients show performance deficits on theory-of-mind tasks, questions remain about the functional basis of such impairments. Recent findings suggest that these impairments in schizophrenia may be secondary to more fundamental disruptions of social attention (e.g. poor discrimination of social attention cues, such as eye-gaze direction) coupled with abnormal reasoning and/or attributional biases (e.g. a 'jumping to conclusions' style of belief formation and an excessive tendency to attribute blame for negative events to other people). Dr Robyn Langdon, Prof. Max Coltheart & A/Prof. Philip Ward conducted a study in persecutory-prone patients, with and

without a current persecutory delusion, that investigated the role of attributional biases and social cognition impairments in the explanation of persecutory delusion formation and poor insight. Interrelationships of paranoid ideation and self-consciousness (including social anxiety) were also examined. Social cognition deficits among patients were associated with poor insight. Social anxiety was highest in persecutory-deluded patients, and self-focused attention directed exclusively outwards to monitor other people's reactions exacerbated an other-blaming bias. More severe delusions in patients with a current persecutory delusion were associated with a defensive externalising bias. The study suggests that a defensive bias may be secondary to the threat-filled experience of living with a persecutory delusional belief.

ATTENTIONAL ORIENTING TRIGGERED BY GAZE IN SCHIZOPHRENIA

The ability to detect other people's gaze and to shift attention reflexively in the same direction (subserved by the superior temporal sulcus: STS) facilitates the sharing of attention with other people. Such sharing of attention may be critical for the maintenance of normal social cognition. Social cognition is severely impaired in people with schizophrenia who also show STS anomalies. Dr Robyn Langdon and colleagues therefore undertook a study to investigate reflexive and controlled attentional orienting triggered by gaze in schizophrenia. This study provides the first evidence that people with schizophrenia show abnormal hyper-responsive, rather than hypo-responsive, reflexive orienting triggered by gaze. These individuals are also impaired in their ability to endogenously redirect attentional shifts triggered by gaze. These results support the view that schizophrenia is characterised by abnormal social hyper-arousal/vigilance coupled with impaired controlled/inferential processing.

PERSECUTORY DELUSIONS IN SCHIZOPHRENIA

NISAD-supported PhD student Mr Ryan McKay, undertook a range of studies investigating persecutory delusions in schizophrenia. One such study hypothesised that patients with persecutory delusions would display higher need for closure and a more extreme 'jumping to conclusions' bias than healthy participants. Patients with persecutory delusions recruited from the NISAD Schizophrenia Register (acute and remitted) and healthy controls were administered a probabilistic reasoning task, along with self-report measures of depression, need for closure, indecisiveness and various aspects of paranoid ideation and delusion-proneness. The results confirm an association between persecutory delusions and need for closure, yet suggest that the jumping to conclusions bias may be more closely associated with non-persecutory delusional ideation than with persecutory ideation. There is little support for the suggestion that a high need for closure drives the jumping to conclusions data-gathering bias in deluded individuals.

Centre for Clinical Research in Neuropsychiatry, University of Western Australia; School of Behavioural Sciences, University of Newcastle.

WELL-BEING IN SCHIZOPHRENIA: THE ROLE OF EMOTION IN AUDITORY HALLUCINATIONS

The majority of patients with schizophrenia will experience auditory hallucinations (AH) during their illness. Hallucinated voices are predominantly negative and critical in tone and content. Negative emotions (e.g. depression, anxiety, stress etc) are strongly linked with AH, often accompanied by lower personal well-being, such as hopelessness and suicidality and predicts poor long term outcomes. Current pharmacological and psychological treatments for schizophrenia, and in particular, of AH, are not consistently successful. The association of negative emotions with AH contributes to diagnostic and treatment difficulties. NISAD is supporting a new collaborative study with scientists from the University of WA (Ms Georgina Paulik, Dr Johanna Badcock) and Prof. Pat Michie. This study will examine patients currently experiencing AH, taking into account negative emotions. This study will examine both the biological and psychological processes involved in the development of AH and may contribute to improved diagnostic and treatment practices for patients with schizophrenia. In particular, the research will focus on developing new psychological tasks that can be used in the assessment of individuals at risk of developing schizophrenia. The identification of specific emotional and thought processes which increase the risk for depression and hallucinations will also lead to better strategies for suicide intervention, especially in young adults, and provide improved targets for cognitive-behavioural treatment strategies.

PSYCHOPHARMACOLOGY AND THERAPEUTICS RESEARCH PANEL REPORT

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Dr Martin Cohen
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Mr Daren Draganic
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Mr Jim Sheedy
NISAD Research Officer (until November 2003)
Dr Nadia Solowij
University of Wollongong
Dr Helen Stain
Centre for Rural and Remote Mental Health (from May 2004)
Associate Professor Philip Ward
University of New South Wales (until April 2004)

The Psychopharmacology and Therapeutics Research Panel focuses on research investigating the effects of medication and/or pharmacological probes in patients, 'at-risk' populations and healthy volunteers. It also provides a platform for initiating trials of new interventions, both pharmacological and non-pharmacological.

Northern Sydney Area Health Service

PATHWAYS TO CARE IN EARLY PSYCHOSIS: UNDERSTANDING TREATMENT DELAY

With the emergence of psychotic illnesses such as schizophrenia, there is often an extended period of delay where problems get worse and assistance is sought from inappropriate settings or not sought at all. These delays can be extremely damaging to a young person, often at an important stage of development. This study, conducted by Ms Bev Moss, Ms Jo Gorrell, A/Prof. Philip Ward, Dr Louise Nash and Prof. Chris Tennant developed a tool to collect information about the pathway to care for young people with first episode psychosis.

The methodology used modified early warning sign cards and notable events as anchors to prompt recall and enabled the researcher and client/family member to collaborate in mapping a time line of indefinite length, including prodrome and psychosis onset, help-seeking attempts, missed opportunities and illicit substance usage.

The results demonstrated that on average subjects first sought help two years after they noticed something was wrong and received treatment two years later after making 4.6 help seeking attempts. This is 68 weeks after psychosis onset. Of contacts made during periods of acute psychosis 50% did not lead to appropriate treatment, due to failure of those approached to identify psychosis, to refer, or to assertively follow-up. Many of these contacts were with medical practitioners. Substance users took significantly longer than non-users to seek and receive help.

Ultimately it is hoped to develop targeted mental health promotion initiatives for maximum impact.

Department of Psychology and Biomedical Science, University of Wollongong

INVESTIGATION OF RELATIONSHIPS BETWEEN CANNABIS USE AND SCHIZOPHRENIA

A range of NISAD-supported studies, examining the relationship between cannabis use and schizophrenia, were undertaken at the University of Wollongong in 2003-2004. This is an area of particular interest to NISAD as such a high percentage of people with schizophrenia also use cannabis.

Dr Nadia Solowij, A/Prof. Philip Ward and colleagues have continued with their study that is using functional MRI and tests of neuropsychological functioning to investigate the neurocognitive correlates of impaired memory function associated with long term heavy cannabis use. Long term heavy use of cannabis has been shown to result in memory and attentional impairments similar to those seen in schizophrenia. Preliminary results have shown differences in neuropsychological test performance with the worst performance by long-term heavy cannabis users. Accordingly, long-term heavy users show the greatest alterations in brain activation, with lower activation in regions relevant to memory function. Data collection from cannabis users is ongoing and the project will be extended to include cohorts of people with schizophrenia who do and do not also use cannabis.

Dr Solowij also commenced collaborations with NISAD neurobiology scientists, Dr Katerina Zavitsanou and A/Prof. Xu-Feng Huang, which will link animal and human investigations of the chronic effects of cannabinoids on brain chemistry and function. Little is known about these systems following chronic administration of cannabinoids. The major outcome of this research will be a greater understanding of the brain mechanisms that mediate the effects of cannabinoids in relation to psychosis and the potential to indicate new pharmacological directions for the treatment of both cannabis dependence and psychosis.

THE EXPERIENCE OF RECOVERY FROM SCHIZOPHRENIA

A review of consumer accounts of recovery, and consumer-oriented qualitative research has led to the finding that recovery takes place in stages, and that the outcome of recovery is psychological well-being, even in the presence of continuing mental illness. A number of processes take place during recovery. The aim of this study, undertaken by NISAD-supported PhD student Ms Retta Andresen, was to develop and test a model of the psychological processes of recovery. This could provide stronger empirical foundations for research, training and practice related to the emerging recovery movement in mental health. Focusing on reports made by people with schizophrenia, the first stage of the study identified four key factors in psychological recovery: (i) finding hope; (ii) re-establishment of identity; (iii) finding meaning in life; (iv) taking responsibility for recovery. Five stages were identified in the process of

psychological recovery: (i) moratorium; (ii) awareness; (iii) preparation; (iv) rebuilding; (v) growth. This 'stage model of recovery' may assist both clinicians and consumers in conceptualizing the recovery process, and may also help to validate consumers' experiences. It may also prove useful for determining the treatment approach that would be best suited to an individual at a given time.

Centre for Mental Health Studies, University of Newcastle

BRAIN IMAGING IN CHRONIC CANNABIS USERS AND CANNABIS USING FIRST EPISODE SCHIZOPHRENIA PATIENTS

This study, being undertaken by Dr Martin Cohen and colleagues, is investigating whether schizophrenia pathology shares a common neural substrate with the pathological brain changes associated with cannabis use. Chronic use of cannabis can impair frontal brain functioning, affecting the capacities for attention, working memory and concentration. These cognitive deficits bear striking similarities to those associated with the negative symptom cluster of schizophrenia, which are also thought to be related to frontal brain dysfunction. The study, which received an NHMRC project grant in 2003-2004, is using the LONI analysis technique, via NISAD's collaboration with UCLA, to apply both structural and functional MRI techniques to investigate how chronic cannabis use affects the structure and function of the brain and make a comparative analysis with the brain changes associated with schizophrenia. Preliminary results have shown that both chronic cannabis users and first episode schizophrenia patients demonstrated a similar reduced pattern of activation (compared to healthy controls) in the dorsolateral prefrontal cortex, parietal lobule and cerebellum suggesting the possibility of a shared pathological mechanism in these conditions.

SCANPATH DEFICITS TO FACE STIMULI AMONG PEOPLE WITH SCHIZOPHRENIA: THE EFFECT OF COMORBID SUBSTANCE USE

Patients with schizophrenia demonstrate deficits in their ability to identify facial displays of emotion, which may contribute to the observed problems with interpersonal communication and social interaction seen in schizophrenia. Recording eye movements (i.e., visual scanpaths) while people view face stimuli provides a window into the neurocognitive strategies that underlie face processing. Previous research by Dr Carmel Loughland and colleagues has shown that people with schizophrenia exhibit a 'restricted' visual scanpath strategy and make fewer fixations on salient facial features that assist with discriminating emotion. There is also evidence that scanpath abnormalities to facial stimuli may involve familial transmission. This project aims to investigate whether scanpath deficits to faces in schizophrenia are further disturbed by substance abuse (i.e., cannabis), and if these deficits involve a familial transmission component, as observed in the first-degree relatives of schizophrenia patients. This research will provide information on the potential clinical utility of cognitive rehabilitation strategies focusing on improving facial affect recognition.

CHARACTERISTICS OF SMOKERS WITH A PSYCHOTIC ILLNESS AND IMPLICATIONS FOR SMOKING INTERVENTIONS

The prevalence of smoking among people with a psychiatric illness, especially schizophrenia, is greater than in the general population. Exposure to tobacco smoke has been identified as a cause of 32 different diseases and increases the risk of many different cancers. Smoking related diseases rate second in frequency to suicide as the greatest contributor to early mortality in schizophrenia.

Led by Dr Amanda Baker, and utilising the NISAD Register, this was the first large-scale, comprehensive study of smoking, smoking-related phenomena and psychopathology in a sample of smokers with a psychotic illness, including schizophrenia. The aims of this NHMRC-funded study were threefold: to describe the demographic and clinical characteristics of smokers with a psychotic illness residing in the community; to describe their smoking behaviours, severity of nicotine dependence, stage of change and reasons for smoking and for quitting. Results found significant differences in smoking characteristics between stage of change subgroups within the present sample of smokers with a psychotic illness and between the present sample and other studies (e.g., higher nicotine dependence, motivations related to more extrinsic factors). In conclusion these findings may have important implications for the nature and timing of smoking interventions among people with a psychotic illness.

The research group has now commenced the first randomised controlled trial of an intervention for tobacco dependence among people with mental illness. This project will examine the effectiveness of nicotine replacement therapy combined with counseling compared to a self-help booklet on smoking. The results of the study will inform future clinical intervention for smokers with a mental illness. The group will also investigate the characteristics of people with a diagnosis of psychosis and varying patterns of substance use, that is, co-existing psychosis and substance use disorder, co-existing psychosis and nicotine dependence; and psychosis without substance use problems.

A STUDY OF COGNITIVE BEHAVIOUR THERAPY FOR SUBSTANCE USE DISORDERS AMONG PEOPLE WITH A PSYCHOTIC ILLNESS

The aim of this NHMRC-funded study, supported by the NISAD Register, and undertaken by Dr Amanda Baker and colleagues, is to evaluate the effectiveness of cognitive-behavioural therapy (CBT) on the course of alcohol and other drug (AOD) use and

psychiatric symptomatology among individuals with a psychotic illness and concurrent AOD problems. The study is significant for two main reasons: firstly, it represents the first randomised controlled trial of CBT among people with a psychiatric illness and AOD problems and secondly it will assist in the development of services for people with comorbid mental illness and AOD abuse. The results of the study will contribute to knowledge regarding the key illness factors associated with treatment effectiveness, such as age of onset, duration and severity of psychiatric illness and AOD problems. This information will assist Mental Health and Drug and Alcohol Services to both target and personalise interventions for clients with a dual diagnosis of major mental illness and AOD abuse.

School of Biomedical Sciences, University of Newcastle

INVESTIGATION OF CANNABIS USE IN THE DEVELOPMENT OF SCHIZOPHRENIA IN GENETICALLY PREDISPOSED INDIVIDUALS

Dr Fraser Ross and Dr Paul Tooney have commenced a study examining whether dopamine and serotonin receptors, which have been shown to display altered characteristics in subjects with schizophrenia can form unique signalling complexes with the cannabinoid CB-1 receptor. The CB-1 receptor was chosen due to the link between cannabis abuse and the precipitation of psychosis and the reported increase in the incidence of cannabis use amongst people with schizophrenia. It has been hypothesised, that the complexation of either the dopamine or the serotonin receptor to the cannabinoid CB-1 receptor, to form a 'receptor complex' may allow the hyperactivation of the signalling pathways associated with these systems as seen in schizophrenia, after the active ingredient of cannabis (THC) is administered. Preliminary results from the study have successfully detected these receptor complexes in vitro indicating that the cannabinoidergic receptor system has the ability to interact at the molecular level with the dopaminergic D2 and serotonergic $5HT_{2A}$ and $5HT_{2C}$ receptor systems. The study will now investigate the signalling behaviour of these receptor complexes in the presence of cannabinoid agonists and the detection of these receptor complexes in animal and human neurons. The ultimate goal of the research is to develop selective antagonists for physiologically relevant cannabinoid heterodimeric receptor complexes that will prevent the development of cannabis-induced schizophrenia.

TISSUE RESOURCE INFRASTRUCTURE PANEL REPORT

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Associate Professor Philip Ward
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The aim of the NSW Tissue Resource Centre is to collect, store and distribute fixed and frozen brain tissue that is well characterised both clinically and pathologically for neuropsychiatric research projects. The focus for the collection is cases with schizophrenia, other major psychiatric disorders and normal control cases that provide an important comparative group. To help facilitate this collection, the Panel has also developed Tissue Donor Programs with pre-mortem diagnosis and assessment.

NSW Tissue Resource Centre (TRC)

Schizophrenia is a uniquely human disease and NISAD has therefore placed a high priority on research using post-mortem human brain tissue. The NSW TRC is a facility for the collection, storage and distribution of well characterised fixed and frozen human brain tissue for neuropsychiatric research (with a focus on schizophrenia). The NSW TRC has continued to grow during 2003-2004 with a further 41 cases collected, taking the total number of cases held by the TRC to over 220. Dr Irina Dedova commenced as TRC Coordinator in December 2003.

In the past year tissue has been requested and supplied for 15 neuropsychiatric research studies nationally (New South Wales, Queensland, Victoria) and internationally (Japan). Promotion of the NSW TRC and associated donor programs at a

number of major national neuroscience/schizophrenia conferences in the past year has again led to a number of requests for tissue submitted by researchers who had not previously used the facility.

Importantly, NSW TRC Director and NISAD-affiliate, Prof. Clive Harper, was successful in obtaining two major five-year grants to support the operation of the NSW TRC and associated brain donor programs. The first was from the US National Institutes of Health ($US1.6M) and the second was an NHMRC Enabling Grant ($2M).

The NSW TRC is jointly supported by NISAD, the University of Sydney, Central Sydney Area Health Service and the National Institute of Alcohol Abuse and Alcoholism.

BRAIN BANKING FOR NEUROSCIENCE RESEARCH

The principal role of a brain bank is to supply researchers with high-quality human post mortem brain tissue to study the aetiology and pathogenesis of neurological and psychiatric disorders such as schizophrenia.

Research using human brain tissue has already led to a number of important discoveries and there is an increasing demand for the use of human brain tissue in research projects. Ms Kimberley Alexander, a NISAD-supported student, undertook a review of the operations of the NSW TRC in comparison with 50 other brain banking protocols throughout the world. Five amendments to the TRC protocol were proposed to help maximise tissue quality and availability for research. The study also recommended that collaborative initiatives were necessary to standardise brain-banking activities and therefore enable broad cross-sectional studies and the study of rare diseases.

BRAIN DONOR PROGRAMS - THE NISAD 'GIFT OF HOPE' & 'USING OUR BRAINS' TISSUE DONOR PROGRAMS

The NISAD 'Gift of Hope' (GoH) program enables individuals with schizophrenia and those without a mental illness to volunteer to donate their brain for schizophrenia research after death.

The benefit of this program (and the UoB program - see below) is that volunteers are assessed on a range of clinical and neuroimaging investigations once enrolled, the results of which are available for later correlation with post-mortem findings.

Over 230 volunteers have now joined the GoH program, recruited from NSW, with an additional 100 enrolling in 2003-2004. The screening of a GoH community service announcement in October 2003, the first TV recruitment campaign for brain donors in Australia, was extremely successful with over 75 new donors identified. One further collection for the GoH occurred in 2003-2004.

The 'Using our Brains' (UoB) program focuses on recruiting individuals without a mental illness to volunteer to donate their brain for neuroscientific research after death. Having access to 'normal control' tissue for comparison is essential for studies into disorders such as schizophrenia and bipolar disorder. Approximately 1,500 people have joined the UoB program nationwide, and 10 collections have occurred.

BRAIN DONATION FOR RESEARCH

Whilst it is known that Australians are interested in donating organs for transplantation purposes, generally for altruistic reasons, the issue of how people feel about donating brain tissue for medical research has not been systematically explored. Ms Therese Garrick, Ms Lisa Azizi, Prof. Clive Harper and colleagues therefore undertook two studies to: (1) examine the responses of the next of kin of the deceased, to the question of brain donation for medical research and (2) examine knowledge, attitudes and the motivation for donation for research in individuals registered with the 'Using our Brains' donor program.

In the first study, results demonstrated that approximately two thirds of next of kin spoken to gave permission for the donation. The main reasons given were exposure to an illness and the desire to help others with the same illness. Most next of kin who decided to donate commented that the donation allowed an 'altruistic' outcome to the death.

The preliminary results from the second study found that the age, gender, ethnicity, education, personal health and family history of the donor, all influenced the decision to donate. Overwhelmingly the motivation was altruistic, motivated by benefiting science, medicine and the community. These findings have generated recommendations for education and donation programs to encourage donation.

THE DIAGNOSTIC ACCURACY OF THE MODIFIED COMPOSITE INTERNATIONAL DIAGNOSTIC INSTRUMENT (CIDI) IN A CLINICAL SAMPLE OF PSYCHOTIC DISORDERS

The CIDI is a structured diagnostic instrument that can be administered by a lay-interviewer, and has recently been modified in an effort to improve diagnostic accuracy. Prior research suggests that the original CIDI psychosis instrument does tap into psychosis but its diagnostic accuracy for schizophrenia in clinical samples is unsatisfactory. In this study, NISAD scientists Ms Lisa Azizi, Ms Therese Garrick and colleagues compared the diagnoses generated by the modified CIDI with another diagnostic instrument - the Schedule for Clinical Assessment in Neuropsychiatry (SCAN), which has a comprehensive coverage of the symptoms of psychotic disorder and is administered by a clinician. The results found that the modifications do not represent an improvement, suggesting the CIDI in its original form, is ideal as a screener for psychotic symptoms.

CLINICAL RESEARCH INFRASTRUCTURE PANEL REPORT

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Dr Carmel Loughland (Convenor)
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Dr Louise Nash
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Professor Rodney Scott
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Mr Jim Sheedy
NISAD Research Officer (until November 2003)
Dr Paul Tooney
NISAD Senior Research Officer
Associate Professor Philip Ward
NISAD Scientific Director (until April 2004)

The Clinical Research Infrastructure Panel coordinates the recruitment and diagnostic assessment of NISAD Schizophrenia Research Register participants, promotes the Register to clinicians and researchers and provides training in clinical assessment techniques. The Panel also oversees the Hunter DNA Bank for Schizophrenia and Allied Disorders, which collects and stores DNA to be utilised for genetic research into schizophrenia.

NISAD Schizophrenia Research Register

In the past year the NISAD Schizophrenia Research Register, a volunteer database of people with schizophrenia, family members and people with affective disorder who are willing to be involved in schizophrenia research reached a significant milestone, with over 1,000 volunteers now enrolled. A further 169 people joined the Register in 2003-2004, taking the total number enrolled to over 1,100. Approximately half of the volunteers have been clinically assessed and participated in a research study.

Recruitment to the Register was once again aided by a re-screening of a television community service announcement commencing in Schizophrenia Awareness Week 2003, with national exposure via SBS for the first time. Over 400 calls were received, resulting in 135 new Register members. As a statewide database with significant regional representation, NISAD conducted presentations and clinical assessments of Register members in Canberra and Lismore. Further regional visits are scheduled for 2004-2005.

In the past year the Register has provided participants for 16 schizophrenia research studies in NSW conducted at Macquarie University, University of Newcastle, University of Wollongong and Liverpool Hospital.

The Hunter DNA Bank for Schizophrenia and Allied Disorders

The Hunter DNA Bank for Schizophrenia and Allied Disorders is a facility that stores DNA obtained from blood samples of people with schizophrenia, their close relatives and healthy controls. The DNA Bank was officially launched in November 2003 at the John Hunter Hospital in Newcastle by NSW Transport Minister and Minister for the Hunter, the Hon. Michael Costa.

The first recruitment campaign for the DNA Bank commenced in late 2003, with volunteers initially recruited through the resources of the NISAD Register, Hunter Health and the community. In its first six months of operation the DNA Bank recruited approximately 100 volunteers.

As with the Register, all volunteers also undergo a structured interview to confirm diagnosis and to collect clinical and neuropsychological information, and family history of psychiatric illness. This will provide a large sample of genetic (DNA) samples that are cross-referenced with comprehensive clinical and neuropsychological information, which will be available to researchers investigating the genetics of schizophrenia once sufficient samples are obtained.

The DNA Bank is supported by NISAD, the Hunter Medical Research Institute, University of Newcastle and Hunter Area Pathology Service.

Research Databases

The NISAD Schizophrenia Research Database of NSW and the ACT, which aims to provide a single source of information for neuroscientists, clinicians and consumers / carers about schizophrenia research projects currently planned or underway in New South Wales and the ACT continued to develop in 2003-2004. An additional 17 schizophrenia research projects were added to the database, taking the total number of research studies listed to 117.

Design and development of a collaborative database that brings together the current individual databases from the NISAD Schizophrenia Register, 'Gift of Hope' Tissue Donor Program and DNA Bank continued in 2003-2004. This reflects the considerable overlap in data obtained from volunteers of the three programs. The aim is to develop a database that could be de-identified and viewed on-line in a read-only format by researchers.

NEUROPSYCHOLOGICAL FUNCTIONING WITHIN SCHIZOPHRENIA SAMPLES FROM DIFFERENT SOURCES: COMPARISONS WITH RBANS

Previous research has demonstrated that schizophrenia samples derived from different sources vary markedly (e.g., illness onset, relationships and supports, current functioning, illness course). This study, conducted by Dr Carmel Loughland, Prof. Vaughan Carr, Dr Anthony Harris and Mr Terry Lewin has extended this research by comparing the neuropsychological performance of volunteers from the NISAD Schizophrenia Research Register with published RBANS data from an American schizophrenia sample and from normal controls. The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) is an assessment instrument that is used to determine a person's current neuropsychological status. Preliminary results have reinforced the notion that a severity/functioning gradient exists across various schizophrenia recruitment sources, which has important implications for the generalisability of findings and for research design. These data also suggest that memory impairments may be a core feature of schizophrenia.

ATTITUDES AND ROLES OF GENERAL PRACTITIONERS IN THE TREATMENT OF SCHIZOPHRENIA COMPARED WITH COMMUNITY MENTAL HEALTH STAFF AND PATIENTS

Most general practitioners (GPs) are currently treating a small number of patients with schizophrenia; however, little is known about GPs' experiences in this area. This study, undertaken by Prof. Vaughan Carr, Mr Terry Lewin and colleagues, which utilised the NISAD Register, examined the attitudes and roles of Australian GPs in the treatment of schizophrenia and their relationships with specialist services. Results found that perceived helpfulness ratings were reasonably consistent across groups. However, patients tended to rank close family members as more helpful. GPs and MHS staff reported complementary roles, with a shared responsibility for early detection and relapse prevention. Treatment compliance, and communication and accessibility to specialist agencies were identified as major problems. In conclusion, it was found that GPs fulfil a valuable role in the treatment of schizophrenia, which could be enhanced through improved training. Mental health services need to work more effectively with GPs in treating schizophrenia and acknowledge their complementary roles.

RISK FACTORS FOR TRANSITION TO FIRST EPISODE PSYCHOSIS AMONG INDIVIDUALS WITH 'AT RISK MENTAL STATES'

Prof. Vaughan Carr, A/Prof. Ulrich Schall and colleagues completed a study of 'At Risk Mental State' (ARMS) assessment criteria, a clinical measurement tool to help decide whether a young person is at risk of developing a psychotic disorder. Using ARMS criteria, the research team investigated 74 patients who had been assessed as high risk between 1997 and 2002 at the Psychological Assistance Service of Hunter Mental Health, and found that the criteria had produced a 50% 'false-positive' result. That is, approximately half of the patients had not developed a psychotic disorder as predicted by the ARMS criteria. The team then found that adding the following assessment points to the ARMS test criteria would improve predictive accuracy: (1) odd beliefs and magical thinking, (2) marked impairment in role functioning, (3) blunted or inappropriate affect, (4) transient hallucinations and (5) marked social isolation. If these five items had been added to the original assessment, 31 of the 37 patients who later became psychotic could have been correctly identified, and 32 of the 37 patients who did not later become psychotic could have been correctly identified. That is, the accuracy of the tests would have been improved from 50% to around 85%.

PUBLICATIONS

Journal Articles

NISAD support played a vital role in the development of the schizophrenia-related research initiatives that led to the submission and publication of the following manuscripts in peer-reviewed journals.

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Breakspear M, Brammer M, **Das P**, Bullmore E, **Williams L**. Spatio-temporal wavelet resampling for functional neuroimaging data. *Human Brain Mapping* (in press, subsequently published 2004: 23: 1-25).

Das P, Kemp A, Liddell B, Brown K, Olivieri G, Peduto T, **Williams L**. Pathways to fear perception: modulation of amygdala activity by thalamo-cortical systems. *Neuroimage* (in press).

Dixon G, Garrick T, Whiteman I, **Sarris M**, **Sithamparanathan S**, **Harper C**. Characterisation of GABAergic neurons within the human medial mamillary nucleus. *Neuroscience* (in press, subsequently published 2004; 127: 365-372).

Dixon G, Harper C. No evidence for selective GABAergic interneuron deficits in the anterior thalamic complex of patients with schizophrenia. *Progress in Neuropsychopharmacology and Biological Psychiatry* (in press, subsequently published 2004; 28: 1045-1051).

Karl T, Lin S, Schwarzer C, Sainsbury A, Couzens M, Wittman W, Boey D, von Horsten S, Herzog H. Y1 receptors regulate aggressive behaviour via modulating serotonin pathways. *Proceedings of the National Academy of Sciences* (in press, subsequently published 2004; 101: 12742-12747).

Malhi G, Lagopoulos J, Sachdev P, Mitchell P, Ivanovski B, Parker G. Cognitive generation of affect in hypomania: an fMRI study. *Bipolar Disorders* (in press, subsequently published 2004; 6: 271-285).

Mason O, Startup M, Halpin S, **Schall U**, Conrad A, **Carr V**. Risk factors for transition to first episode psychosis among individuals with 'at-risk mental states'. *Schizophrenia Research* (in press, subsequently published 2004: 71: 227-237).

Rasser P, Johnston P, Lagopoulos J, Ward P, Schall U, Thienel R, Bender S, Toga A, **Thompson P**. Functional MRI BOLD response to Tower of London performance of first-episode schizophrenia patients using cortical pattern matching. *Neuroimage* (in press).

Schleimer S, Hinton T, Dixon G, Johnston G. GABA transporters GAT-1 and GAT-3 in the human dorsolateral prefrontal cortex in schizophrenia. *Neuropsychobiology* (in press, subsequently published 2004; 50: 226 - 230).

Schleimer S, Johnston G, Henderson J. Novel oral drug administration in an animal medial of chronic neuroleptic therapy. *Journal of Neuroscience Methods* (in press).

Williams L, Brown K, **Das P**, Brammer M, Boucsein B, Sokolov N, Olivieri G, Peduto A, Gordon E. The dynamics of cortico-amygdala and autonomic activity over the experimental time course of fear perception. *Cognitive Brain Research* (in press, subsequently published 2004; 21: 114-123).

Williams L, Das P, Liddell B, Olivieri G, Peduto A, Brammer M, Gordon E. BOLD, sweat and fears: functional MRI and arousal distinguish signals of fear. *Neuroreport* (in press).

Zavitsanou K. M1 receptor agonism, a possible treatment for cognitive deficits in schizophrenia (letter). *Neuropsychopharmacology* (in press, subsequently published 2004; 29: 1585-1586).

CONFERENCE PAPERS

Rasser P, Johnston P, Ward P, Thompson P. Deformable Brodmann Area Atlas. *Proceedings of the IEEE International Symposium on Biomedical Imaging*: *From Nano to Macro*, 2004; 400-403.

RESEARCH GRANTS

NISAD GRANTS

NISAD scientists were successful in obtaining the following grants administered by the Institute in the 2003-2004 period.

Badcock J, **Draganic D, Michie P, Ward P**. Well-being in schizophrenia: the role of emotion in auditory hallucinations: a collaborative NISAD/CCRN study. Ron and Peggy Bell Foundation, 2004-2006 ($30,675).

Draganic D, Tooney P, Ward P. Analysis of gene expression in schizophrenia using genetic technology: NISAD PhD Scholarship for Schizophrenia Research. JS Love Trust, 2004-2005 ($20,000).

Draganic D, Ward P. Polhemus digitiser for schizophrenia research. The Cecilia Kilkeary Foundation, 2003 ($8,920).

Loughland C. Face processing in schizophrenia and first degree relatives. NARSAD Young Investigator Award, 2004-2005 ($US18,400).

McDonald D, Ward P, Schall U. Establishment of a NISAD research laboratory at the Psychological Assistance Service, Newcastle. The Mine Workers Trust, 2004 ($53,240).

NISAD-SUPPORTED GRANTS

NISAD infrastructure support played a vital role in the success of the following grant applications from NISAD scientists and affiliates in 2003-2004.

Bowden N. Altered expression of brain related genes in lymphocytes in schizophrenia. World Congress on Psychiatric Genetics Travel Grant, 2004 ($EUR1,200).

Breakspear M. Young Mind in Psychiatry Award. American Psychiatric Association, 2003-2004 ($US45,000).

Budd B. Integrity of auditory temporal processing in the central auditory system in schizophrenia. University of Newcastle Early Career Researcher Project Grant, 2003-2004 ($11,500).

Budd B. Integrity of auditory temporal processing in the central auditory system in schizophrenia. University of Newcastle Research Management Committee Travel Grant, 2004 ($2,500).

Carr V, Ward P, Schall U, **Baker A, Johnston P.** A comparative structural and functional cerebral MRI study in first episode schizophrenia and long term cannabis users. NHMRC Project Grant, 2004-2006 ($365,000).

Clunas N. Brain mechanisms of attention problems in people with schizophrenia and bipolar disorder. Ian Scott Fellowship, Australian Rotary Health Research Fund, 2004 ($26,000).

Cohen M, Johnston P, Schall U, Carr V. A comparative structural and functional cerebral MRI study of first episode schizophrenia and long-term cannabis use. University of Newcastle Project Grant, 2004-2005 ($14,500).

Deng C. Dopamine and glutamate receptors in the prefrontal cortex in schizophrenia. University of Wollongong URC Small Grant, 2004 ($12,000).

Green M. Face processing in social contexts. Macquarie University Research Development Grant, 2004-2005 ($20,000).

Harper C. Brain tissue resource center for alcohol research. National Institute of Alcoholism and Alcohol Abuse (NIH), 2003-2008 (US$1.6M).

Huang X, Zavitsanou K. Unravelling the neuropathology of a typical anti-psychotic drug-induced metabolic disorders in schizophrenia. University of Wollongong URC Grant, 2003-2006 ($35,000).

Huang X, Zavitsanou K, Deng C. ProgRes C10 digital microscope camera. NHMRC Equipment & University of Wollongong Research Committee Grants, 2004 ($5,000).

Hughes M. Stop signal inhibition: an fMRI investigation. Australasian Society for Psychiatric Research Travel Grant-in-Aid, 2003 ($1,000).

Langdon R, Ward P. Cognitive neuropsychiatry: understanding delusional belief and delusional hallucination from a cognitive neuropsychological perspective. ARC Discovery Grant, 2004-2008 ($410,825).

Michie P, Hunter M, **Karayanidis F, Todd J, Budd B, Fulham R**. Upgrade of ERP facilities in the Functional Neuroimaging Laboratory. Brain and Mental Health Research Program Grant, Hunter Medical Research Institute, 2004-2005 ($8,000).

McClean C, **Harper C**. National network of brain banks. NHMRC Enabling Grants, 2004-2009 ($2,000,000).

Ross F, Tooney P. Investigation of the contribution of the use of cannabis in the development of schizophrenia in genetically predisposed individuals. Hunter Medical Research Institute Grant, 2003-2004 ($16,000).

Schall U, Karayanidis F, Johnston P. Functional neuroimaging of inhibitory brain processes in schizophrenia. University of Newcastle Project Grant, 2004-2005 ($14,000).

Schall U, Michie P. Compatible 64-channel EEG recording system. University of Newcastle Research Infrastructure Block Grant, 2004 ($40,000).

Schall U, Michie P, Carr V, Johnston P, Karayanidis F, Todd J, Budd B, Cohen M. Research assistant for EEG recordings and neuropsychiatric assessments at the Psychological Assistance Service. Brain and Mental Health Research Program Grant, Hunter Medical Research Institute, 2004-2005 ($17,500).

Sim A, Aitken, Dunkley P, Rostas J, Dickson, Ashman, Smith, Burns, McCluskey, **Tooney P, Ross F**, Rose. Biacore 3000 - expansion of proteomics facility. ARC Lief Infrastructure Grant, 2004 ($187,341).

Solowij N. Functional magnetic resonance imaging indices of memory function in long-term cannabis users. Ian Potter Foundation Travel Grant, 2004 ($2,500).

Solowij N, Zavitsanou K. Cannabinoid effects on brain chemistry and function relevant to psychosis. University of Wollongong URC Grant, 2004 ($12,300).

Tooney P, Loughland C, Scott R, Carr V. Technical support for the Hunter DNA Bank for Schizophrenia and Allied Disorders. Brain and Mental Health Research Program, Hunter Medical Research Institute, 2004-2006 ($75,116).

Ward P. SynAmps2 EEG/ERP amplifier (64 channel). NHMRC Equipment Grant, 2004 ($30,000).

Williams L. Missing links: the cause and treatment of functional brain disconnections. Pharmacia Foundation Senior Research Fellowship, 2004-2008 ($983,562).

Weidenhofer J. Gene profiling in the amygdala in schizophrenia. World Congress on Psychiatric Genetics Travel Grant, 2004 ($EUR1,200).

CONFERENCE PRESENTATIONS

INVITED PRESENTATIONS

NISAD scientists were invited to give presentations on NISAD-supported research outcomes at the following conferences/meetings.

Solowij N. Cannabis and cognitive function: relevance to psychotic disorders. Invited presentation at the Cannabis and Mental Illness Conference, Melbourne, August, 2003.

Green M. Delusions Demand Attention! Invited presentation at the Macquarie University Open Day Discovery Lecture, Macquarie University, September, 2003.

Tooney P. The first step towards a genetic diagnosis for schizophrenia. Invited presentation at the Centre for Mental Health Studies Research Forum, Newcastle, October, 2003.

Carr V. Spending and sampling in schizophrenia. Invited presentation at the Australasian Society for Psychiatric Research Meeting (The Novartis Oration), Christchurch, New Zealand, December 2003.

Loughland C, Williams L, Gordon E. Face processing deficits in schizophrenia: what can we learn from visual scanpath analysis? Invited presentation at the Australasian Opthamlic and Visual Science Conference, Melbourne, December, 2003.

Solowij N. Cannabis: neuropsychiatric and psychobiological overview. Invited presentation at the International Congress on Biological Psychiatry, Sydney, February, 2004.

Carr V. Concept of a 'core-set' of standardized endophenotoype measures: application in Australian psychosis-related research. Invited presentation at the Endophenotypes in Mental Illness: A National Workshop, University of Sydney, May, 2004.

Solowij N. Cannabis and neurocognitive functioning. Invited presentation at the Institute of Psychiatry Symposium on Cannabis and Psychosis, London, December, 2004.

AFFILIATED PRESENTATIONS

NISAD support played a vital role in the development of the schizophrenia-related research initiatives that led to the following conference presentations/submissions.

Garrick T, Azizi L, Merrick J, **Harper C**. Brain donation for research: what do the next of kin say? Presented at the Australian Institute of Medical Scientists Meeting, Sydney, July, 2003.

Solowij N. The neurobiology of substance use and psychosis. Presented at the British Association for Psychopharmacology meeting, UK, July, 2003.

Hughes M, Michie P, Fulham R, Budd B. Neural networks activated in stop-signal inhibition. Presented at International Conference on Cognitive Science, Sydney, July, 2003.

Hannan R, Karayanidis F, Poboka D, Heathcote A, **Michie P**. Anticipatory preparation & passive dissipation processes in task-switching: event-related potential analysis. Presented at International Conference on Cognitive Science, Sydney, July, 2003.

Poboka D, Heathcote A, **Hannan R, Karayanidis F**. Anticipatory preparation & passive dissipation processes in task-switching: Reaction time distribution analysis. Presented at International Conference on Cognitive Science, Sydney, July, 2003.

Green M. Delusional themes and the nature of aberrant experience. Presented at International Conference on Cognitive Science, Sydney, July, 2003.

Langdon R. Attributional reasoning biases and persecutory delusions: cause or consequence? Presented at International Conference on Cognitive Science, Sydney, July, 2003.

Garrick T, Azizi L, Merrick J, **Harper C**. Brain donation for research: what do people say? Presented at the International Congress on Neuropathology, Turin, Italy, September, 2003.

Langdon R. Limits of mindreading in schizophrenia. Presented at the Interdisciplinary Workshop on "Other Minds", Institute of Cognitive and Decision Sciences, University of Oregon, USA, September, 2003.

Dixon G, Garrick T, Sarris M, Whiteman I, **Harper C**. Neuron diversity in the human medial mamillary nucleus. Presented at the International Congress on Neuropathology, Turin, Italy, September, 2003.

Maharaj R, Plumbe P, **Sheedy J**. Medication adherence: developing pragmatic clinical strategies to enhance patient compliance. Presented at the TheMHS Conference, Canberra, September, 2003.

Sheedy J, Maharaj R, Plumbe P. Medication adherence: staff and patient education. Presented at the BMDH Nursing Research Festival, Sydney, September, 2003.

Maharaj R, Plumbe P, **Sheedy J**. Medication adherence: can we make a difference? Presented at the Paediatric and Mental Health Conference, Brisbane, October, 2003.

Boyes M, Loughland C, Ward P, Tooney P. Brain tissue donation and DNA banking for schizophrenia research: "it's my body". Presented at the International Congress on Law and Mental Health, Sydney, October, 2003.

Chetcuti A, Adams L, **Schofield P**. Identification of potential drug targets for bipolar disorder by microarray profiling gene expression in an animal model of anti-manic drug action. Presented at the World Congress for Psychiatric Genetics, Quebec, Canada, October, 2003.

Baker A, Bucci S, Kay-Lambkin F, **Lewin T, Carr V**, Constable P. Randomised controlled trial of cognitive behaviour therapy for comorbid psychotic illness and alcohol and other drug problems. Presented at the Australian Professional Society on Alcohol and Other Drugs - National Conference, Brisbane, November 2003.

Baker A, Richmond R, Haile M, **Carr V, Lewin T**, Wilhelm K, Moeller-Saxone K, Taylor R, Jansons S, Constable P, Kay-Lambkin F. A randomised controlled trial of an intervention for tobacco dependence among people with a psychotic illness. Presented at the Australian Professional Society on Alcohol and Other Drugs - National Conference, Brisbane, November 2003.

Clunas N, Ward P. Altered auditory recovery cycle function in schizophrenia: an ERP study. Presented at the Society for Neuroscience Conference, New Orleans, USA, November, 2003.

Hinton T, Carland J, **Chebib M, Johnston G**. Clozapine inhibits GABA activity at recombinant ionotropic GABA receptors expressed in xenopus oocytes. Presented at the Australasian Society of Clinical and Experimental Pharmacologists and Toxicologists Meeting, Sydney, December 2003.

Clunas N, Ward P. Altered auditory recovery cycle function in schizophrenia: an ERP study. Presented at the Australasian Society for Psychiatric Research Conference, Christchurch, New Zealand, December, 2003.

Baker A, Bucci S, Kay-Lambkin F, **Lewin T, Carr V**, Constable P. Randomised controlled trial of cognitive-behavioural therapy for comorbid psychotic illness and alcohol and other drug problems. Presented at the Australasian Society for Psychiatric Research, Christchurch, New Zealand, December 2003.

Cohen M, Johnston P, Schall U, Ward P, Carr V. Functional magnetic resonance imaging of executive function in chronic cannabis use and first episode psychosis. Presented at the Australasian Society for Psychiatric Research Conference, Christchurch, New Zealand, December, 2003.

Dixon G, Garrick T, Sarris M, Whiteman I, **Harper C**. Neuron diversity in the human medial mamillary nucleus. Presented at the Australasian Society for Psychiatric Research Conference, Christchurch, New Zealand, December, 2003.

Garrick T, Azizi L, Merrick J, **Harper C**. Families and brain donation: What do they say? Presented at the Australasian Society for Psychiatric Research Conference, Christchurch, New Zealand, December, 2003.

Hughes M, Michie P, Fulham R, Budd B, Badcock J. Stop-signal inhibition: an fMRI investigation. Presented at the Australasian Society for Psychiatric Research Conference, Christchurch, New Zealand, December, 2003.

Loughland C, Tooney P, Scott R, Carr V, Ward P. The Hunter DNA Bank for Schizophrenia and Allied Disorders. Presented at the Australasian Society for Psychiatric Research Conference, Christchurch, New Zealand, December, 2003.

Rasser P, Johnston P, Ward P, Schall U, Thompson P. Co-registration of structural and functional deficits of first-episode schizophrenia patients on probabilistic cortical surface maps. Presented at the Australasian Society for Psychiatric Research Conference, Christchurch, New Zealand, December, 2003.

Schall U, Johnston P, Stojanov W, **Devir H, Carr V**. A generalized deficit accounts for impaired facial emotion recognition in schizophrenia: I. Neuropsychological data. Presented at the Australasian Society for Psychiatric Research Conference, Christchurch, New Zealand, December, 2003.

Schall U, Johnston P, Stojanov W, **Devir H, Carr V**. A generalized deficit accounts for impaired facial emotion recognition in schizophrenia: II. fMRI data. Presented at the Australasian Society for Psychiatric Research Conference, Christchurch, New Zealand, December, 2003.

Schall U, Karayanidis F, Meem L, Hannan R. Preparation for a predictable task-switch in schizophrenia. Presented at the Australasian Society for Psychiatric Research Conference, Christchurch, New Zealand, December, 2003.

Breakspear M, Terry J, **Williams L**, Robinson P. Unfolding an instability in brain activity: empirical and phenomenological consideration. Presented at the Australasian Society for Psychiatric Research Conference, Christchurch, New Zealand, December, 2003.

Green M, Waldron J. Social context processing is impaired in schizophrenia: Implications for the perception of complex mental states. Presented at the Australasian Society for Psychiatric Research Conference, Christchurch, New Zealand, December, 2003.

Langdon R, McLaren J, Corner T. Reflexive and controlled orienting of attention triggered by another person's gaze in schizophrenia. Presented at the Australasian Society for Psychiatric Research Conference, Christchurch, New Zealand, December, 2003.

Hannan R, Karayanidis F, Poboka D, Heathcote A, **Michie P**. Electrophysiological components associated with preparation for an impending task switch. Presented at the Australasian Society for Psychophysiology meeting, Hobart, December, 2003.

Davies A, **Hannan R, Karayanidis F**, Poboka D, Heathcote A, **Michie P.** Active preparation in task-switching: Effects of 'switching to' versus 'switching away' from a task-set. Presented at the Australasian Society for Psychophysiology Meeting, Hobart, December, 2003.

Alexander K, Garrick T, Sarris M, Sheedy D, Harper C. Brain banking for neuroscience research. Presented at the Australian Neuroscience Society Conference, Melbourne, January, 2004.

Newell K, Zavitsanou K, Huang X. Alterations in the serotonin and cannabinoid systems in the posterior cingulate cortex in schizophrenia. Presented at the Australian Neuroscience Society Conference, Melbourne, January, 2004.

Han M, Zavitsanou K, Newell K, Huang X. Increased CB1 mRNA in the cortical areas of mice prone to diet-induced obesity. Presented at the Australian Neuroscience Society Conference, Melbourne, January, 2004.

Schleimer S, Henderson J, Johnston G. Behavioural effects of neuroleptics: an animal model. Presented at the Australian Neuroscience Society Conference, Melbourne, January, 2004.

Wheeler D, Dixon G, Harper C. Calcium binding protein immunoreactivity in the posterior cingulate and visual cortex: schizophrenia and control. Presented at the Australian Neuroscience Society Conference, Melbourne, January, 2004.

Packianathan M, Dixon G, Harper C. Are interneuron parameters within the posterior cingulate cortex altered in schizophrenia? Presented at the Australian Neuroscience Society Conference, Melbourne, January, 2004.

Williams S, **Dixon G,** Pow D. Is there an abnormality in the expression of glutamate transporters in schizophrenia? Presented at the Australian Neuroscience Society Conference, Melbourne, January, 2004.

Hinton T, Chebib M, Johnston G. GABA-A receptor subunit expression in human brain and evidence for changes in schizophrenia. Presented at the Australian Neuroscience Society Conference, Melbourne, January, 2004.

Bowden N, Weidenhofer J, Scott R, Todd J, Case V, **Schall U, Tooney P**. Differential gene expression in peripheral blood lymphocytes in schizophrenia. Presented at the Australian Neuroscience Society Conference, Melbourne, January, 2004.

Bowden N, Weidenhofer J, Scott R, Todd J, Case V, **Schall U, Tooney P**. Distinct gene profiles linked to age in schizophrenia. Presented at the Australian Neuroscience Society Conference, Melbourne, January, 2004.

Weidenhofer J, Bowden N, Scott R, Tooney P. Altered gene expression profiles in the amygdala in schizophrenia. Presented at the Australian Neuroscience Society Conference, Melbourne, January, 2004.

Cohen M, Johnston P, Schall U, Ward P, Carr V. Executive function in chronic cannabis use and first episode psychosis: an fMRI study. Presented at the International Congress on Biological Psychiatry, Sydney, February, 2004.

Schall U, Johnston P, Stojanov W, **Devir H, Carr V**. Impaired facial emotion recognition in schizophrenia (1): neuropsychological evidence for a generalised deficit. Presented at the International Congress on Biological Psychiatry, Sydney, February, 2004.

Johnston P, Schall U, Carr V. Impaired facial emotion recognition in schizophrenia (2): fMRI evidence for a generalised deficit. Presented at the International Congress on Biological Psychiatry, Sydney, February, 2004.

Rasser P, Johnston P, Ward P, Schall U, Lagopoulos J, Thienel R, Bender S, **Thompson P**. Structural and functional deficits in first-episode schizophrenia patients using cortical pattern matching. Presented at the International Congress on Biological Psychiatry, Sydney, February, 2004.

Schall U, Johnston P, Budd B, Dittmann-Balcar A, **Karayanidis F**. Functional brain imaging of prepulse inhibition. Presented at the International Congress on Biological Psychiatry, Sydney, February, 2004.

Williams L. A dysjunction of autonomic and limbic-prefrontal systems in paranoid schizophrenia: an integrated fMRI and skin conductance study. Presented at the International Congress on Biological Psychiatry, Sydney, February, 2004.

Monterrubio S, Solowij N, Meyer B. Are clozapine-medicated individuals with schizophrenia lacking in fatty acids? Presented at the International Congress on Biological Psychiatry, Sydney, February, 2004.

Respondek C, Solowij N, Ward P. Functional magnetic resonance imaging indices of memory function in long-term heavy cannabis users. Presented at the International Congress on Biological Psychiatry, Sydney, February, 2004.

Ward P, Clunas N. Altered auditory recovery cycle function in schizophrenia: an ERP study. Presented at the Winter Workshop on Schizophrenia, Davos, Switzerland, February, 2004.

Green M, Waldron J. Reduced appreciation of social context in schizophrenia impairs the perception of complex mental states. Presented at the Winter Workshop on Schizophrenia, Davos, Switzerland, February, 2004.

Rasser P, Johnston P, Ward P, Thompson P. Deformable Brodmann Area Atlas. Presented at the IEEE International Symposium on Biomedical Imaging, Arlington, USA, April, 2004.

Garrick T, Azizi L, Merrick J, **Harper C**. Families and brain donation for research: what do they say? Presented at the Australian Tissue Banking Forum, Sydney, April, 2004.

Dedova I, Garrick T, Fortis A, **Sheedy D**. Brain banking for neuroscience. Presented at the Australian Tissue Banking Forum, Sydney, April, 2004.

Breakspear M. Investigating dynamic correlations in a neural system with a multiscale architecture using wavelets. Presented at the Brain Connectivity Workshop, Havana, Cuba, April, 2004.

Breakspear M. Multiscale analysis of functional connectivity. Presented at the SIAM Conference on Imaging Science, Utah, USA, May, 2004.

Chetcuti A, Adams L, **Schofield P**. Mice drugs and rock n' roll: what can mice teach us about bipolar disorder. Presented at the Australian Society for Medical Research Conference, Sydney, May 2004.

Dedova I, Garrick T, Fortis A, **Sheedy D**. Brain banking for neuroscience. Presented at the International Symposium on Biological Motility, Moscow, Russia, May, 2004.

Das P, Kemp A, Brown K, Olivieri G, Peduto T, **Williams L**. Pathways for fear perception: the interaction of amygdale, hippocampus and prefrontal cortices. Presented at the Human Brain Mapping Meeting, Budapest, Hungary, June 2004.

Budd B, Case V, **Cooper G, Michie P, Schall U**. A psychoacoustic and fMRI investigation of auditory temporal processing in schizophrenia. Presented at the Human Brain Mapping Meeting, Budapest, Hungary, June 2004.

Hughes M, Michie P, Fulham R, Budd B. Neural networks activated in stop-signal inhibition. Presented at the Human Brain Mapping Meeting, Budapest, Hungary, June 2004.

Johnston P, Schall U. A combined fMRI and ERP study of facial emotion recognition deficits in schizophrenia. Presented at the Human Brain Mapping Meeting, Budapest, Hungary, June 2004.

Rasser P, Johnston P, Lagopoulos J, Ward P, Schall U, Thienel R, Bender S, Toga A, **Thompson P**. Analysis of first episode schizophrenia patients sMRI and fMRI BOLD activation during the Tower of London using cortical pattern matching. Presented at the Human Brain Mapping Meeting, Budapest, Hungary, June 2004.

Cohen M, Johnston P, Schall U, Carr V, Ward P, Rasser P. fMRI investigation of executive function in first episode psychosis and chronic cannabis use. Presented at the Human Brain Mapping Meeting, Budapest, Hungary, June 2004.

Breakspear M. Coupled nonlinear dynamical systems as neuronal models. Presented at the Human Brain Mapping Meeting, Budapest, Hungary, June 2004.

Zavitsanou K, Huang X, Solowij N. Significant correlations between cannabinoid and serotonin/glutamate receptor densities in the anterior cingulate cortex in schizophrenia: a site of functional interactions. Presented at the International Cannabinoid Research Society Conference, Naples, Italy, June 2004.

Solowij N, Respondek C, Ward P. Functional magnetic resonance imaging indices of memory function in long term cannabis users. Presented at the International Cannabinoid Research Society Conference, Naples, Italy, June 2004.

Monterrubio S, Solowij N. Cannabis use and fatty acids in schizophrenia. Presented at the Illawarra Health Medical Research Conference, Wollongong, June, 2004.

Sheedy D, Dedova I, Garrick T, Fortis A. Brain banking for neuroscience. Presented at the Research Society for Alcoholism Meeting, Vancouver, Canada, June, 2004.

Boyes M, Garrick T. Schizophrenia, neuroscience and the 'Gift of Hope' Tissue Donor Program. Accepted for presentation at the Central Sydney Area Health Service Winter Symposium, Sydney, July, 2004.

Green M. Context processing and social cognition in schizophrenia. Accepted for presentation at the Australian Society for the Study of Brain Impairment, Brisbane, July, 2004.

Green M, Waldron J, Coltheart M. Mental state perception in schizophrenia: the role of context. Accepted for presentation at the International Neuropsychology Society Conference, Brisbane, July, 2004.

Green M, Waldron J, Coltheart M. Social context processing and schizophrenia: a visual scanpath investigation. Accepted for presentation at the 3rd Australian Conference of Cognitive Neuropsychology and Cognitive Neuropsychiatry, Sydney, July, 2004.

Monterrubio S, Solowij N, Meyer B. Cannabis and schizophrenia: fatty acids and symptom distress differ with history of cannabis use. Accepted for presentation at the Cannabis and Mental Illness Conference, Melbourne, August 2004.

Hinton T, Johnston G. $GABA_A$ receptor subunit mRNA expression in human brain and evidence for changes in schizophrenia. Accepted for presentation at the Australasian Winter Conference on Brain Research, Queenstown, New Zealand, August, 2004.

Andresen R, Oades L, Caputi P. Psychometric testing of a measure of stages of recovery. Accepted for presentation at The Mental Health Services Conference of Australia and New Zealand, Gold Coast, September, 2004.

Respondek C, Solowij N, Ward P. Memory functioning in long-term cannabis users: an fMRI investigation. Accepted for presentation at the Australian Psychological Society Conference, Sydney, September, 2004.

Moss B, Gorrell J, Ward P, Nash L, Tennant C, Draganic D, Rosen A. Pathways to care in early psychosis: an effective tool to map the pathway to effective treatment. Accepted for presentation at the International Conference on Early Psychosis, Vancouver, Canada, September, 2004.

Gorrell J, Moss B, Ward P, Nash L, Tennant C, Draganic D, Rosen A. Pathways to care in early psychosis: understanding treatment delay. Accepted for presentation at the International Conference on Early Psychosis, Vancouver, Canada, September, 2004.

Gorrell J, Moss B, Ward P, Nash L, Tennant C. Pathways to care in early psychosis: understanding treatment delay. Accepted for presentation at the Australasian Schizophrenia Conference, Brisbane, September, 2004.

Loughland C, Sheedy J, Harris A, Lewin T, Carr V. Neuropsychological functioning within schizophrenia samples from different sources: comparisons with RBANS. Accepted for presentation at the Australasian Schizophrenia Conference, Brisbane, September, 2004.

Schall U, Johnston P, Budd B, Karayanidis F. Functional brain imaging of prepulse inhibition. Accepted for presentation at the Australasian Schizophrenia Conference, Brisbane, September, 2004.

Cohen M, Carr V, Schall U, Johnston P, Ward P, Rasser P. fMRI investigation of executive function in first episode schizophrenia and chronic cannabis users. Accepted for presentation at the Australasian Schizophrenia Conference, Brisbane, September, 2004.

Chetcuti A, Adams L, **Schofield P**. Microarray analysis of altered gene expression in the mouse brain after treatment with lithium chloride or sodium valproate. Accepted for presentation at the Australasian Schizophrenia Conference, Brisbane, September, 2004.

Schleimer S, Henderson J, Johnston G. Locomotor and social effects of neuroleptics in rodents. Accepted for presentation at the Australasian Schizophrenia Conference, Brisbane, September, 2004.

Weidenhofer J, Bowden N, Scott R, Tooney P. Differential gene expression in the amygdala and superior temporal gyrus in schizophrenia. Accepted for presentation at the Australasian Schizophrenia Conference, Brisbane, September, 2004.

Matthews N, Todd J, Michie P. Behavioural and brain measures of sound lateralisation in schizophrenia. Accepted for presentation at the Australasian Schizophrenia Conference, Brisbane, September, 2004.

Rasser P, Johnston P, Peck G, Thompson P, Ward P, Schall U. FMRI BOLD cerebellar activation of first-episode schizophrenia patients during the Tower of London task. Accepted for presentation at the Australasian Schizophrenia Conference, Brisbane, September, 2004.

Richards A, Todd J, Michie P. The contribution of contextual processing problems to reduced mismatch negativity (MMN) in schizophrenia. Accepted for presentation at the International Society for NeuroImaging in Psychiatry and the EEG & Clinical Neuroscience Society Conference, California, USA, September, 2004.

Sarris M, Ng W, Harper C, Dixon G. The role of white matter microglia in the pathogenesis of schizophrenia. Accepted for presentation at the National Society Histotechnology Convention, Toronto, Canada, September, 2004.

Bowden N, Weidenhofer J, Scott R, Todd J, Case V, **Schall U, Tooney P.** Altered expression of brain related genes in lymphocytes in schizophrenia. Accepted for presentation at the World Congress on Psychiatric Genetics, Dublin, Ireland, October, 2004.

Weidenhofer J, Bowden N, Scott R, Tooney P. Gene profiling in the amygdala in schizophrenia. Accepted for presentation at the World Congress on Psychiatric Genetics, Dublin, Ireland, October, 2004.

NISAD SUPPORTED RESEARCH STUDENTS

In the past year NISAD has supported the following students via provision of scholarships, equipment or access to research infrastructure.

PhD STUDENTS

Mr Wayne Anderson
School of Biomedical Sciences, University of Newcastle
The contribution of cannabinoid (CB-1) receptor complexation in the precipitation of schizophrenia.
Supervisors: Dr Fraser Ross, Dr Paul Tooney

Ms Retta Andresen
Department of Psychology, University of Wollongong
The experience of recovery from schizophrenia.
Supervisors: Dr Lindsay Oades, Mr Peter Caputi

Ms Karin Aubrey
Department of Pharmacology, University of Sydney
Modulation of glycine receptors.
Supervisor: Dr Robert Vandenberg

Ms Aurelie Boucher
Department of Pharmacology, University of Sydney
The effects of drugs of abuse in an animal model of schizophrenia: the neuregulin knockout mouse.
Supervisors: Prof. Graham Johnston, Dr Jonathon Arnold, Dr Tina Hinton

Ms Nikola Bowden
School of Biomedical Sciences, University of Newcastle
Gene expression profiling in schizophrenia.
Supervisors: Dr Paul Tooney, Prof. Rodney Scott

Mr Nathan Clunas
School of Psychiatry, University of New South Wales
Brain mechanisms of attention problems in people with schizophrenia and bipolar disorder.
Supervisor: Prof. Philip Ward

Ms Carlotta Duncan
Faculty of Medicine, University of New South Wales
Identification and characterisation of genes associated with schizophrenia using microarray analysis of an animal model of antipsychotic drug action.
Supervisors: Prof. Peter Schofield, Dr Albert Chetcuti

Ms Mei Han
Department of Biomedical Science, University of Wollongong
Unravelling the neuropathology of atypical anti-psychotic drug-induced metabolic disorders in schizophrenia.
Supervisors: A/Prof. Xu-Feng Huang, Dr Chao Deng.

Ms Rebecca Hannan
School of Behavioural Sciences, University of Newcastle
Organisation of cognitive control processes in individuals with and without schizophrenia.
Supervisors: Prof. Pat Michie, Dr Frini Karayanidis

Ms Tina Hinton
Department of Pharmacology, University of Sydney
Ionotropic GABA receptors in the CNS and schizophrenia.
Supervisors: Prof. Graham Johnston, Dr Mary Collins

Mr Matthew Hughes
School of Behavioural Sciences, University of Newcastle
Cortical networks responsible for behavioural inhibition in schizophrenia.
Supervisors: Prof. Pat Michie, Dr Ross Fulham, Dr Bill Budd

Mr Takeshi Iwazaki
Department of Pathology, University of Sydney
Synaptic dysfunction in schizophrenia.
Supervisor: A/Prof. Izuru Matsumoto

Mr Patrick Johnston
Centre for Mental Health Studies, University of Newcastle
Facial emotion processing deficits in schizophrenia: an integrative, cognitive neurosciences approach.
Supervisors: A/Prof. Ulrich Schall, Dr Andrew Scholey

Mr Aaron Kent
Department of Psychology & Department of Psychiatry and Behavioural Science, University of Western Australia
Executive function in individuals at risk for schizophrenia: physiological correlates of sustained attention, response inhibition and working memory activation.
Supervisors: Dr Allison Fox, Prof. Pat Michie, Prof. Assen Jablensky

Mr Craig Little
School of Psychiatry, University of New South Wales
Pre-attentive and memory deficits in schizophrenia: an ERP and fMRI investigation.
Supervisors: A/Prof. Philip Ward, Prof. Neil McConaghy

Ms Natasha Matthews
School of Behavioural Sciences, University of Newcastle
Location MMN in schizophrenia: an investigation of auditory lateralization using interaural time and intensity cues.
Supervisors: Prof. Pat Michie, Dr Juanita Todd

Mr Ryan McKay
Macquarie Centre for Cognitive Science, Macquarie University
'Sleights of Mind': delusions and self-deception.
Supervisors: Prof. Max Coltheart, Dr Robyn Langdon

Ms Kelly Newell
Department of Biomedical Science, University of Wollongong
Neural pathophysiology of posterior cingulate cortex in schizophrenia.
Supervisors: A/Prof. Xu-Feng Huang, Dr Katerina Zavitsanou

Ms Penny Newson
School of Biomedical Sciences, University of Newcastle
Schizophrenia and sensory deprivation.
Supervisor: A/Prof. Loris Chahl

Ms Colleen Respondek
Department of Psychology, University of Wollongong
An investigation of neurocognitive performance, verbal learning ability and fMRI indices of cognitive functioning in long term cannabis users.
Supervisors: Dr Nadia Solowij

Ms Amy Richards
School of Behavioural Sciences, University of Newcastle
The contribution of contextual processing problems to reduced mismatch negativity (MMN) amplitude in schizophrenia.
Supervisors: Dr Juanita Todd, Prof. Pat Michie

Ms Sonja Schleimer
Department of Pharmacology, University of Sydney
GABA transporters in schizophrenia and Parkinson's disease.
Supervisors: Prof. Graham Johnston, Dr Jasmine Henderson

Ms Judith Weidenhofer
School of Biomedical Sciences, University of Newcastle
The role of the tachykinins and their receptors in schizophrenia: an investigation at a cellular and genetic level.
Supervisors: Dr Paul Tooney, A/Prof. Loris Chahl, Prof. Rodney Scott

Mr David Wheeler
Department of Pathology, University of Sydney
Memory dysfunction in schizophrenia, Alzheimer's disease and alcoholic Wernicke-Korsakoff's syndrome.
Supervisors: Dr Gavin Dixon, Prof. Clive Harper

MASTERS STUDENTS

Ms Holly Devir
School of Behavioural Sciences, University of Newcastle
Facial emotion processing deficits in schizophrenia: evidence against a negative emotion specific deficit in a differential deficit design study.
Supervisors: Dr Frini Karayanidis, Mr Pat Johnston

Ms Lydia Meem
School of Behavioural Sciences, University of Newcastle
Task switching in schizophrenia: differential modulation of anticipatory and stimulus-driven components.
Supervisor: Dr Frini Karayanidis

Ms Kathryn McCabe
School of Behavioural Sciences, University of Newcastle
Face processing in schizophrenia and biological first degree relatives: an examination of spacial and temporal parameters.
Supervisors: Dr Mick Hunter, Dr Carmel Loughland, Mr Pat Johnston

Ms Rachel Taylor
Macquarie Centre for Cognitive Science, Macquarie University
Menstrual related symptom changes in women with schizophrenia.
Supervisor: Dr Robyn Langdon

HONOURS STUDENTS

Ms Kimberley Alexander
Department of Pathology, University of Sydney
Brain Banking for neuroscience research.
Supervisor: Prof. Clive Harper

Ms Amanda Brown
School of Biomedical Sciences, University of Newcastle
Do cannabinoid and dopamine receptors form hetero-oligomeric receptor complexes and facilitate the development of schizophrenia in genetically predisposed individuals who abuse cannabis?
Supervisors: Dr Fraser Ross, Dr Paul Tooney

Ms Teresa du Bois
Department of Biomedical Science, University of Wollongong
Membrane phospholipid composition affects serotonin and muscarinic receptor binding density in the rat brain: implications for schizophrenia.
Supervisors: A/Prof. Xu-Feng Huang, Dr Chao Deng

Mr Simon Howell
Department of Pathology, University of Sydney
Motivation of donation: the 'Using our Brains' experience.
Supervisors: Prof. Clive Harper, Ms Therese Garrick

Ms Sharon Monterrubio
Department of Psychology, University of Wollongong
A study of fatty acid levels and stress in individuals with schizophrenia who do and who do not smoke cannabis.
Supervisors: Dr Nadia Solowij, Dr Barbara Meyer

Ms Wan Yi Ng
Department of Pathology, University of Sydney
Do microglial cells play a role in the pathogenesis of chronic schizophrenia?
Supervisors: Prof. Clive Harper, Dr Maria Sarris

Ms Mathana Packianathan
Department of Pathology, University of Sydney
An analysis of parvalbumin-immunoreactive neurons within BA 30 of the human brain: schizophrenia versus control.
Supervisors: Dr Gavin Dixon, Prof. Clive Harper

Ms Kelly Skilbeck
Department of Pharmacology, University of Sydney
The effects of antipsychotic drugs on GABA-A receptors.
Supervisors: Dr Tina Hinton, Ms Renee Granger, Prof. Graham Johnston

NISAD SUMMER STUDENT SCHOLARSHIPS

Mr Kimberley Alexander
Department of Pathology, University of Sydney
Proteomics of schizophrenia brain.
Supervisors: A/Prof. Izuru Matsumoto, Prof. Clive Harper

Ms Melissa Balkin
Neurobiology Program, The Garvan Institute
Molecular genetics of bipolar disorder.
Supervisor: Prof. Peter Schofield

Ms Amanda Brown
School of Biomedical Sciences, University of Newcastle
The contribution of the cannabinoid receptor complexation in the precipitation of schizophrenia.
Supervisors: Dr Fraser Ross, Dr Paul Tooney

Ms Teresa du Bois
Department of Biomedical Science, University of Wollongong
Correlation between altered MPC and 5-HT receptor binding in the brain of animal models and its implications for treatment of schizophrenia.
Supervisor: A/Prof. Xu-Feng Huang

Mr Daniel Getts
Department of Pathology, University of Sydney
The role of hippocampal damage in psychosis cascade.
Supervisors: Dr Gavin Dixon, A/Prof. Izuru Matsumoto, A/Prof. Nicholas King

Mr Greg Peck
Centre for Mental Health Studies, University of Newcastle
Brain imaging of function and structure relationships of Tower of London performance in first-episode schizophrenia patients.
Supervisors: Mr Paul Rasser, A/Prof. Ulrich Schall

Ms Jennifer Waldron
Macquarie Centre for Cognitive Science, Macquarie University
Social context processing in schizophrenia: A visual scanpath investigation.
Supervisor: Dr Melissa Green

DEGREES AND AWARDS

THESES AWARDED

NISAD provided support to the following students who were awarded higher degrees.

DOCTOR OF PHILOSOPHY

Dr Karin Aubrey
Department of Pharmacology, University of Sydney
Modulation of glycine receptors.
Supervisor: Dr Robert Vandenberg

Dr Tina Hinton
Department of Pharmacology, University of Sydney
Ionotropic GABA receptors in the CNS and schizophrenia.
Supervisors: Prof. Graham Johnston, Dr Mary Collins

MASTERS

Ms Lydia Meem
School of Behavioural Sciences, University of Newcastle
Task switching in schizophrenia: Differential modulation of anticipatory and stimulus-driven components.
Supervisor: Dr Frini Karayanidis

HONOURS

Ms Kimberley Alexander
Department of Pathology, University of Sydney
Brain Banking for neuroscience research.
Supervisor: Prof. Clive Harper

Ms Sharon Monterrubio
Department of Psychology, University of Wollongong
A study of fatty acid levels and stress in individuals with schizophrenia who do and who do not smoke cannabis.
Supervisors: Dr Nadia Solowij, Dr Barbara Meyer

Ms Mathana Packianathan
Department of Pathology, University of Sydney
An analysis of parvalbumin-immunoreactive neurons within BA 30 of the human brain: schizophrenia versus control.
Supervisors: Dr Gavin Dixon, Prof. Clive Harper

AWARDS

The following NISAD scientific employees and affiliates received awards in 2003-2004 based on NISAD-supported research.

Ms Retta Andresen
Article in *Australian and New Zealand Journal of Psychiatry* rated by an international panel as one of the top articles published by the journal in 2003, June, 2004.

Professor Vaughan Carr
Novartis Oration, Australasian Society for Psychiatric Research Conference, Christchurch, New Zealand, December, 2003.

Dr Melissa Green
Best Poster, Australasian Society for Psychiatric Research Conference, Christchurch, New Zealand, December, 2003.

Ms Colleen Respondek
Astra Zeneca Best Poster Prize, International Congress of Biological Psychiatry, Sydney, February 2004.

SCHIZOPHRENIA RESEARCH INFRASTRUCTURE SUPPORT

Schizophrenia Research Register

The following schizophrenia research projects were provided with volunteers from the NISAD Schizophrenia Research Register in 2003-2004.

Andresen R, Oades L, Caputi P. The experience of recovery: towards an empirically validated stage model. Department of Psychology, University of Wollongong.

Baker A, Ayre M. The measurement of feelings, problem-solving and well-being in schizophrenia. Centre for Mental Health Studies, University of Newcastle.

Budd B, Michie P, Todd J, Schall U. The integrity of auditory temporal processing in the ascending auditory system in schizophrenia. School of Behavioural Sciences & Centre for Mental Health Studies, University of Newcastle.

Green M, Coltheart M, Ward P. Face processing in social contexts. Macquarie Centre for Cognitive Science, Macquarie University.

Green M, Langdon R, Coltheart M. Automatic thoughts study. Macquarie Centre for Cognitive Science, Macquarie University.

Johnston P, Schall U. The neural substrates of facial emotion processing in patients with schizophrenia and healthy control subjects. Centre for Mental Health Studies, University of Newcastle.

Karayanidis F, Johnston P, Devir H. Facial emotion processing in schizophrenia. Discipline of Psychology, University of Newcastle.

Karayanidis F, Schall U, Meem L, Stojanov W. Task-switching in schizophrenia. Discipline of Psychology, University of Newcastle.

Langdon R, Stevenson R, Catts S, Coltheart M, Ward P. Olfactory hallucinations in schizophrenia. Schizophrenia Research Unit, Liverpool Hospital.

Matthews N, Todd J, Michie P. Behavioural and brain measures of sound lateralization in schizophrenia. School of Behavioural Sciences, University of Newcastle.

McKay R, Coltheart M, Langdon R. Paranoia and persecutory delusions. Macquarie Centre for Cognitive Science, Macquarie University.

Michie P, Schall U, Todd J, Karayanidis F. A study of sound processing in individuals with schizophrenia and their family members. Discipline of Psychology, University of Newcastle.

Monterrubio S, Solowij N, Meyer B. A study of fatty acids, stress and cannabis use in schizophrenia. Department of Psychology, University of Wollongong.

Schall U, Ward P, Michie P, Thompson. Brain imaging studies of auditory processing dysfunction in schizophrenia. Centre for Mental Health Studies, University of Newcastle.

Startup M, Sedgman A. Self-esteem instability and anomalous experiences in persecutory delusions. School of Behavioural Sciences, University of Newcastle.

Taylor R, Coltheart M, Langdon R. Changes in premenstrual symptoms in women with schizophrenia. Macquarie Centre for Cognitive Science, Macquarie University.

NSW Tissue Resource Centre

The following schizophrenia/neuropsychiatric research initiatives received tissue from the NSW Tissue Resource Centre in 2003-2004.

Buckland M. Gene methylation and schizophrenia. Victor Chang Cardiac Research Institute.

Dedova I, Matsumoto I. Changes in proteomics of brain in schizophrenia: effects of neuroleptics. Department of Pathology, University of Sydney.

Deng C, Huang X. Relationship between dopamine, GABA and glutamate receptors in the anterior cingulate cortex and STG in schizophrenia. Department of Biomedical Science, University of Wollongong.

Dixon G. Quantitative analysis of neurons in the posterior cingulate cortex in schizophrenia. Department of Pathology, University of Sydney.

Gundlach A. Localisation of galanin peptides and galanin receptors in human brain. Howard Florey Institute, The University of Melbourne.

Halliday G, Shepherd C. What contributes to regional vulnerability in neurodegenerative diseases? A study of familial cases. Prince of Wales Medical Research Institute.

Jones A. Autoimmunity in schizophrenia. Department of Medicine, University of Queensland.

Kapoor V. Involvement of D-serine and kynurenic acid in the pathology of schizophrenia. Department of Physiology and Pharmacology, University of New South Wales.

Masayuki I, Matsumoto I. HNP22 in the frontal cortex in schizophrenia. Department of Neuropsychiatry, Fukushima University.

Newell K, Zavitsanou K, Huang X. The role of posterior cingulate cortex in the neuropathology of schizophrenia. Department of Biomedical Science, University of Wollongong.

Pow D, Dixon G. Glutamate transporter proteins in human hippocampus: alterations in schizophrenia. Department of Physiology and Pharmacology, University of Queensland & Department of Pathology, University of Sydney.

Schofield P, Blair I. Understanding the molecular basis of bipolar affective disorder. Neurobiology Program, The Garvan Institute of Medical Research.

Tooney P. Gene expression patterns in schizophrenia. School of Biomedical Science, University of Newcastle.

Wheeler D, Dixon G, Matsumoto I. Proteomics of human post-mortem brain. Department of Pathology, University of Sydney.

Yoshikawa T. Molecular genetic analysis of functional psychosis using post mortem brains. RIKEN Brain Science Institute, Japan.

INFORMATION ON DIRECTORS

Christine Bennett
Deputy Chair, Non-Executive Director
Chief Executive Officer, Research Australia; MBBS University of Sydney; Fellowship of the Royal Australasian College of Physicians; Master of Paediatrics, University of NSW; Managing Director, Total Healthcare Enterprises Ltd; Partner of Health, Education and Community Services Group, KPMG (2000-2001); CEO of Westmead Hospital and Community Health Service (1997-2000); Director of Population Health and Clinical Services, South Eastern Sydney Area Health Service (1997-1996).
Board member since 2001.

Vaughan Carr
Executive Director
Director, Hunter Mental Health; Scientific Director of NISAD; Professor of Psychiatry, Centre for Mental Health Studies, Faculty of Health, University of Newcastle; Past President, Australasian Society for Psychiatric Research.
Board Member since April 2004

Stanley Catts
Non-Executive Director
Founding Chair of NISAD (1995-1999); Professor of Hospital and Community Psychiatry, University of Queensland.
Board member since 1995. Chairman 1995 to 2000.

Matthew Cullen
Non-Executive Director
Co-President of McKesson Asia-Pacific Pty Ltd. (formerly High Performance Healthcare Pty Ltd); Previously medical officer and consultant psychiatrist, St George Hospital; Member, NSW Mental Health Review Tribunal; Board member, Schizophrenia Fellowship of NSW; Member, Royal Australian and New Zealand College of Psychiatrists; Member, Australian College of Health Service Executives; Member, Australian Institute of Company Directors; Member, Australian Medical Association; Member, American Academy of Organisational and Occupational Psychiatrists.
Board Member since April 2004

Peter Dempsey
Chairman, Non-Executive Director
Formerly Chief Executive Officer Baulderstone Hornibrook Group; Vice President and Director, Australian Constructors Association; Member of the Government's Standards and Conformance Advisory Council.
Board member since 2001, appointed Chairman 2003.

Ian Harrison
Non-Executive Director
President, NSW Bar Association; Chairman, Professional Conduct Committee #4 1998; Conducted Australian Federal Police Corruption Inquiry for Federal Attorney General (1996-1997); appointed Senior Counsel 1995; Lecturer in Law, UNSW Law School (1975-1980).
Board member since 1999, Chairman 2000 to 2003.

Peter Maher
Non-Executive Director
Group Head of Macquarie Bank Ltd's Financial Services Group; General Manager of the Marketing Group, Westpac, from April 1997 to October 2000; General Manager at DB Breweries.
Board member since 2003.

Rita Mallia
Non-Executive Director
Senior Legal Officer/Co-ordinator for Construction Forestry Mining Energy Union; formerly Workers Compensation Officer. Previously a solicitor for Barlow & Co Solicitors. CFMEU representative re: Occupational Health and Safety and Workers compensation Advisory Council; Director of NSW Dust Disease Board, Construction Industry Reference Group; Director of MEND Rehabilitation Services; Coverforce, Uplus Claims Committee, ALP Employment and Industrial Policy Committee.
Board Member since November 2003

Don McDonald
Non-Executive Director
Director, NSW Institute of Psychiatry; Former Conciliator, NSW Government; Former Secretary, Construction Forestry, Mining Energy Union.
Board member since 1995. Deputy Chairman 1995-2001.

Patricia Michie
Non-Executive Director
Professor of Psychology, School of Behavioural Science, Faculty of Science and Information Technology, University of Newcastle; Adjunct Professor in School of Psychiatry and Behavioural Science, University of Western Australia; Member of Neuroimaging Consortium of NHMRC Network for Brain Research in Mental Disorders.
Board member since 2000.

Andrew Mohl
Non-Executive Director
Managing Director and Chief Executive Officer, AMP Limited; ANZ Banking Group's Chief Economist and Managing Director of ANZ Funds Management; Reserve Bank of Australia from 1978 to 1986 as Deputy Head of Research; Chairman of the Investment and Financial Services Association (2001-2002).
Board member since 2002.

Patricia Oakley
Non-Executive Director
Director, Meridian Media; Former Media Partner, Brophy Oakley Consulting; Chief of Staff, Office of the Deputy Premier, New South Wales Government (1995-1999); Press Secretary and political strategist, Dr Refshauge as Deputy Leader of the Opposition (1990-1995); former Journalist, Australian Broadcasting Corporation.
Board member since 2001.

Christos Pantelis
Non-Executive Director
Associate Professor & Head, Cognitive Neuropsychiatry Academic & Research Unit, Department of Psychiatry, The University of Melbourne, Sunshine Hospital; Clinical Director/Principal Specialist, Adult Mental Health Rehabilitation Unit (AMRHU), Sunshine Hospital, North Western Mental Health Program; Divisional Co-ordinator, Applied Schizophrenia Division, Mental Health Research Institute of Victoria; Principal Fellow, Centre for Neuroscience, The University of Melbourne; Co-Director, Melbourne Neuropsychiatry Centre.
Board Member since April 2004

Dymphna Rees Peterson
Non-Executive Director
BA (Behavioural Sciences); Grad. Dip. Ed; MA (Aboriginal Studies); Past State President, ARAFMI NSW Inc.; Vice President of the ARAFMI National Council; Consultant in Vocational Education and Training; Lecturer, Editor and Writer, works widely in the mental health sector, advocating for the needs of families of people with mental illness; parent of an adult son with schizophrenia. Special interest: Member of NISAD/NSW Health Partnership Project Committee.
Board member since 1999. Retired 27 November 2003.

Alexandra Rivers
Non-Executive Director
Psychologist, former lecturer, (Special Education), Faculty of Education, University of Sydney; Board member, Guardianship Tribunal, NSW; Guardian ad Litern, Children's Court, NSW; Guardian ad Litern, Administrative Decisions Tribunal NSW; Vice President, Schizophrenia Fellowship of NSW; Board Member, Mental Health Council of NSW; Board Member, Aboriginal Education Council of NSW; Carer.
Board Member since October 2003

Graham Shaw
Non-Executive Director
Currently Managing Director of Interfine Holdings Pty Ltd; Commercial Services Manager, The Summerland Credit Union (1987-1995); Lifeline counsellor (1989-1993); Board Member, Chrysalis Northern Rivers (1991-1995).
Board Member since October 2003

Deborah Willcox
Executive Director
Executive Director of NISAD; Director, NISAD/NSW Health Partnership Project; Previously, solicitor (in training) Abbott Tout Solicitors (employment and industrial relations law); Chief of Staff, Office of the Deputy Premier of New South Wales (1999-2004); Policy Adviser, Office of the Deputy Premier (1995-1996); Registered Nurse (Intensive care).
Board Member since June 2004.

Peter Young
Non-Executive Director
Executive Vice Chairman, ABN AMRO Australia; Chairman, ABN AMRO Rothschild; Chairman, National Rail Corporation; Governor, Taronga Foundation; Director, Australia Business Arts Foundation.
Board member since 2001. Retired 21 August 2003

Directors have been in office since the start of the financial year to the date of this report unless otherwise stated.

FINANCE

The abridged consolidated financial position accounts and financial performance for the year ended 30 June 2004 have been prepared from audited financial statements, passed by the Board of Directors, who are responsible for the presentation of those financial statements and the information they contain.

For a better understanding of the scope of the audit by KPMG, this report should be read in conjunction with KPMG's report on the unabridged financial statements. This report may be obtained from:

NISAD Schizophrenia Research
384 Victoria Street
Darlinghurst NSW 2010
Ph: (02) 9295 8407

Financial Performance
for the year ended 30 June 2004:

	2004	2003
INCOME		
Fundraising	699,434	1,060,522
External grant income	1,395,386	1,396,945
Sundry income	110,177	45,065
Total	2,204,997	2,502,532
LESS EXPENSES		
Research	1,398,438	1,271,908
Marketing & fundraising	363,028	494,397
Administration	254,769	282,729
Total	2,016,235	2,049,034
Net Surplus	188,762	453,498
Opening retained earnings	887,926	213,409
Closing retained earnings	1,076,688	666,907
Transfer (to)/from reserves	_	221,019
Retained earnings	**1,076,688**	**887,926**

SPONSORS AND SUPPORTERS

Government Support

NSW Health

NSW Ministry for Science and Medical Research

Outstanding Support

Building Workers on Jacksons Landing Site (Bovis Lend Lease / CFMEU)

Construction Forestry Mining Energy Union (CFMEU NSW Branch)

KPMG Audit & Risk Advisory Services

Mineworkers Trust

Mr Jack & Mrs Judy Gibson

St. George Bank

Sylvia & Charles Viertel Foundation

Telstra Friends

3-Year Gold Sponsorship

- $25,000 per year

Mrs Margarete Ainsworth

Breakfast Point

St. George Foundation

Westfield Construction Contractors & Workers - Bondi Junction

3-Year Silver Sponsorship

- $10,000 per year

Australand Holdings

Baulderstone Hornibrook

Deutsche Bank

Janssen- Cilag

Ron & Peggy Bell Family Foundation

Tony Bleasdale & Associates

3-Year Bronze Sponsorship

- $5,000 per year

AbiGroup

Chubb Fire Safety

Leighton Holdings

Lundbeck Australia

Paynter Dixon Constructions

Southern Cross Constructions

Workplace Giving Programs

ABN AMRO

Insurance Australia Group (IAG)

Wollongong City Council - Staff

Key Supporters A-Z

AMP Foundation

AMP Limited

Australian Charities Fund

Automatic Fire Protection Design

AW Edwards Builders & Contractors

Justice Graham Barr

H A Barton

Bill Grace & Sons

Mr Neroli Blakeman

Mr Kevin Bowering

Brighton Ceiling

Mr George Brown

Mr H Bullock & Mrs B Power

Mr Terry Burgess

Cecilia Kilkeary Foundation

City Bricklaying

Mrs Elizabeth Chisholm

Clubs NSW

Club Managers Association of Australia

Contrast Design & Construction

Mr Phillip Cornwell

Mr Alan Corr

Mr Michael Doyle

Mr Wallace Coward

CPG Australia

Dr. Joyce Clinch

De Martin & Gasparini

Mr Ian Davidson

Delta Group

Mr Gary Dilly

Dr Anthony Durrell

Mr Michael Dysart

Dural Country Club

Dwyers Hire

Elton Consulting

Equipped Constructions

Mr Wayne Evans

Express Deco

Mr L Elkhoury

Form 700

Franform

General Industries Australia

Mrs Susan Grasyan

Hansen Yuncken Subcontractors at Warrawee

Mr Anthony Harris

Hawker Britton

Holdmark Developers

Holroyd City Council

Hudson Global Resources

Ms Barbara Hobson

Ms Carolyn Huckel

Interfine Holdings

JS & N Hanna

JS Love Trust

Mr Michael Johnson

Mr Thomas Jucovic QC

Kari and Ghossayn

Mr Bill & Mrs Betty Kenealy

Mrs Ezma Beverley Kew

Mrs April Kohlmann

Linddales

Macquarie Bank

Macquarie Bank Foundation

M Mayo

MEI

Melinda Group

Morris C Painting & Building

Mr Andrew Mohl

Macquarie Hospital Staff

Mr N Minogue

NSW Golf Association

NSW Painting

Nu Line Group

Optimus

Panelrite

Mr Gill Palmer

Mr Stanley Pendall

PH Carpentry

Property Council of Australia

Mr Clive Powell

Mrs Renee Pollack

Quatram Interiors

R & R Consultants

R3 Render

Mr Steven Rares SC

Mr Germaine Rich

Mr Ian Reid
Ms Pat Richardson
Rotary Club of Botany
Rotary Club of Bulli
Rotary Club of North Sydney
Rotary Club of Wollongong Central
Mr Brian & Mrs Jill Rathborne
Mr Frank Romeo
Sanaa Painting
Schizophrenia Fellowship Southern Group
Services Clubs Association
Mr Bryan & Mrs Fiona Shedden
Mrs Barbara Simpson
Ms Deby Simpson
Southern Cross Bricklaying NSW
St. George Bank
St. Marys Lions Club
Mrs Janine Studdert
Telstra
The Ascot Club
The Bankshouse Mental Health Carers Support Group
The Leagues Club Association of NSW
The Medical Secretaries Assoc
Mr John Thomas
Dr Jenny Thompson
Trebor Building Group
Tyrrell's Wines
University of Newcastle
Warren Toyota
Mr Steve Weston
Western Suburbs Leagues Club
Westfield Design & Construction - Pines Redevelopment Fountaingate
Westfields - David Jones Bondi Junction
Westpac Banking Corporation
Westpac Compensation Team
Mrs Patricia Westwood
Wollongong City Council
Yago
Zenith Constructions (NSW)

Friends of NISAD

Mr Jeff Borg
Mr D & Mrs B Dyer
Ms Christine Hatcher
Mrs Margaret Health
Ms Denise Hume
Mr Alan Jackson
Ms Stephanie Julienne
Mr Allan Johansson
Mr Michael McCullan
Mrs Sandra McDonald
Mrs Vickie McFadden
Ms Sandra Moriarty
Dr. M Nichols
Ms Leigh Pitkethly
Mr Michael Roper
Mr Duncan & Mrs Mirrel Roper
Mr Ronald Sears
Mrs Jean Spiers
Mrs Gillian Sutherland
Ms Susan Sheather
Ms Belinda Vos

Support in Kind

20th Century Fox
2GB
A Fish Called Paddo
Admiral
Air New Zealand
AJ Hackett Bungy
Alta Wines
AMP
Auction Construction Services
Awesome Screen Printing
Ms Jennifer Baird
Belinda Franks Catering
Blue Fish
Brandmakers
Bridge Climb
Bright Print
Camden Valley Golf Resort
Chapel Hill Wines
City Bricklaying
Crabtree & Evelyn
Crowne Promenade Hotel
Darty River Safaris
Destination Queenstown
Mr Andrew Denton
Mr Tony & Mrs Alison Dickins
Exhibition Hire Service
Ms Anne Fulwood
GET Group Event Travel
Gibbston Valley
Ms Graziella Garrett
Gulf Air
Mr Doug Hawkins - TUV
Heritage Queenstown
Hungerford Hill Wines
Inner West Skills Centre & Central West Employment Services
Innovations
InterContinental Hotels
Jamberoo Recreation Park
Mr Alan Jones
Katnook Estate Coonawarra
Mr Tony (A.J) Kentuck
Lake Village Photography
Lilianfels - Blue Mountains
Lishas Catering
Mr Michael Teulon
Michael Thompson Photography
Ms Marilyn Mitchell
Mr Nic Moodie
Mudgee Fancy Dress Hire
Novotel Northbeach Wollongong
Orient Express Hotels
P & O Cruises
Panasonic
Provedore Pelagio
Real Journeys
Ms Emma Reid
Rockbare Wines
Mr Duncan & Mrs Mirrel Roper
Sel et Poivre
South Sydney Rabbitohs
Southern Cross Sporting Goods
St. George Bank
St. George Illawarra Dragons
Sydney Fish Markets Seafood School
Sydney Prop Specialist
Sydney Yoga Space
Ms Danielle Symoms
Mr David Tapp
Terroir Restaurant & Wine Bar
Thaspa Day Spa
The Australian Air Force
The Leagues Club Association of NSW
The Lodge at Nobel Domain
The Observatory Hotel
Thredbo Alpine Hotel
Warner Bros Theme Parks