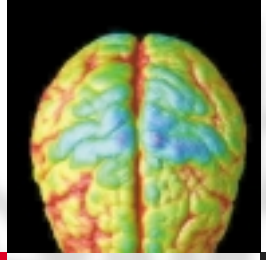
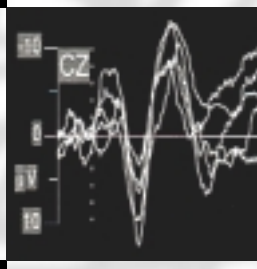
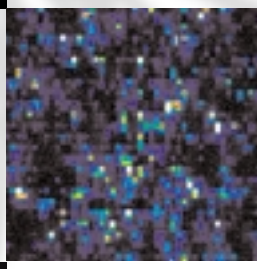
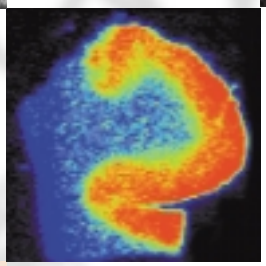


ANNUAL REPORT 2003





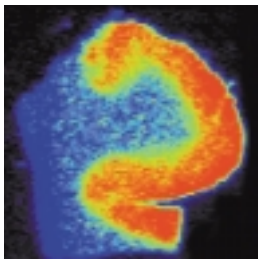


NISAD
Schizophrenia Research
SPARE A THOUGHT. FIND A CURE.

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. Around 10% will suicide, making schizophrenia a major cause of youth suicide.

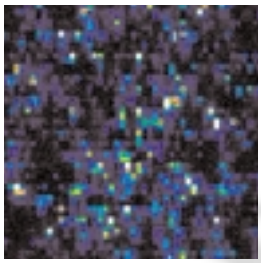
Since inception in 1996, NISAD has developed a powerful research network integrating clinical research, neurobiology, neuroimaging and genetics in the quest to find a cure for schizophrenia.

Some Research Highlights 2002-2003



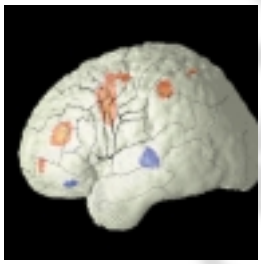
■ Over $200,000 was raised by the South Coast community to purchase a beta-imager for NISAD's Wollongong research centre. This extensive campaign involved support from local government, unions, media, business, clubs and the general community.

The Wollongong University team has already put the Beta-imager to work in their research, finding that schizophrenia brains have abnormal numbers of cannabinoid neuroreceptors (the red staining in the picture), suggesting that changes in this system may be involved in the development of schizophrenia.



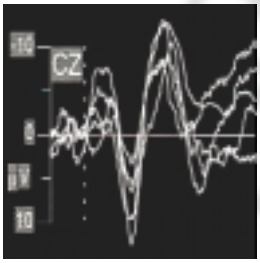
■ NISAD-affiliated scientists originally discovered a fundamental deficit of auditory processing in schizophrenia brains called 'mismatch negativity'. Now, key cortical areas in the temporal and frontal lobes have been identified as being involved in its generation. Genetic tools are now being used to identify genes in blood samples of schizophrenia patients with the 'mismatch negativity' deficit.

NISAD's University of Newcastle team are using 'gene chip' microarray technology to detect numbers of genes which are consistently changed in schizophrenia patients as compared to normal controls.



■ The NISAD Brain Atlasing Initiative is the first study to link deficits in gray matter thickness to reduced brain activation during performance of a planning task in young people experiencing their first episode of schizophrenia.

Through its fruitful collaboration with the UCLA Laboratory of Neuroimaging, NISAD was able to introduce to Australia the brain imaging techniques which made the current research possible.



■ NISAD research at Liverpool Hospital has focussed on the brain's auditory system because 'hearing voices' is such a common symptom. The ensuing discovery that neurons in the auditory systems of schizophrenia brains have a much faster 'recovery cycle' (higher excitability) may account for some symptoms of the illness.

Event Related Potentials (ERPs) were used to detect electrical responses in the brain's auditory systems during measured sound input tests.

■ The University of Sydney neurobiology team found altered levels of GABA receptors and transporters in the prefrontal cortex and superior temporal gyrus of schizophrenia subjects compared to controls. Abnormal GABA neurotransmission may account for symptoms such as debilities in speech, movement, emotion, memory and attention.

GABA transporters (the darker spots) detected in a sample area of brain tissue from the prefrontal cortex. As the brain's major inhibitory system, GABA abnormalities may play a key role in producing some symptoms of schizophrenia.

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 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 NSW, 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 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 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 combined support of Government and the private sector. 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 increased cannabinoid receptors in the anterior cingulate cortex (ACC) region in schizophrenia. These results suggest that changes in the endogenous cannabinoid system in the ACC may be involved in the development of schizophrenia, particularly in relation to negative symptoms.

■ Demonstration of alterations in GABA receptors and transporters in the prefrontal cortex and superior temporal gyrus in schizophrenia, but no changes to the ratio of GABAergic neurons in the mamillary bodies. Abnormal GABA neurotransmission in schizophrenia may account for some of the symptoms of schizophrenia, such as poverty of speech, movement, emotion, memory and attention.

■ Cutting edge genetic tools have been used to identify genes in blood samples of schizophrenia patients linked to a fundamental deficit in auditory processing called mismatch negativity (MMN). MMN was first discovered by NISAD scientists, who have also recently demonstrated key cortical areas in the temporal and frontal lobes involved in its generation.

■ Award of a major grant ($240,000) from the Viertel Foundation for a collaborative study with the Queensland Centre for Schizophrenia Research to develop a shared platform related to the use of animal models in schizophrenia research.

■ Development of a new animal model of chronic schizophrenia-medication induced obesity and related metabolic disorders. Obesity occurs as a major side effect of anti-psychotic drug therapy; causes patients to cease treatment, and leads to a number of life-threatening illnesses. This model will allow for research into this side effect of current medication.

■ The NISAD Brain Atlasing Initiative is the first study to link deficits in gray matter thickness to reduced brain activation during performance of a planning task in young people experiencing their first episode of schizophrenia.

■ The first study to demonstrate that schizophrenia subjects elicited excessive arousal responses, but an associated reduction in amygdala-medial prefrontal activity, when viewing facial expressions of fear.

■ Evidence that patients with schizophrenia display deficits in early stages of auditory information processing, which may reflect altered inhibitory processing, making some schizophrenia patients easily distracted, and unable to attend selectively to relevant information in their environment.

■ Initiation of a project aiming to identify the barriers that prevent young people experiencing their first episode of psychosis from accessing specialised early intervention programs, which can effectively engage and treat symptoms early, preventing long-term disability and suicide.

■ Completion of a review on the neurobiology of substance use and psychosis that concluded that further neurobiological research using a variety of techniques that cross disciplinary boundaries (eg. the NISAD model) is likely to provide the best way forward to ultimately improving preventative and therapeutic interventions.

RESEARCH OUTPUTS

■ 18 publications of NISAD-supported research in peer-reviewed scientific journals with an average impact factor of 4.0. A further 4 manuscripts are in revision and 7 under editorial review.

■ 45 presentations (including 3 invited) of NISAD-supported schizophrenia research at scientific conferences held in Australia, Japan, Denmark, France, UK and USA.

■ 22 grants, with a total value of approximately $3.5M, were awarded to NISAD and/or NISAD-affiliated scientists to support schizophrenia research initiatives, equipment or travel costs.

■ Award of 9 research higher degrees to NISAD-supported employees and students. In addition, Dr Carmel Loughland was awarded the University of Sydney Postgraduate Publication Prize for 2002.

RESEARCH INFRASTRUCTURE

■ Continued growth of the NISAD Schizophrenia Research Register with approximately 1,000 volunteers now on the database. 50% of these volunteers have now participated in a research project.

■ Initiation of the Hunter DNA Bank for Schizophrenia and Allied Disorders, a critical research infrastructure facility to support genetics research in schizophrenia.

■ The NSW Tissue Resource Centre supported 17 neuropsychiatric research studies in New South Wales, Queensland and Victoria, including many first time users of the facility.

■ Further development of the NISAD 'Gift of Hope' Tissue Donor Program (TDP). Patron, Marilyn Mitchell, gave an invited presentation on the TDP and brain banking from a consumer's perspective at the World Fellowship for Schizophrenia and Allied Disorders Conference in Japan.

RESEARCH PERSONNEL

■ Commencement of 7 new NISAD research positions building upon the success of the Institute's schizophrenia research program.

■ Increased investment in training with NISAD support for 37 students undertaking schizophrenia research. This recognises the need to develop young schizophrenia researchers, as they are the scientists who will provide the discoveries of the future.

■ Major growth in scientific participation on NISAD research panels with affiliation of 19 new scientists.

RESEARCH SITES AND COLLABORATIONS

■ Initiation of NISAD-supported research at the Macquarie Centre for Cognitive Science, Macquarie University, and Northern Sydney Area Health Service.

■ New schizophrenia research collaborations commenced with scientists from the Queensland Centre for Schizophrenia Research, University of Queensland, and Illawarra Institute of Mental Health.

OTHER RESEARCH HIGHLIGHTS

■ Provision of support for important scientific meetings with a schizophrenia focus including: Australasian Schizophrenia Conference, Australasian Society for Psychophysiology, Australian Functional Brain Mapping Meeting, and Australasian Society for Biological Psychiatry Meeting.

■ Negotiations with University of Wollongong regarding the NISAD-funded beta-imager resulted in the agreement for a 5-year University-funded Research Fellow position in schizophrenia research.

■ Following on from the NISAD External Review, the development, adoption and implementation of a Research Strategic Plan designed to substantially move NISAD forward in its goal to become a leading contributor to schizophrenia research outcomes.

FUNDRAISING/AWARENESS HIGHLIGHTS

■ Continued success of the NSW Health/NISAD Partnership Project, raising over $620,000 for NISAD research during the period, and providing workplace presentations to approximately 13,000 people. The overall success of the project led to a commitment from NSW Health to extend funding support for the project for a further 3 years, until the end of 2006.

■ Successful staging of a major black tie gala dinner on Goat Island, which raised approximately $115,000 for NISAD research.

■ Support from 5 new sponsors – Mrs Margarete Ainsworth, Breakfast Point, Westfield Constructions, Tony Bleasdale & Associates, and Barclay Mowlen Constructions. These three-year sponsorships will provide $195,000 for NISAD.

■ Over $200,000 obtained from charitable foundations to support schizophrenia research.

■ Over $200,000 raised from the South Coast Community to purchase a beta-imager for NISAD's Wollongong research centre. This extensive campaign involved obtaining support from local government, unions, media, business, clubs and the general community.

■ A construction industry leaders lunch, organised by NISAD Chairman Peter Dempsey, and attended by former Health Minister Craig Knowles, raised over $60,000.

■ The first annual NSW Club Industry Golf Championship for NISAD. With over 100 participants, $16,000 was raised, and the championship will be an annual event.

■ The Bill Grace & Son Charity Race Day at Rosehill featured Australia's first horse race dedicated to schizophrenia, the NISAD Schizophrenia Research Handicap. The race is expected to be an annual event.

■ First bi-state edition of the NISAD newsletter 'Headlines' featuring research from NISAD and the Queensland Centre for Schizophrenia Research. Circulation of the newsletter in Queensland was assisted by Queensland Health, and Queensland Schizophrenia Fellowship.

CHAIRMAN'S REPORT

I think everyone reading the research 'highlights' of the year included in this annual report will find it a remarkable list of achievements for an organisation barely 7 years old.

These substantial and original findings in schizophrenia research are what NISAD was created to acheive. I warmly congratulate the scientists involved, together with our Scientific Director Prof. Philip Ward, who is responsible for mentoring, coordinating and sustaining our many-faceted research effort.

These achievements would not have been possible without the support of the solid infrastructure laid down in earlier years.

We must remember that before 1996, when NISAD commenced operations, there was no schizophrenia-focussed tissue resource centre, no register of consumers willing to participate in research, no brain donor program, no PhD scholarship program, and no large-scale funding for conducting schizophrenia research in NSW. All these facilities and sources of expertise have been created by the hard work of the scientists and parents who were campaigning against the neglect and stigma of this illness long before their Institute, NISAD, was officially incorporated.

Another key factor in NISAD's successful development has been the unbroken succession of supportive NSW Ministers for Health. I thank Andrew Refshauge, Craig Knowles, and Morris Iemma for their understanding of the issues involved, and for their commitment to NISAD's mission.

In addition to providing core funding, such government support has allowed the Institute to benefit from the full-time fundraising and public awareness advocacy of Don McDonald who, as Director of the NISAD/NSW Health Partnership Project, has raised more than $620,000 over the year. Don was on the original NISAD board, and he has continued to provide invaluable support to the Institute throughout its development.

In August 2002, NSW Minister for Health Craig Knowles reviewed the work of the Partnership Project, and endorsed its extension to 2006.

A particular success of the Partnership Project has been the progress of the South Coast campaign which, at time of writing, has delivered over $200,000 to purchase a Beta brain imager for NISAD's research team based at the University of Wollongong. Don McDonald's advocacy recruited the help of the Mayor of Wollongong, the Illawarra Mercury, the City Coast Credit Union, CFMEU Trades Unions, Clubs and many individual supporters. It is some measure of this achievement that the machine is the only one of its kind in the Southern Hemisphere, and that it delivers research results in hours, which used to take months to process. This was a landmark campaign, and I thank all contributors.

Parallelling our growth in scientific output and fundraising success, the number of NISAD employees, including scientists and administrative staff, has risen from 17 to 25 - a rise which is already being reflected in our increases in research activities and published papers.

The number of postgraduate students supported by NISAD has also risen from 12 to 37. Many of these students are able to nurture and develop their interest in schizophrenia research only with the support of grants and sponsorships administered by NISAD and its sponsors. Under the supervision of NISAD-affiliated senior scientists, they not only perform much of the hands-on work in the Institute's research centres throughout NSW, they also represent the core schizophrenia specialist scientists of the future who will continue NISAD's mission. In 2003, Dr Tina Hinton became the first of these NISAD students to graduate with a PhD, funded via NISAD by a grant from the Rebecca L Cooper Medical Research Foundation.

Managing and accounting for the Institute's expanding staff, affiliates, scientific projects, and sponsorships is an especially demanding task in an organisation which is necessarily scattered among all universities and most clinical centres in NSW. The central office team has, as usual, coped with the task magnificently. I congratulate Research Manager Daren Draganic, Office Manager Annette Carter, and Accountant Genevieve Hemsley-Wilken. Communications Director Alan Tunbridge must also be commended for writing, designing and managing much of the Institute's publications, display, TV and video output.

During the Financial Year a number of Directors stepped down from the NISAD Board, and others generously accepted invitations to join. I thank Pru Goward, Michael Shepherd and Bernard McNair for providing valuable service to the Institute, and welcome Peter Maher and Andrew Mohl.

The year also saw the departure of Executive Director Jackie Crossman, who engineered the highly successful Goat Island fundraising event in January 2003, raising $115,000 for the Institute.

I also thank corporate consultant Mick Reid for completing a review of the Institute's structure and providing recommendations for our future development.

Traditionally last on the list, but certainly not last in the Institute's esteem, my predecessor Ian Harrison has served NISAD as Chairman since February 2000, and his presence as speaker at many events since then has added measurably to the Institute's prestige as a major Australian research organisation. While taking over as Chairman, I am delighted to report that he will continue to provide his valuable support as a Boardmember.

Peter Dempsey
Chairman

SCIENTIFIC DIRECTOR'S REPORT

One of the key goals identified at the outset of NISAD's research program in 1997 was the need to increase research capacity within the distributed network that constitutes our 'institute without walls'. The research activities of the past year provide testament to our success in achieving this goal, with a substantial expansion of the numbers of scientists and clinicians striving to find the means to prevent and cure schizophrenia.

Of particular note are the growing numbers of postgraduate students who are choosing to focus their energies on a range of important questions, under the expert supervision of both NISAD staff and affiliated academics. With our growing understanding of normal brain development, and more refined tools for investigating brain structure and function, today's postgraduate students are well placed to make a major contribution to our understanding of the factors that contribute to the development of schizophrenia.

Another key element in building research capacity involves obtaining funding to support our research endeavours. 2003 saw the award of several major grants, from both government agencies and private foundations, that bear testament both to the high standing of NISAD-linked researchers amongst their academic peers, and the novelty and significance of the hypotheses they will be able to examine thanks to the funding they have obtained.

However, an equally vital source of funding has been the community at large, that have again contributed generously to NISAD via a range of exciting and innovative fundraising initiatives. These funds have enabled us to provide start-up support for new and important research questions, such as understanding the links between substance abuse and the development of psychosis.

Without such support, our efforts to initiate new research programs, and to develop them to a level where they can attract peer-reviewed competitive funding, would have been severely restricted. I know I speak for all NISAD researchers in thanking our growing list of donors for their generous support over the last year.

Community support is dependent on community awareness, and the past year has seen many important developments in this area. The Illawarra-based campaign to raise funds for a Beta-Imager, the first of its kind in the Southern hemisphere, supported by the local media and a range of special fundraising events, led to numerous opportunities for NISAD researchers to talk about schizophrenia, and explain their efforts to help to find the means to prevent and cure this illness.

Our 'Year of the Goat' fundraising event provided an opportunity for many of our supporters to hear first hand from Professor Allan Fels how this illness had affected his family. The testimony of prominent public figures sends a powerful message to the community at large: mental illness, and schizophrenia in particular, are no longer topics of shame that families and sufferers must hide.

The many research achievements outlined in the pages that follow are a harbinger of the greater insights into what causes schizophrenia, and how better to treat it, that NISAD researchers will discover in the forthcoming years.

It is only through such new knowledge that our health systems will acquire the capacity to redress the substantial disability that many people living with schizophrenia experience. The foundations for new knowledge are in place, and our highly skilled and dedicated teams are poised to deliver the answers we all want: the means to prevent and cure this devastating disease. Watch this space.

Associate Professor Philip Ward
Scientific Director

Research Council

Professor Vaughan Carr
Convenor, Psychopharmacology and Therapeutics Research Panel
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 (from February 2003)
Professor Pat Michie
NISAD Board Representative
Dr Ulrich Schall
Convenor, Cognitive Neuroscience Research Panel (from March 2003)
Professor Peter Schofield
Co-Convenor, Neurobiology Research Panel
Dr Paul Tooney
NISAD Scientific Employee Representative
Associate Professor Philip Ward
Scientific Director (Chair)
Associate Professor Leanne Williams
Convenor, Cognitive Neuroscience Research Panel (until March 2003)

NISAD/NSW HEALTH PARTNERSHIP PROJECT DIRECTOR'S REPORT

The decision of the former NSW Minister for Health Craig Knowles to fund a unique partnership project between NISAD and NSW Health, with the objectives of raising workplace and community awareness of mental health as well as to raise funds to support NISAD Schizophrenia Research, has proven to be fully justified with more and more impressive results being achieved.

Since the last Annual Report, the partnership project has achieved the following results:

■ Presentations to over 13,000 people face to face in 143 separate workplaces and community organisations. The NISAD video, "The Quest for a Cure", continued to be very helpful.

■ Over $620,000 was raised for NISAD Schizophrenia Research plus another $70,000 from the Myer Foundation to develop Australia's first national strategic plan for psychosis research, which continues to develop - led by Professor Stan Catts, the founding chairman of NISAD.

■ Coverage by all sections of the media has continued to grow. Coverage has been obtained through TV, radio, newspapers, foundation, company, union, club publications.

■ The Partnership Project has assisted NISAD to continue to lift its profile in the community as a result of the recruitment of Mr Andrew Mohl, CEO, of AMP and Mr Graeme Shaw, Managing Director of Interfine Holdings to join the NISAD board.

Lee Drury

■ The Partnership Project has also engaged Ms Lee Drury, a former National Sales Manager of InterContinental Hotels Group, as a new Manager of Corporate and Community Partnerships.

■ The magnificent campaign on the NSW South Coast to supply NISAD Schizophrenia Researchers at the University of Wollongong with a Beta Brain Imaging machine has been concluded with over $200,000 raised. The campaign has been led by the Lord Mayor of Wollongong, Councillor Alex Darling and his 'Light and Hope' Committee of local business and community leaders chaired by Mr Stephen Mayers, former CEO of the City Coast Credit Union. The campaign has been strongly promoted by the Illawarra Mercury who have run a series of major articles written by Ms Kerry O'Connor. As a testimony to the success of the project, the Lord Mayor's committee have decided to continue this great work by developing a new campaign to provide a 'Pioneer Clubhouse' on the south coast.

■ Among the numerous grant applications that were submitted success has been achieved in gaining a grant of $240,000 from the Sylvia and Charles Viertel Charitable Foundation to fund a collaborative research project between NISAD and the Queensland Centre for Schizophrenia Research.

■ A very successful corporate lunch was hosted by NISAD's new chairman, Mr Peter Dempsey, when has was the CEO of Baulderstone Hornibrook. This was attended by the Hon. Craig Knowles, the then Minister for Health, and raised over $60,000 for NISAD research.

■ A new PhD scholarship into schizophrenia research was awarded by the Breakfast Point Development project, which was launched at Concord Hospital by the Director of the Centre for Mental Health, Professor Beverley Raphael.

■ Workers at the Jackson's Landing construction project decided to donate all funds raised from a site parking fee to NISAD, and workers at Westfield's construction project at Bondi Junction have joined with the company and site contractors in raising funds to support a further PhD scholarship for schizophrenia research.

■ In 2002, very successful Sponsors and Major Supporters Presentation Lunch was hosted by Mr Mike Shepherd of Challenger International, which was attended by over 70 sponsors and major supporters. The Director has also been able to present to staff of Janssen-Cilag, which resulted in the company becoming a new Silver Sponsor. A number of NISAD's foundation sponsors have also decided to renew their sponsorships for a further 3 years.

■ Friends of Telstra held a trivia night for NISAD research.

■ The NSW club industry held their first NISAD charity golf day with over 100 in attendance, which raised over $16,000 for NISAD research.

■ A NISAD Schizophrenia Research Handicap event also took place at Rosehill racecourse, with a full page about NISAD and schizophrenia appearing in race day programs throughout Australia.

■ KPMG have now been engaged as NISAD's external auditors pro-bono.

■ The Urban Arts Base, which is a recovery program for young people who have suffered their first psychosis, has also been assisted. This includes obtaining a new centre at Double Bay from Woollahra Municipal Council and a commitment from South Sydney Junior Rugby Leaque club to provide $150,000 over 3 years to engage a Welfare Officer.

■ The Pioneer Clubhouse at Balgowlah has also been assisted by obtaining extra accommodation facilities on a pro-bono basis.

■ A very successful sportsman's lunch was held at North Sydney League's club attended by over 300,which raised thousands of dollars for NISAD. This led to South Sydney Rugby Leaque Club having a 'Grow Your Moe', competition to raise funds for NISAD as well. This competition not only appeared on the 'Footy Show' twice but also resulted in 'moes' being sold by volunters at a game played at Aussie Stadium.

Don McDonald
Project Director

NEUROBIOLOGY RESEARCH PANEL REPORT

Panel Members

Associate Professor Loris Chahl
University of Newcastle
Dr Albert Chetcuti
NISAD Research Officer (from January 2003)
Dr Mary Collins
University of Sydney
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 (from February 2003)
Dr Tina Hinton
University of Sydney
Associate Professor Xu-Feng Huang
University of Wollongong
Professor Graham Johnston (Co-Convenor)
University of Sydney
Associate Professor Izuru Matsumoto
University of Sydney (from June 2003)
Professor George Paxinos
University of New South Wales
Professor Peter Schofield (Co-Convenor)
The Garvan Institute of Medical Research
Professor Rodney Scott
University of Newcastle
Dr Paul Tooney
NISAD Senior Research Officer
Dr Bryce Vissell
The Garvan Institute of Medical Research (from February 2003)
Associate Professor Philip Ward
NISAD Scientific Director
Dr Katerina Zavitsanou
NISAD Senior Research Officer

Aim

The Neurobiology 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 has developed four Centres for Collaborative Human Brain Research in NSW.

NEUROTRANSMITTER AND RECEPTOR STUDIES IN SCHIZOPHRENIA

Schizophrenia is a uniquely human disease and NISAD has therefore given high priority to neuroscientific research using post-mortem human brain tissue. Abnormalities in neurotransmitters and receptors (the 'chemical messenger system' of the brain) have been well documented in previous schizophrenia research. NISAD scientists are therefore targeting specific brain regions known to be involved in the cognitive functions compromised by the disorder to investigate changes in these chemical messenger systems.

The tachykinin system

Research into the role of the tachykinin system in schizophrenia has continued at NISAD's Newcastle Centre. A role for tachykinins in schizophrenia has been implicated from previous studies showing alterations in this system in various regions of post-mortem schizophrenia brains. For example, a previous NISAD study demonstrated that tachykinin NK1 receptor-immunoreactivity was increased in the prefrontal cortex in schizophrenia. Subsequently, Dr Paul Tooney and colleagues commenced a study that aims to determine whether this altered distribution of tachykinin receptors was due to anti-psychotic drug treatment or the illness itself. Preliminary results have shown alterations in the density of NK1 receptor-positive neurons in haloperidol treated animals, suggesting that anti-psychotic treatment may be the cause of the changes in the tachykinin system. Further brain regions are now being investigated.

Other studies at the Newcastle Centre are examining the distribution patterns of the tachykinins and their receptors in the amygdala, a brain region known to be affected in schizophrenia. Preliminary results indicate that the distribution of neurons containing NK1 receptors in the human amygdala might be more extensive than previously reported. Data collection is continuing to determine what type of neurons contain the NK1 receptor in the amygdala. Genetic analysis of the amygdala has also commenced.

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 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, mamillary bodies and subiculum. Two lines of evidence suggest the Papez circuit may be altered in schizophrenia: specific deficits in declarative memory have been correlated with Papez circuit damage in other brain diseases, and previous research has demonstrated declarative memory dysfunction in schizophrenia.

In the past year research has focused on investigating the GABA system in the posterior cingulate cortex (PCC) and the mamillary bodies (MB). GABA is the principle neurotransmitter mediating inhibition in the mammalian CNS and is known to be altered by schizophrenia. Results indicate no significant difference in the ratio of GABAergic neurons in the MB of schizophrenia cases compared to controls. However, a trend of fewer GABAergic neurons in the PCC of schizophrenia cases was found, which may be related to reduced afferent input from the anterior thalamus. Further research is examining the interstitial cells in the PCC, neurons that play a role in cortical development and which remain in the adult brain. Several previous studies have found altered patterns of interstitial cell distribution in the subcortical white matter in the brains of individuals diagnosed with schizophrenia.

The GABA system

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, such as poverty of speech, movement, emotion, memory and attention.

NISAD-supported researchers Dr Tina Hinton, Sonja Schleimer and colleagues at University of Sydney have continued to investigate the GABA system in an attempt to understand its molecular composition in the CNS and role in schizophrenia. The major findings from these studies have included the demonstration of the presence of $GABA_A$ receptor mRNAs in human brain regions, which have not previously been investigated and alterations in $GABA_A$ receptor subunit mRNAs in the schizophrenia brain, specifically in the prefrontal cortex and superior temporal gyrus. Furthermore, significant alterations of GABA transporters were shown in the prefrontal cortex. Future research will establish if the changes in these transporters were due to the use of neuroleptics or if they are a pathological marker.

The role of the cingulate cortex 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 has previously reported abnormalities in serotonin and glutamate receptors in the ACC of schizophrenia and changes in GABA containing interneurons in the PCC in schizophrenia. Building on these findings, Dr Katerina Zavitsanou and colleagues investigated two further systems in the ACC, the cannabinoid and muscarinic.

Previous research suggests that long-term cannabis use causes cognitive impairment and lack of motivation, conditions that also resemble core negative symptoms of schizophrenia. The ACC plays an important role in normal cognition, particularly in relation to motivation and attention. This suggests that changes in the cannabinoid system might be present in the ACC of patients suffering schizophrenia. Therefore a study examining the distribution and density of CB1 cannabinoid receptors in the ACC was undertaken with results demonstrating a significant increase in CB1 receptors in the schizophrenia group. These results support the suggestion that changes in the endogenous cannabinoid system in the ACC may be involved in the pathology of schizophrenia, particularly in relation to negative symptoms.

Abnormal cholinergic neurotransmission has been suggested to occur in psychiatric illness and the ACC is known to receive intense cholinergic innervation. Therefore Dr Zavitsanou and colleagues investigated cholinergic muscarinic receptors (M1/M4) in the ACC of schizophrenia, bipolar and major depression disorders using brain tissue supplied by the Stanley Foundation Neuropathology Consortium. Results from the study demonstrated a significant decrease in muscarinic receptor density in the ACC in schizophrenia, but no evidence for significant changes in these receptors in the bipolar and major depression groups. The changes observed in schizophrenia may contribute to dysfunctional ACC neural circuits.

GENETIC RESEARCH IN SCHIZOPHRENIA AND ALLIED DISORDERS

Previous research has demonstrated a genetic component in the development of schizophrenia and bipolar disorder. However, the nature of these genetic changes remains unknown. NISAD scientists in Newcastle and Sydney 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.

In a collaborative study based in Newcastle, Dr Paul Tooney and colleagues are aiming to determine the gene expression pattern in lymphocytes from individuals with schizophrenia that have reduced mismatch negativity (MMN), compared to controls. MMN is an event-related potential (brain wave) that is produced in response to a deviant sound when presented amongst a series of standard sounds. MMN is reduced in people that have schizophrenia. Preliminary results show that genes predominantly expressed in the brain tissue can be detected in lymphocytes, and that the expression of a number of genes is altered in participants with schizophrenia, including genes involved in brain function and development. The study is also investigating the gene expression profiles in the superior temporal gyrus, a generator of MMN activity in the brain, from subjects with schizophrenia and controls.

At NISAD's Garvan Institute Centre, Dr Albert Chetcuti commenced a study aiming to identify genetic changes produced via the treatment of normal mice with anti-manic and anti-psychotic drugs. Genes identified may lead to the identification of potential molecular and cellular pathways responsible for these disorders and the gene expression patterns observed in the mouse model correlated with brain tissues from patients affected by schizophrenia/bipolar disorder. Preliminary results from the anti-manic studies have identified approximately one hundred genes that are differentially expressed in treated mice and further analysis of selected transcripts has commenced. The anti-psychotic studies will commence in late 2003.

DEVELOPMENT OF ANIMAL MODELS OF SCHIZOPHRENIA

Understanding of many human diseases has been advanced through the use of experimental animal models. Although schizophrenia is a uniquely human disease, NISAD scientists have commenced the development of various animal models that display schizophrenia-like behaviours and pathologies. 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.

The development of an NMDA receptor gene knockdown mouse model of schizophrenia has continued under the direction of Prof. Peter Schofield at the NISAD Centre for Molecular Brain Research. This model is of considerable interest as these mice show a number of behavioural alterations that are ameliorated by anti-psychotics. The mice are scheduled to be produced in early 2004 and will be a key component of the collaborative NISAD/Queensland Centre for Schizophrenia Research (QCSR) study (see below).

NISAD was successful in obtaining a $240,000 grant from the Sylvia and Charles Viertel Foundation for a collaborative study with QCSR to develop a shared platform related to the use of animal models in schizophrenia research. 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. NISAD has appointed Dr Tim Karl as Research Officer to take forward the project in early 2004.

At NISAD's Wollongong Centre, Prof. Xu-Feng Huang and colleagues have developed a new animal model of schizophrenia medication-induced obesity via the chronic administration of anti-psychotics. Obesity occurs as a major side effect of anti-psychotic drug therapy and leads to a number of life threatening illnesses such as cardiovascular disease and type II diabetes. Importantly, many patients cannot tolerate such severe side effects and are forced to cease treatment. In the coming year, genetic and receptor changes will be investigated in this model.

RESEARCH EQUIPMENT SUPPORT

NISAD has continued to provide funding for the purchase of vital equipment needed to support the Institute's research programs. Facilitated by Don McDonald, NISAD successfully concluded a campaign to raise funds to purchase a beta-imager for neurobiological studies at the NISAD Centre for Collaborative Human Brain Research, University of Wollongong. Over $200,000 was raised from the Illawarra region and the beta-imager purchased in early 2003. NISAD has also provided support for computer hardware and software required for the analysis of microarray data from genetic schizophrenia studies at the Garvan Institute.

COGNITIVE NEUROSCIENCE RESEARCH PANEL REPORT

Panel Members

Dr Bill Budd
University of Newcastle (from February 2003)
Dr Martin Cohen
University of Newcastle (from February 2003)
Mr Gavin Cooper
NISAD Systems Administrator (from April 2003)
Dr Pritha Das
NISAD Research Officer (from March 2003)
Mr Daren Draganic
NISAD Research Manager
Dr Allison Fox
University of Western Australia
Dr Ross Fulham
University of Newcastle (from February 2003)
Dr Melissa Green
Macquarie University (from February 2003)
Dr Anthony Harris
University of Sydney
Mr Patrick Johnston
University of Newcastle
Dr Frini Karayanidis
University of Newcastle
Dr Jim Lagopoulos
NISAD Research Officer
Dr Robyn Langdon
Macquarie University (from February 2003)
Dr Carmel Loughland
NISAD Senior Research Officer (from February 2003)
Dr Gin Malhi
University of New South Wales (from February 2003)
Professor Pat Michie
University of Newcastle
Mr Paul Rasser
NISAD Research Officer
Dr Ulrich Schall
(Convenor, from March 2003), University of Newcastle
Dr Nadia Solowij
University of Wollongong (from February 2003)
Dr Juanita Todd
University of Newcastle (from February 2003)
Professor Paul Thompson
University of California Los Angeles
Associate Professor Philip Ward
University of New South Wales
Associate Professor Leanne Williams
(*Convenor, until March 2003), University of Sydney*

Aim

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).

FUNCTIONAL AND STRUCTURAL MAGNETIC RESONANCE IMAGING (fMRI, sMRI) RESEARCH IN SCHIZOPHRENIA

The Cognitive Neuroscience Research Panel has continued to support fMRI and sMRI research in schizophrenia conducted by NISAD imaging groups located in Sydney and Newcastle. fMRI is a non-invasive method of examining brain activation accompanying performance of cognitive tasks.

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 and other psychiatric disorders, due in part to the high prevalence of auditory hallucinations amongst these patients. Over the last decade a core group of NISAD scientists including Prof. Philip Ward, Dr Ulrich Schall and Prof. Pat Michie have identified an index of auditory information processing called mismatch negativity (MMN), recorded from scalp electrodes (ERPs), that is abnormal in patients with schizophrenia, and their biological relatives.

In the past year NISAD research groups in Sydney and Newcastle have used fMRI to successfully identify functional neural networks activated by auditory sensory memory processing in healthy volunteers. In line with previous PET and EEG source modelling studies, the results found temporal lobe and prefrontal cortical activation that was associated with auditory MMN processing. Subsequently this group of researchers were awarded an NHMRC Project Grant for a study that will examine the relationship between these electrophysiological findings (ERPs), and fMRI results, which will identify the specific brain regions that are active during auditory information processing, and link these to the sources of the scalp-recorded measures in schizophrenia patients. Both of these functional measures will be examined in relation to the volume of brain tissue, measured from MRI scans using the LONI analysis technique (see below), 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.

Brain networks associated with eye movement and attentional dysfunctions in schizophrenia

Several brain areas have been implicated in directing attention, a cognitive function affected by schizophrenia. However, the full extent of the networks involved requires further elucidation. Dr Jim Lagopoulos and colleagues commenced a study that aims to record eye movements whilst simultaneously conducting an fMRI experiment investigating attention. Simultaneous measures of eye movements and fMRI are essential in cognitive paradigms where regions of brain activity associated with eye movements have to be delineated from activations resulting from cognitive activity. This study examined the covert

orientation of attention, where the subject is required to fixate on a central cue but respond to target stimuli, which are presented in the periphery, without moving their eyes. Therefore simultaneous assessment of eye movements is essential in order to ensure that unwanted eye movements do not contaminate the results. Data was collected from controls, with data from schizophrenia patients to be collected in late 2003.

NISAD Brain Atlasing Initiative - Analysis of fMRI activation during an executive function task using cortical pattern matching

This study forms part of the collaborative Brain Atlasing Initiative between NISAD, UCLA and the University of Essen. The study aims to use structural and functional MRI (using the 'Tower of London' paradigm) to discover some of the potential relationships between structural brain anomalies and the functional deficits observed in schizophrenia. Data has been collected in Australia and Germany and analysed using the latest analysis techniques developed at LONI, UCLA. This will be the first time the LONI analysis method will be used to examine the relationship between structure and function in schizophrenia. Preliminary results from an initial analysis of the functional data in first episode patients and controls demonstrated activation in the right cerebellar, bilateral occipito-parietal and right dorsolateral prefrontal regions of both groups during task performance, with greater intensity of activation in the control group. These findings are consistent with previous research. Subsequently, the LONI technique was employed to examine whether its novel cortical surface modelling approach would provide more accurate localisation of functional deficits in schizophrenia, and more sharply defined activation foci. The LONI analysis method resulted in sharper localisation of the functional data when compared to the functional data mapped to the cortical model derived from an average intensity brain. Future comparisons will relate these functional differences to structural differences in cortical grey matter density in patients and controls.

Dysregulation of arousal and amygdala-prefrontal systems in paranoid schizophrenia

This study conducted by Prof. Lea Williams, Dr Pritha Das and colleagues investigated impaired differentiation of limbic-prefrontal systems by autonomic arousal in schizophrenia. The study predicted that paranoid patients would be distinguished by a disjunction of hyperarousal but reduced amygdala and medial prefrontal activity, compared to both healthy control and nonparanoid schizophrenia subjects. Facial expressions of fear were used in an implicit perception task to evoke limbic activity. Simultaneous fMRI and skin conductance arousal recordings were acquired for fear versus neutral stimuli in schizophrenia patients (paranoid and nonparanoid) and matched healthy comparison subjects. In control subjects, arousal dissociated amygdala-medial prefrontal (with-arousal, 'visceral') and hippocampus-lateral prefrontal (without-arousal, 'context') networks for fear perception. Schizophrenia subjects elicited excessive arousal responses, but an associated reduction in amygdala-medial prefrontal activity. This disjunction was pronounced in paranoid patients, relative to both controls and nonparanoid patients. Paranoid patients also showed a relatively greater prefrontal deficit for 'without-arousal' responses. This is the first study to reveal a functional disconnection in autonomic and central systems for processing threat-related signals in paranoid schizophrenia. Paranoid cognition may reflect an internally generated cycle of misattribution about incoming fear signals, due to the inability of amygdala-prefrontal circuits to modulate autonomic arousal.

Integrity of auditory temporal processing in the ascending auditory system in schizophrenia.

Using a combination of neuroimaging and psychoacoustic methods Dr Bill Budd and colleagues have commenced a study that aims to extend the original finding by NISAD scientists that schizophrenia may be characterised by deficits in brain mechanisms underlying auditory processing. This evidence suggests that the auditory deficits in schizophrenia may be specific to mechanisms underlying auditory temporal processing. Recently, fMRI studies have shown that auditory neural structures show a distinct pattern of reactivity to the temporal aspects of auditory stimulation. In healthy controls this is evident as a change in sensitivity to the rate of amplitude modulation of sound at successively higher stages in the ascending auditory system. This study aims to provide a comparison of this pattern of reactivity in cortical, subcortical and brainstem auditory neural structures in patients with schizophrenia and healthy controls. This evidence will provide unique information regarding the nature of the auditory processing deficits in schizophrenia as well as important information regarding the level in the central auditory system where these deficits first arise. Psychoacoustic methods will also be used to further determine the nature of the auditory temporal processing deficits in schizophrenia and the relationship between these perceptual measures and neurophysiological measures of auditory temporal processing.

EVENT-RELATED POTENTIAL (ERP) RESEARCH IN SCHIZOPHRENIA

Converging evidence from ERP and behavioural studies demonstrates that patients with schizophrenia display deficits in early stages of auditory information processing, which may reflect altered inhibitory processing. Nathan Clunas and Prof. Philip Ward used ERP techniques to investigate the brain function abnormalities which make some schizophrenia patients easily distracted, and unable to attend selectively to relevant information in their environment. The focus was the brain's auditory system because 'hearing voices' is one of the most common symptoms, indicating that the disease particularly affects the brain areas that process sound. The study measured the recovery cycle of the auditory N100 ERP component in patients with schizophrenia and healthy volunteers. Results found significant differences between the groups and support the hypothesis of altered inhibitory processing of auditory stimuli in schizophrenia.

VISUAL SCANPATH STUDIES TO FACES AND FACIAL EXPRESSIONS IN SCHIZOPHRENIA

NISAD has supported a range of studies in Sydney and Newcastle that examined visual scanpaths (as a psychophysiological marker of visual attention) in response to different facial expressions. Dr Carmel Loughland and colleagues conducted a study that demonstrated 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). These visual scanpath deficits may contribute to problems with interpersonal communication and social interaction in schizophrenia. Further results also found that scanpath deficits to faces are paralleled to a lesser degree in the biological first-degree relatives of schizophrenia patients, and may represent a trait vulnerability marker for schizophrenia.

Prof. Lea Williams and colleagues conducted a study that investigated the effects of atypical (risperidone) versus typical (haloperidol) antipsychotic medication on facial emotion perception in schizophrenia and controls. Results found that compared to controls, both schizophrenia subgroups showed a restriction in visual scanning. Haloperidol-treated schizophrenia subjects exhibited an additional and consistent pattern of reduced attention to salient features for neutral, happy and sad expressions. By contrast, risperidone-treated subjects showed a relatively greater attention to salient features for happy and neutral expressions, in which they did not differ from controls. Recognition accuracy for happy and neutral showed a similar lack of impairment. These findings suggest that risperidone may play a specific role in schizophrenia in the ability to attend to salient features, and to integrate this information into an accurate percept for neutral and positive expressions in particular.

Dr Melissa Green and colleagues conducted a study that examined visuo-cognitive processing of threat-related (anger, fear) and non-threat faces (happy, sad, neutral) in deluded schizophrenia, non-deluded schizophrenia, and control participants. Results found that deluded schizophrenia subjects exhibited significantly fewer fixations of shorter duration for all faces, and fewer fixations of reduced duration to the feature areas of negative facial expressions (anger, sad), compared with healthy controls. Compared with non-deluded schizophrenia subjects, deluded subjects exhibited fewer fixations to fear expressions and more fixations to the feature areas of happy expressions. These findings were revealed in the context of restricted scanning (reduced number and duration of fixations, shorter scanpath length and shorter duration of fixations to facial features) in the entire schizophrenia group compared with healthy controls. The findings suggest a controlled attentional bias away from the feature areas of negative facial expressions in deluded schizophrenia, that is, specific to threat-related expressions compared with non-deluded schizophrenia subjects.

DIFFERENTIAL IMPAIRMENT OF WORKING MEMORY PERFORMANCE IN FIRST-DEGREE RELATIVES OF INDIVIDUALS WITH SCHIZOPHRENIA

Previous studies have reported neuropsychological impairment in schizophrenia and there is increasing evidence demonstrating that individuals with a schizophrenia spectrum disorder and their unaffected first-degree family members exhibit deficits in the same neuropsychological domains. NISAD-supported PhD student Aaron Kent conducted a study that examined the memory profile of individuals with a schizophrenia spectrum disorder, their unaffected first-degree family members and controls utilising a clinical assessment test called the Wechsler Memory Scale. The mean performance level of individuals with a schizophrenia spectrum disorder was lower on auditory memory, visual memory, and working memory indices when compared to both unaffected family member and control groups. However, the relatives were significantly impaired on the working memory index. Thus, the working memory index may be a potential phenotypic marker of schizophrenia. Further research in this domain may enhance molecular genetic studies of the disorder and our understanding of the etiological processes involved in schizophrenia.

RESEARCH INFRASTRUCTURE POSITION

Mr Gavin Cooper was appointed as Systems Administrator in April, 2003. His position supports NISAD's cognitive neuroscience research programs based at James Fletcher Hospital and the University of Newcastle, bringing valuable expertise in computer programming and data management to their schizophrenia research initiatives.

RESEARCH EQUIPMENT SUPPORT

Utilising funding provided by the Macquarie Bank Foundation and South Sydney Junior Rugby League Club, NISAD has purchased a Viewpoint Eye Tracker required for data collection on fMRI schizophrenia studies. NISAD has also provided funding to purchase hardware and software required for stimulus presentation and analysis of functional and structural MRI schizophrenia studies.

PSYCHOPHARMACOLOGY AND THERAPEUTICS RESEARCH PANEL REPORT

Panel Members

Professor Vaughan Carr
(Convenor) University of Newcastle
Associate Professor Scott Clark
South Western Sydney Area Health Service
Dr Martin Cohen
University of Newcastle
Mr Daren Draganic
NISAD Research Manager
Dr Melissa Green
Macquarie University
Ms Jo Gorrell
NISAD Research Officer (from June 2003)
Dr Anthony Harris
University of Sydney
Dr Carmel Loughland
NISAD Senior Research Officer
Ms Bev Moss
NISAD Research Officer (from June 2003)
Dr Louise Nash
Northern Sydney Area Health Service
Mr Jim Sheedy
NISAD Research Officer
Dr Nadia Solowij
University of Wollongong
Associate Professor Philip Ward
NISAD Scientific Director

Aim

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.

PATHWAYS TO CARE IN EARLY PSYCHOSIS

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. Utilising funding provided by the Telstra Foundation, NISAD initiated a project that aims to identify the barriers that prevent young people experiencing their first episode of psychosis from accessing specialised early intervention programs, which can effectively engage and treat symptoms early, preventing long-term disability.

NISAD secured the part-time services of project officers Bev Moss (Area Coordinator, Early Intervention for Psychosis, Northern Sydney Area Health Service) and Jo Gorrell, a clinical psychologist with extensive data analysis experience to undertake this study in the Northern and South Western Sydney Area Health Services. It was concluded that in-depth interviews

with young people (within six months of initiating treatment) and a key informant (usually a parent) would provide the best chance of identifying the circumstances that both impeded and facilitated access to care. Based on the findings from this project, it will be possible to develop targeted mental health promotion strategies to ensure increased recognition of psychosis as a treatable illness among key stakeholder groups (e.g. parents, teachers, counsellors and general practitioners).

THE NEUROBIOLOGY OF SUBSTANCE USE AND PSYCHOSIS

There are high rates of substance use among patients with psychotic disorders. The clinical reality of comorbid substance use and psychotic disorders is widely acknowledged but the interaction of these diagnoses is not well understood. NISAD therefore commissioned Dr Nadia Solowij to perform a comprehensive review of the literature pertinent to the neurobiology of substance use and psychosis to draw together information from a vast number of studies conducted in recent years and identify future research priorities.

The review found that licit and illicit substances used recreationally or abused by humans interact with the neuroanatomical regions and neuromodulator systems implicated in psychosis. Findings from the literature suggest a significant overlap on a neurobiological level between the development of psychosis on the one hand, and the propensity toward substance use and the consequences of use, on the other hand. There is a paucity of controlled studies on specific treatment strategies for comorbid substance use and psychotic disorders. Careful integration of pharmacotherapy and psychosocial treatment is thought to be the optimal treatment for this population, yet very little information is available on appropriate pharmacotherapies and drug interactions. Further neurobiological research using a variety of techniques that cross disciplinary boundaries (eg. genetics, biochemistry, neuroscience, neuroimaging, neurophysiology, cognitive neuropsychology and psychopharmacology) is likely to provide the best way forward to elucidate the mechanisms underlying these complex syndromes and to ultimately improve preventative and therapeutic interventions.

INVESTIGATION OF COGNITIVE IMPAIRMENTS DUE TO CANNABIS USE AND SCHIZOPHRENIA

Long term heavy use of cannabis has been shown to result in memory and attentional impairments similar to those seen in schizophrenia. Dr Nadia Solowij, Prof. Philip Ward and colleagues commenced a project that aims to investigate the neurocognitive and biochemical correlates of impaired memory function associated with long term heavy cannabis use, and to determine the contribution of frequency of cannabis use to these indices of brain function. Long term heavy and long term light users of cannabis and nonuser controls will perform an adaptation of the Rey Auditory Verbal Learning Test during fMRI scanning and magnetic resonance spectroscopy will be used to examine neuronal integrity in regions involved in memory function and with high density cannabinoid receptors. It is planned that the project will be extended to include cohorts of people with schizophrenia who do and do not also use cannabis.

FUNCTIONAL AND STRUCTURAL BRAIN IMAGING OF EXECUTIVE FUNCTION IN CHRONIC CANNABIS USERS AND CANNABIS USING FIRST EPISODE SCHIZOPHRENIA PATIENTS

Dr Martin Cohen and collaborators commenced this study using MRI to investigate 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. Epidemiological studies have revealed that cannabis use amongst adolescents increases the relative risk of developing schizophrenia by 2.4 times and up to 6 times in heavy users. This study will utilise the LONI analysis technique, via NISAD's collaboration with UCLA, to apply both structural and functional magnetic resonance imaging 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.

MEDICATION ADHERENCE: DEVELOPING CLINICAL STRATEGIES

Medication adherence remains a major issue in the rehabilitation and relapse prevention of many people with a severe mental illness. Assisting people to make informed decisions, and develop useful skills in regard to medication use, has the potential to significantly enhance lifestyle. NISAD scientist Jim Sheedy and colleagues continued their project that encompasses the development and refinement of clinical measurement tools, producing educational aids, and longitudinal studies into the effectiveness of clinical strategies. The long-term objectives are to improve the health and wellness of those dealing with mental illness until cures or preventative measures are found. Preliminary results indicate that there is a need to develop more clinically useful and user-friendly tools in regard to medication adherence. Groups are perceived as a valuable resource in developing skills for both staff and consumers in regard to medication issues. Games that complement educational efforts are under development.

TISSUE RESOURCE INFRASTRUCTURE PANEL REPORT

Panel Members

Lisa Azizi
NISAD Research Assistant
Ms Margaret Boyes
NISAD Tissue Donor Program Coordinator
Associate Professor Scott Clark
South Western Sydney Area Health Service
Dr Gavin Dixon
NISAD Research Officer
Mr Daren Draganic
NISAD Research Manager
Ms Therese Garrick
NSW TRC Manager
Professor Clive Harper
(Convenor), University of Sydney
Associate Professor John Hilton
Department of Forensic Medicine (until June 2003)
Professor Graham Johnston
University of Sydney
Associate Professor Izuru Matsumoto
University of Sydney (from June 2003)
Mr Robert MacDonald
NISAD Research Assistant (from March 2003)
Dr Maria Sarris
NISAD Tissue Resource Centre Coordinator
Mrs Donna Sheedy
University of Sydney (from November 2002)
Associate Professor Philip Ward
NISAD Scientific Director

Aim

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)

The NSW TRC has continued to grow during the past year. A further 35 cases were collected during the 2002-2003 period taking the total collection held to approximately 180. 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.

In the past year tissue has been requested and supplied for 17 neuropsychiatric research studies in New South Wales, Queensland and Victoria. An exhibition stand at the 2003 Australian Neuroscience Society meeting and Royal Prince Alfred Hospital Health Festival was used to promote the NSW TRC and associated brain donor programs (see below).

A good response was received with a number of requests for tissue submitted by researchers who had not previously used the facility.

Mr Robert MacDonald was appointed as a Research Assistant in March, 2003. His position focuses on liaison with the Department of Forensic Medicine to obtain suitable brain tissue donations for schizophrenia research.

THE NISAD 'GIFT OF HOPE' TISSUE DONOR PROGRAM (TDP)

The NISAD TDP enables individuals with schizophrenia and those without a mental illness to volunteer to donate their brain for schizophrenia research after death. The benefit of the TDP is that volunteers are tested on a range of clinical and neuroimaging investigations once enrolled, the results of which are available for later correlation with post-mortem findings. In the past year an additional 34 volunteers have indicated their interest in joining the TDP, taking the total number of donors to over 130. A total of 35 donors have now been clinically assessed and consented, with a further 64 in progress. One further collection for the TDP occurred in June 2003.

NISAD's TDP Patron, Marilyn Mitchell, gave an invited presentation on the TDP and brain banking from a consumer's perspective at the World Fellowship for Schizophrenia and Allied Disorders conference (Japan). ZENKAREN (the alliance for the mentally ill in Japan) supported Ms Mitchell's attendance. Julie Barlow was appointed as part-time Administrative Assistant to provide support to the NISAD Tissue Donor Program and NSW TRC in May 2003.

BRAIN DONATION FOR SCHIZOPHRENIA RESEARCH: GIFT, CONSENT AND MEANING

This study examined ethical issues in relation to the NISAD TDP and the issue of organ donation for research compared to donation for transplantation purposes. Conducted by Margaret Boyes and Prof. Philip Ward, the review concluded that organ donation for purposes of research differed from transplant donation in a number of ways, most notably the absence of a single recipient. However within a particular community (people with schizophrenia and their carers) the single recipient is replaced by a sense of shared experience, preventing suffering in others and providing donors with an investment in the research. The ability of the TDP to address the ethical issues of brain donation for research is attested to by the acceptance of the protocols by various ethics review bodies. Perhaps more compelling evidence is provided by its acceptance within the community of volunteers who have enrolled, including patients, their families, and the general public.

MOTIVATION OF DONATION: THE 'USING OUR BRAINS' EXPERIENCE

Operating in tandem with NISAD's 'Gift of Hope' TDP, the University of Sydney's 'Using our Brains' TDP aims to encourage people without a mental illness to donate their brain for research following death. Control tissue is vitally important for neuroscience research and the response to this program has been excellent. Thus far 400 people have volunteered to join the UoB program. As a means of investigating why people are interested in donating organs, including the brain, to medical research, an on-line survey study has commenced.

APOLIPOPROTEINS IN SCHIZOPHRENIA AND ALZHEIMER'S DISEASE

Utilising tissue from the NSW TRC, a group of researchers including NISAD-affiliate Prof. Clive Harper have conducted a number of studies examining the role of apolipoproteins in the development of schizophrenia and Alzheimer's disease. Apolipoprotein D & E are

known to be important transport proteins in the central nervous system. Examining the prefrontal cortex area of post-mortem human brain, these studies demonstrated significantly increased apolipoprotein D and E (apoD, apoE) expression in Alzheimer's disease, and significantly increased levels of apoE in schizophrenia subjects compared to controls. These findings suggest that apoD and apoE may be related to the cognitive decline observed in Alzheimer's patients and that increased levels of apoE may be associated with the pathology of schizophrenia.

CLINICAL RESEARCH INFRASTRUCTURE PANEL REPORT

Panel Members

Professor Vaughan Carr
University of Newcastle
Associate Professor Scott Clark
South Western Sydney Area Health Service
Mr Daren Draganic
NISAD Research Manager
Dr Anthony Harris
University of Sydney
Dr Carmel Loughland
(Convenor) NISAD Senior Research Officer
Dr Louise Nash
Northern Sydney Area Health Service
Professor Rodney Scott
Hunter Area Pathology Service
Mr Jim Sheedy
NISAD Research Officer
Dr Paul Tooney
NISAD Senior Research Officer
Associate Professor Philip Ward
NISAD Scientific Director

Aim

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 DNA Bank for Schizophrenia and Allied Disorders, which collects and stores DNA to be utilised for genetic research into schizophrenia.

NISAD SCHIZOPHRENIA RESEARCH REGISTER

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, has continued to grow and develop over the past year. A further 160 people joined the Register taking the total number enrolled to 950, with approximately half of the volunteers now clinically assessed. Recruitment was once again aided by a re-screening of a television community service announcement in Schizophrenia Awareness Week (May, 2003), with national exposure via SBS for the first time.

As a statewide database with significant regional representation, NISAD conducted presentations and clinical assessments of Register members in Canberra and Orange. Further regional visits are scheduled for 2003-2004.

In the past year the Register has provided participants for 18 schizophrenia research studies in NSW conducted at Macquarie University, University of Newcastle and Liverpool, Prince of Wales and Westmead Hospitals. A further 140 Register volunteers participated in these schizophrenia research studies meaning that 50% of members have now assisted with schizophrenia research.

THE DNA BANK FOR SCHIZOPHRENIA AND ALLIED DISORDERS

The DNA Bank for Schizophrenia and Allied Disorders obtained ethical approval to commence collections in February, 2003. The facility will store DNA from blood samples of people with schizophrenia and their close relatives, who will be initially recruited from the NISAD Schizophrenia Register. Once sufficient samples have been obtained, researchers will be able to apply for access to this material for research projects investigating the genetics of schizophrenia. In the future, samples from other mental disorders and controls will be included in the DNA Bank. NISAD provided funding for the purchase of a liquid nitrogen tank to store samples for the DNA Bank. Ms Jessica Hansen was appointed as part-time Administrative Assistant to provide support to the DNA Bank in June 2003.

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 grew substantially in 2002-2003. Linked to the NISAD web site, the database now lists details from over 100 research projects.

Design and development of a collaborative database that brings together the current individual databases from the NISAD Schizophrenia Register, Tissue Donor Program and DNA Bank commenced in 2003. 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 in 2003-2004.

CLINICAL ASSESSMENT TRAINING

In the past year NISAD has once again facilitated a training course on the Diagnostic Interview for Psychosis (DIP) clinical assessment tool at the Centre for Mental Health Studies, Newcastle. A workshop on OH&S issues in regards to mental health research was also held in the School of Behavioural Sciences, University of Newcastle.

PUBLICATIONS

Journal Articles

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

PUBLISHED

Boyes M, Ward P. Brain donation for schizophrenia research: gift, consent and meaning. *Journal of Medical Ethics* 2003; 29: 165-168.

Harper C, Garrick T, Matsumoto I, Pfefferbaum A, Adalsteinsson E, Sullivan E, Dodd P, Lewohl J, Butterworth R. How important are brain banks for alcohol research? *Alcoholism: Clinical and Experimental Research* 2003; 27: 310-323.

Johnston P, McCabe K, **Schall U**. Differential susceptibility to performance degredation across categories of facial emotion – a model confirmation. *Biological Psychology* 2003; 63: 45-58.

Laws S, Hone E, Taddei K, **Harper C**, Dean B, McClean C, Masters C, Lautenschlager N, Gandy S, Martins R. Variation at the APOE -491 promoter locus is associated with altered brain levels of apolipoprotein E. *Molecular Psychiatry* 2002; 7: 886-890.

Loughland C, Williams L, Gordon E. Schizophrenia and affective psychosis show different visual scanning behaviour for faces: A trait verses state-based distinction. *Biological Psychiatry* 2002; 52: 338-348.

Zavitsanou K, Ward P, Huang X. Selective alterations of iontropic glutamate receptors in anterior cingulate cortex in schizophrenia. *Neuropsychopharmacology* 2002; 27: 826-833.

IN PRESS

Garrick T, **Azizi L,** Merrick J, **Harper C**. Brain donation for research: what do the next of kin say? (letter) *Internal Medicine Journal* (in press, subsequently published 2003; 33: 475).

Dean B, Laws S, Hone E, Taddei K, Scarr E, **Harper C**, McClean C, Masters C, Lautenschlager N, Gandy S, Martins R. Increased levels of apolipoprotein E in the frontal cortex from subjects with schizophrenia. *Biological Psychiatry* (in press, subsequently published 2003; 54: 616-622).

Green M, Williams L, Davidson D. Visual scanpaths to threat-related faces in deluded schizophrenia. *Psychiatry Research* (in press, subsequently published 2003; 119: 271-285).

Harper C, Dixon G, Sheedy D, Garrick T. Neuropathological alterations in alcoholic brains: studies arising from the NSW Tissue Resource Centre. *Progress of Neuropsychopharmacology and Biological Psychiatry* (in press, subsequently published 2003; 27: 951-961).

Kent A, Fox A, Michie P, Jablensky A. Differential impairment of working memory performance in first-degree relatives of individuals with schizophrenia. *Acta Psychiatrica Scandinavica* (in press).

Loughland C, Williams L, Gordon E. Visual scanpath dysfunction in first-degree relatives of schizophrenia probands: evidence for a vulnerability marker. *Schizophrenia Research* (in press).

Schall U, Johnston P, Lagopoulos J, Jüptner M, Jentzen W, Thienel R, Dittman-Balcar A, Bender S, **Ward P.** Functional brain maps of Tower of London performance: a PET and fMRI study. *NeuroImage* (in press, subsequently published 2003; 20: 1154-1161).

Schall U, Johnston P, Todd J, Ward P, Michie P. Functional neuroanatomy of auditory sensory memory: an event-related fMRI study. *NeuroImage* (in press, subsequently published 2003; 20: 729-736).

Thomas E, Laws S, Sutcliffe G, **Harper C**, Dean B, McClean C, Masters C, Lautenschlager N, Gandy S, Martins R. Apolipoprotein D levels are elevated in prefrontal cortex of subjects with Alzheimer's disease: no relation to apolipoprotein E expression or genotype. *Biological Psychiatry* (in press, subsequently published 2003; 54: 136-14).

Tooney P, Chahl L. Neurons expressing calcium-binding proteins in the prefrontal cortex in schizophrenia. *Progress in Neuropsychopharmacology and Biological Psychiatry* (in press).

Williams L, Das P, Harris A, Liddell B, Brammer M, Skerrett D, Phillips M, David A, Peduto A, Gordon E. Dysregulation of arousal and amygdala-prefrontal systems in paranoid schizophrenia. *American Journal of Psychiatry* (in press)

Williams L, Loughland C, Green M, Harris A, Gordon E. Improved emotion perception in schizophrenia: An eye movement study comparing treatment with risperidone versus haloperidol. *Psychiatry Research* (in press, subsequently published 2003: 120: 13-27).

RESEARCH GRANTS

NISAD Grants

NISAD scientists were successful in obtaining the following grants administered by the Institute in the 2002-2003 period.

Identification of potential drug targets for bipolar disorder by microarray profiling gene expression in an animal model of anti-manic drug action.
Chetcuti A. World Congress on Psychiatric Genetics Travel Scholarship, 2003 ($US1,500).

A DNA Bank for schizophrenia research.
Draganic D, Tooney P, Ward P. The Baxter Charitable Foundation, 2003 ($15,000).

Analysis of gene expression in schizophrenia using genetic technology: NISAD PhD Scholarship for Schizophrenia Research.
Draganic D, Tooney P, Ward P. JS Love Trust, 2003-2004 ($20,000).

Project Teen Rescue: Fighting Youth Suicide.
Draganic D, Ward P, McDonald D. The Telstra Foundation, 2002-2003 ($40,000).

Schizophrenia and affective disorder show different visual scanpath patterns to faces and facial expressions: Is this a trait versus state-based distinction?
Loughland C. Ian Potter Foundation Travel Grant, 2003 ($2,000)

Viewpoint eye tracking system.
McDonald D, Draganic D, Ward P. The Macquarie Bank Foundation, 2003 ($13,000)

Linking clinical and basic research in order to understand the causes of schizophrenia: A collaborative network to study animal models of schizophrenia.
Ward P, McGrath J. The Sylvia and Charles Viertel Charitable Foundation, 2003-2004 ($240,000, shared between NISAD/QCSR).

NISAD-Supported Grants

NISAD infrastructure support played a vital role in the success of the following grant applications from NISAD scientists and affiliates in 2002-2003.

Integrity of auditory temporal processing in the ascending auditory system in schizophrenia.
Budd TW, Michie P, Todd J, Schall U. Hunter Medical Research Institute Young Investigator Award, 2003 ($10,000).

Assessment of somatosensory function in subjects with schizophrenia: touch, pain and axon reflex flare.
Chahl L, Carr V, Tooney P, Loughland C, Calford M, **Michie P.** University of Newcastle RGC Grant, 2003 ($11,000).

Brain mechanisms of attention problems in people with schizophrenia and bipolar disorder.
Clunas N. Ian Scott Fellowship, Australian Rotary Health Research Fund, 2003 ($26,000).

Functional and structural brain imaging of executive function in chronic cannabis users using first episode of schizophrenia patients.
Cohen M, Johnston P, Schall U. Neuroscience Research Grants – Pfizer, 2003 ($55,000).

Functional and structural brain imaging of executive function in chronic cannabis users and cannabis using first episode schizophrenia patients.
Cohen M, Carr V, Johnston P, Schall U. Hunter Medical Research Institute Grant, 2002 ($15,000)

The Centre for Cognitive Science and Cognitive Neuropsychology.
Coltheart M et al. ARC Centre for Excellence Grant, 2003-2005 ($2.2M).

Additional equipment to augment computer-assisted morphometry facility.
Dixon G, Henderson J. University of Sydney Blackburn Precinct Grant, 2003 ($13,800).

'Using Our Brains' - a donor program to promote research into the effects of alcohol on the human brain.
Harper C. The Australian Brewers' Foundation Medical Research Grant, 2003 - 2004 ($32,560).

Brain bank and donor program for biomedical research into schizophrenia and alcohol-related brain damage.
Matsumoto I. New South Wales BioFirst Award, 2003-2005 ($330,000).

Polhemus fastrack digitiser with accessories.
Michie P, Schall U, Ward P, Thompson P, Todd J, Spencer E, **Johnston P**. NHMRC Equipment Grant, 2003 ($20,000).

Brain imaging studies of auditory processing dysfunctions in schizophrenia.
Schall U, Ward P, Michie P, Thompson P. NHMRC Project Grant, 2003-2005 ($357,500).

Neurocognitive and biochemical correlates of memory impairment associated with long term heavy cannabis use.
Solowij N, Ward P, Shnier R, Grenyer B. The Clive and Vera Ramaciotti Foundation, 2003 ($30,000); University of Wollongong, 2003 ($6,000).

Establishment of a DNA Bank to facilitate the investigation of the genetics of schizophrenia and other brain disorders.
Tooney P, Loughland C, Scott R, Carr V. Hunter Medical Research Institute Clinical Neuroscience Program, 2002 (Reallocation of $33,500).

Investigation of muscarinic receptors in the anterior cingulate cortex in schizophrenia.
Zavitsanou K, Mattner F, **Huang X, Newell K**, Katsifis A. Australian Institute of Nuclear Science and Engineering Grant, 2003 ($18,225).

CONFERENCE PRESENTATIONS

Invited Presentations

NISAD scientists were invited to give presentations at the following conferences/meetings.

Ward P. Mismatch negativity: the neurobiology of an index of preattentive auditory processing deficits in schizophrenia. Invited presentation at the Australasian Schizophrenia Conference, Sydney, October, 2002.

Mitchell M. Brain Banking from a consumer perspective: The Neuroscience Institute of Schizophrenia and Allied Disorders (NISAD) Gift of Hope Brain Tissue Donor Program. Invited presentation at the World Fellowship for Schizophrenia and Allied Disorders Conference, Kyoto, Japan, October, 2002.

Malhi G, Lagopoulos J, Ward P, Mitchell P, Parker G, Ivanovski B, Sachdev P. fMRI neural abnormalities during the cognitive generation of affect in hypomania and bipolar depression. Invited presentation at the Australasian Society for Biological Psychiatry, Canberra, December, 2002.

Conference Presentations

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

Ward P, Solowij N, Peters R, Otton J, Chesher G, Grenyer B. An MRI study of regional brain volumes in long-term cannabis users. Presented at the British Association of Psychopharmacology meeting, Harrogate, UK, July, 2002.

Zavitsanou K, Ward P, Huang X. Selective alterations in iontropic glutamate receptors in the anterior cingulated cortex in schizophrenia. Presented at the 3rd Forum of European Neuroscience, Paris, France, July, 2002.

Johnston P, Schall U, Ward P, Lagopoulos J, Rasser P. An fMRI investigation of executive function in early psychosis. Presented at the 3rd International Conference on Early Psychosis, Copenhagen, Denmark, September, 2002.

Catts S, Azizi L, Harding L, **Garrick T**, Andrews G. The diagnostic accuracy of the modified Composite International Diagnostic Instrument (CIDI) in a clinical sample of psychotic disorders. Presented at the Cell to Society Meeting, Sydney, September, 2002.

Wheeler D, Dixon G, Harper C. Schizophrenia and the cingulate cortex. Presented at the Cell to Society Meeting, Sydney, September, 2002.

Boyes M, Garrick T. Mental illness, neuroscience and the Tissue Donor Program. Presented at the Australian and New Zealand College of Mental Health Nurses Conference, Sydney, October, 2002.

Dixon G. Limbic circuitry of the human brain: alterations in schizophrenia and alcohol abuse. Invited presentation at Centre for Education & Research on Ageing (CERA), Concord Hospital, Sydney, October, 2002.

Tooney P, Anderson W, Chahl L. Effect of chronic haloperidol treatment on the distribution of tachykinin NK1 receptors in the guinea pig brain. Presented at the Australasian Schizophrenia Conference, Sydney, October, 2002.

Sithamparanathan S, Garrick T, Dixon G, Sarris M, Harper C. Quantitation of neuron phenotypes in the medial mamillary nucleus in schizophrenia: preliminary findings. Presented at the Australasian Schizophrenia Conference, Sydney, October, 2002.

Zavitsanou K, Ward P, Huang X. Changes in neurotransmitter / antipsychotic drug binding sites in the anterior cingulate cortex in schizophrenia: clues for abnormal neural circuitry. Presented at the Australasian Schizophrenia Conference, Sydney, October, 2002.

Sheedy J. The NISAD Schizophrenia Research Register and stigma: the impact on research. Presented at the Australasian Schizophrenia Conference, Sydney, October, 2002.

Catts S, Azizi L, Harding L, **Garrick T,** Andrews G. The diagnostic accuracy of the modified Composite International Diagnostic Instrument (CIDI) in a clinical sample of psychotic disorders. Presented at the Australasian Schizophrenia Conference, Sydney, October, 2002.

Weidenhofer J, Tooney P, Yip J, **Zavitsanou K, Huang X, Chahl L.** Immunohistochemical localization of tachykinin receptors in the human amygdala. Presented at the Australasian Schizophrenia Conference, Sydney, October, 2002.

Newell K, Klose B, **Zavitsanou K**, Han M, **Huang X.** Effects of clozapine and haloperidol on motor activity in chronic PCP mouse model. Presented at the Australasian Schizophrenia Conference, Sydney, October, 2002.

Loughland C, Carr V, Lewin T. Sampling bias and recruitment source impacts on schizophrenia research. Presented at the Australasian Schizophrenia Conference, Sydney, October, 2002.

Schleimer S, Hinton T, Dixon G, Johnston G. Increase in GAT-3 within the human dorsolateral prefrontal cortex in schizophrenia. Presented at the Australasian Schizophrenia Conference, Sydney, October, 2002.

Kent A, Fox A, Michie P, Howell S, Jablensky A. Differential impairment of working memory performance in first-degree relatives of individuals with schizophrenia. Presented at the Australasian Schizophrenia Conference, Sydney, October, 2002.

Little C, Ward P, Lagopoulos J. Functional magnetic resonance imaging correlates of auditory sensory memory in healthy volunteers. Presented at the Australasian Schizophrenia Conference, Sydney, October, 2002.

Schall U, Johnston P, Todd J, Dittman-Balcar A, Juptner M, **Ward P, Michie P**. Functional neuroanatomy of auditory sensory memory. Presented at the Australasian Schizophrenia Conference, Sydney, October, 2002.

Sheedy J. The NISAD Schizophrenia Research Register: clinical and consumer perspectives. Presented at the Illawarra Institute of Mental Health Conference, Wollongong, November, 2002.

Schleimer S, Hinton T, Dixon G, Johnston G. The GABA transporter, GAT-3, may be increased inn the human dorsolateral prefrontal cortex in schizophrenia. Presented at the Australian Health and Medical Research Congress, Melbourne, November, 2002.

Azizi L, Harding L, Peters L, **Garrick T, Catts S**, Andrews G. The diagnostic accuracy of the modified Composite International Diagnostic Instrument (CIDI) in a clinical sample of psychotic disorders. Presented at the Australasian Society for Psychiatric Research Meeting, Canberra, December, 2002.

Loughland C, Carr V, Lewin T, **Johnston P, Williams L.** Facial expression processing in schizophrenia: an exploration using visual scanpaths. Presented at the Australasian Society for Psychiatric Research Meeting, Canberra, December, 2002.

Sheedy J. The NISAD Schizophrenia Research Register: Sampling across the adult lifespan. Presented at the Australasian Society for Psychiatric Research Meeting, Canberra, December, 2002.

Johnston P, Schall U, Ward P, Lagopoulos J, Rasser P, Thienel R, **Thompson P.** An fMRI investigation of executive function in early psychosis. Presented at the Australasian Society for Psychiatric Research Meeting, Canberra, December, 2002.

Schall U, Johnston P, Todd J, Dittman-Balcar A, Juptner M, **Ward P, Michie P.** Functional neuroanatomy of auditory sensory memory. Presented at the Australasian Society for Psychiatric Research Meeting, Canberra, December, 2002.

Sithamparanathan S, Dixon G, Garrick T, Sarris M, Harper C. Neuron phenotype ratios in the mamillary bodies are unaltered in schizophrenia: preliminary findings. Presented at the Australian Neuroscience Society Meeting, Adelaide, January, 2003.

Garrick T, Sheedy D, Blake H, **Harper C.** 'Using our Brains' – Banking for neuroscience. Presented at the Australian Neuroscience Society Meeting, Adelaide, January, 2003.

Wheeler D, Dixon G, Harper C. Valid estimates of neuronal populations in human posterior cingulate cortex can be achieved by column sampling. Presented at the Australian Neuroscience Society Meeting, Adelaide, January, 2003.

Zavitsanou K, Huang X. Increased cannabinoid-1 receptor binding in the anterior cingulate cortex in schizophrenia. Presented at the Australian Neuroscience Society Meeting, Adelaide, January, 2003.

Rasser P, Johnston P, Lagopoulos J, Schall U, Ward P, Thienel R, **Bender S, Thompson P.** Linking grey matter deficit and function in schizophrenia. Presented at the International Congress on Schizophrenia Research, Colorado, USA, March, 2003.

Loughland C, Williams L, Gordon E. Schizophrenia and affective disorder show different visual scanpath patterns to faces and facial expressions: Is this a trait versus state-based distinction? Presented at the International Congress on Schizophrenia Research, Colorado, USA, March, 2003.

Kent A, Fox A, Michie P, Jablensky A. Executive function in individuals at risk for schizophrenia: neurocognitive and physiological correlates of working memory, response inhibition and sustained attention. Presented at the International Congress on Schizophrenia Research, Colorado, USA, March, 2003.

Ward P. Mismatch negativity: The neurobiology of an index of preattentive auditory information processing. Presented at the Experimental Psychology Conference, Sydney, April, 2003.

Schall U, Johnston P, Todd J, Ward P, Michie P. Functional neuroanatomy of auditory sensory memory: an event related fMRI study. Presented at the Experimental Psychology Conference, Sydney, April, 2003.

Lagopoulos J, Ward P. A system for recording eye movements during fMRI experiments. Presented at the Human Brain Mapping meeting, New York, USA, June, 2003.

Rasser P, Ward P, Johnston P, Lagopoulos J, Schall U, Thienel R, **Bender S, Thompson P.** Linking grey matter deficit and function in schizophrenia. Presented at the Human Brain Mapping meeting, New York, USA, June, 2003.

Malhi G, Lagopoulos J, Ward P, Kumari V, Mitchell P, Parker G, Ivanovski B, Sachdev P. An fMRI study of the cognitive generation of affect in hypomania. Presented at the Human Brain Mapping meeting, New York, USA, June, 2003.

Chetcuti A, Adams L, **Schofield P.** Profiling altered gene expression in an animal model of lithium drug action. Presented at the Australian Society for Medical Research meeting, Sydney, June, 2003.

Garrick T, Sheedy D, Blake H, **Harper C.** 'Using our Brains' – Banking for neuroscience. Presented at the Research Society for Alcoholism Conference, USA, June 2003.

Zavitsanou K, Ward P, Huang X. Changes in neurotransmitter/antipsychotic drug binding sites in the anterior cingulate cortex in schizophrenia: clues for abnormal neural circuitry. Presented at Medical Research Week, Illawarra, June, 2003.

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

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

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

Loughland C, Williams L, Gordon E. Visual scanpath deficits to faces in schizophrenia and first-degree relatives. Accepted for presentation at Eye Movement Conference, Dundee, Scotland, August, 2003.

Boyes M, Loughand C, Sheedy J. NISAD's 'Gift of Hope' Tissue Donor Program and the Hunter DNA Bank for Schizophrenia and Allied Disorders. Invited presentation for the Clinical Unit in Ethics and Health Law, Newcastle, August, 2003.

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

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

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

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

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

Maharaj R, Plumbe P, **Sheedy J.** Medication adherence: can we make a difference? Accepted for presentation at the Paediatric and Mental Health Conference, Brisbane, 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. Accepted for presentation at the World Congress for Psychiatric Genetics, Quebec, Canada, October, 2003.

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

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

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

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 NSW
Brain mechanisms of attention problems in people with schizophrenia and bipolar disorder.
Supervisor: Prof. Philip Ward

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 Pat Johnston
Centre for Mental Health Studies, University of Newcastle
Facial emotion processing deficits in schizophrenia: an intergrative, cognitive neurosciences approach.
Supervisors: Dr 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 NSW
Pre-attentive and memory deficits in schizophrenia: an ERP and fMRI investigation.
Supervisor: Prof. Philip Ward

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: Assoc. Prof. Xu-Feng Huang, Dr Katerina Zavitsanou

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

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

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

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, Assoc. Prof. Loris Chahl

MSc Students

Ms Therese Garrick
Department of Pathology, University of Sydney
Mamillary body quantitation in schizophrenia.
Supervisor: Dr Roger Pamphlett

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 Katherine 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 Ross Fulham, Dr Carmel Loughland, Pat Johnston

BSc Honours Students

Mr David Burns
Department of Biomedical Sciences, University of Wollongong
Correlation between neural MPC and D2, D4 and 5-HT binding efficiency in schizophrenia.
Supervisors: Assoc. Prof. Xu-Feng Huang, Dr Katerina Zavitsanou

Ms Rebecca Hannan
School of Behavioural Sciences, University of Newcastle
Electrophysiological components associated with anticipatory task-switching processes.
Supervisor: Dr Frini Karayanidis

Mr Matthew Hughes
School of Behavioural Sciences, University of Newcastle
The neural basis of countermanding voluntary action.
Supervisors: Prof. Pat Michie, Dr Ross Fulham

Mr Andrea Kerr
School of Behavioural Sciences, University of Newcastle
Memory in schizotypy personality examined by a directed forgetting task.
Supervisor: Dr Karen Drysdale

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 Sonja Schleimer
Department of Pharmacology, University of Sydney
Alterations of GAT-1 and GAT-3 transporters in the frontal cortex of individuals diagnosed with schizophrenia.
Supervisors: Prof. Graham Johnston, Dr Tina Hinton, Dr Gavin Dixon

Mr Tu Hao Tran
Department of Pathology, University of Sydney
Are neuron phenotypes differentially affected in alcohol-related brain damage?
Supervisors: Dr Gavin Dixon, Prof. Clive Harper

NISAD Summer Student Scholarships

Mr Wayne Anderson
School of Biomedical Sciences, University of Newcastle
Investigation of tachykinin receptors in the prefrontal cortex using antigen retrieval.
Supervisors: Dr Paul Tooney, Assoc. Prof. Loris Chahl

Ms Renee Granger
Department of Pharmacology, University of Sydney
Studies on post-mortem brain receptors expressed in Xenopus laevis oocytes.
Supervisor: Prof. Graham Johnston

Ms Mary-Claire Hanlon
Centre for Mental Health Studies, University of Newcastle
Investigation of executive function in cannabis using non psychotic and first episode psychosis patients: a comparative structural and function brain MRI study.
Supervisor: Dr Ulrich Schall

Ms Jessica Hansen
Centre for Mental Health Studies, University of Newcastle
The temporal sequencing of eye movement patterns to face stimuli in healthy controls.
Supervisor: Dr Carmel Loughland

Mr Simon Howell
Department of Pathology, University of Sydney
Brains for research; the motivation for donation.
Supervisor: Prof. Clive Harper

Mr Nicholas Kerr
Neurobiology Program, The Garvan Institute of Medical Research
Molecular genetics of bipolar disorder.
Supervisor: Prof. Peter Schofield

Ms Sharon Monterrubio
Department of Psychology, University of Wollongong
The effects of cannabis use on fatty acid levels and functioning in schizophrenia: insights from magnetic resonance spectroscopy and blood analytic studies.
Supervisor: Dr Nadia Solowij

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, Dr Gavin Dixon

DEGREES AND AWARDS

THESES AWARDED

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

Doctor of Philosophy

Dr Melissa Green
Department of Psychology, University of Sydney
Facial affect processing in delusion-prone and deluded individuals: a continuum approach to the study of delusion formation.
Supervisors: Assoc. Prof. Lea Williams, Assoc. Prof. Harvey Irwin

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

Master of Science

Ms Therese Garrick
Department of Pathology, University of Sydney
Mamillary body quantitation in schizophrenia.
Supervisor: Dr Roger Pamphlett

Bachelor of Science (Honours)

Mr David Burns
Department of Biomedical Sciences, University of Wollongong
Correlation between neural MPC and D2, D4 and 5-HT binding efficiency in schizophrenia.
Supervisors: Assoc. Prof. Xu-Feng Huang, Dr Katerina Zavitsanou

Ms Rebecca Hannan
School of Behavioural Sciences, University of Newcastle
Electrophysiological components associated with anticipatory task-switching processes.
Supervisor: Dr Frini Karayanidis

Mr Matthew Hughes
School of Behavioural Sciences, University of Newcastle
The neural basis of countermanding voluntary action.
Supervisors: Prof. Pat Michie, Dr Ross Fulham

Mr Andrea Kerr
School of Behavioural Sciences, University of Newcastle
Memory in schizotypy personality examined by a directed forgetting task.
Supervisor: Dr Karen Drysdale

Ms Sonja Schleimer
Department of Pharmacology, University of Sydney
Alterations of GAT-1 and GAT-3 transporters in the frontal cortex of individuals diagnosed with schizophrenia.
Supervisors: Prof. Graham Johnston, Dr Tina Hinton, Dr Gavin Dixon

Mr Tu Hao Tran
Department of Pathology, University of Sydney
Are neuron phenotypes differentially affected in alcohol-related brain damage?
Supervisors: Dr Gavin Dixon, Prof. Clive Harper

AWARDS

The following NISAD scientific employees received awards in 2002-2003.

Dr Carmel Loughland
University of Sydney Postgraduate Publication Prize, 2002.

SCHIZOPHRENIA RESEARCH INFRASTRUCTURE SUPPORT

Schizophrenia Research Register

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

Baker A, Lewin T, Carr V. Counselling for alcohol and other drug problems among people with a psychotic illness. Discipline of Psychiatry, University of Newcastle.

Baker A, Richmond R, Carr V, Lewin T, Wilhelm K. Intervention for smoking among people with a mental illness. Discipline of Psychiatry, University of Newcastle.

Drysdale K, Kerr A. Inhibition in schizophrenia: examined by a directed forgetting task. Discipline of Psychology, 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.

Harris A. Emotional well being in schizophrenia – an fMRI study. Brain Dynamics Centre, Westmead Hospital.

Johnston P. Differences in evoked cortical activation during semantic word processing between normals and patients with schizophrenia, and their structural and symptomatic correlates. Discipline of Psychiatry, University of Newcastle.

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.

Langdon R, Ward P, Coltheart M. Social attention and reasoning in schizophrenia. Schizophrenia Research Unit, Liverpool Hospital and Macquarie Centre for Cognitive Science, Macquarie University.

Loo C, Copolov D. A TMS study of auditory hallucinations. Prince of Wales Hospital.

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.

Rossell S, Coltheart M, Ward P. A neuropsychological and neuroimaging investigation of semantic processing in patients with schizophrenia, delusional disorder, mania and controls. Macquarie Centre for Cognitive Sciences, Macquarie University.

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.

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

Dixon G. Cellular abnormalities of posterior cingulate cortex in schizophrenia. Department of Pathology, University of Sydney.

Dixon G. MAP-2 positive neurons in subcortical white matter: possible schizophrenia specific alterations. Department of Pathology, University of Sydney.

Dixon G, Sarris M. Do microglia cells play a role in the pathogenesis of chronic schizophrenia? Department of Pathology, University of Sydney.

Dixon G, Schleimer. Optimal fixation protocol for immunohistochemical analysis of fresh frozen brain tissue. Departments of Pathology and Pharmacology, University of Sydney.

Eyles D. Mapping the vitamin D receptor and alpha 1 hydroxylase in the human brain. Department of Physiology and Pharmacology, University of Queensland.

Garrick T. Mamillary body quantitation in schizophrenia. Department of Pathology, University of Sydney.

Granger R, Johnston G. Studies on post-mortem brain receptors expressed in Xenopus Laevis oocytes. Department of Pharmacology, University of Sydney.

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

Halliday G. Cellular functions of human neuromelanin. Prince of Wales Medical Research Institute.

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

Leah J, Wilce P, Paxinos G. Genetic architecture of human cerebral cortex. School of Biomolecular and Biomedical Sciences, Griffith University.

Newell K, Zavitsanou K, Huang X. Membrane phospholipid composition and 5HT binding efficiency in 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.

Rasser P, Ward P. Tissue classification of postmortem brain tissue from its structural magnetic resonance image. Schizophrenia Research Unit, Liverpool Hospital.

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

Tooney P. Tachykinin receptors in human brain. School of Biomedical Science, University of Newcastle.

INFORMATION ON DIRECTORS

Peter Dempsey

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

Christine Bennett

Deputy Chair, Non-Executive Director.
Chief Executive Officer Research Australia Ltd; formerly 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). MBBS, University of Sydney; Fellowship of the Royal Australasian College of Physicians; Master of Paediatrics, University of NSW. *Board member since 2001.*

Stanley Victor 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.*

Ian Gordon Harrison

Non-Executive Director.
Senior Vice President, NSW Bar Association 2003; 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 James 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. *Appointed to Board March 2003.*

Don McDonald

Executive Director.
Project Director, NSW Health/NISAD Partnership Project; Director, ANZ Executors and Trustees; Director, NSW Institute of Psychiatry; Former Conciliator, NSW Government; Former Secretary, Construction Forestry, Mining and Energy Union. *Board member since 1995. Deputy Chairman 1995-2001.*

Patricia Michie

Non-Executive Director.
Professor of Psychology and Head of School, 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; Formerly Managing Director of ANZ Funds Management; Deputy Head of Research, Reserve Bank of Australia (1978 -1986); Chairman, Investment and Financial Services Association (2001 and 2002). *Appointed to Board November 2002.*

Patricia Ann Oakley

Non-Executive Director.
Director, Meridian Media; Formerly Media Partner, Brophy Oakley Consulting (Issues Management and Government Relations); Chief of Staff, Andrew Refshauge's Office, NSW 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.*

Dymphna Rees Peterson

Non-Executive Director.
BA (Behavioural Sciences); Grad. Dip. Ed; MA (Aboriginal Studies); 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. *Board member since 1999.*

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.*

Pru Goward

Non-Executive Director.
Federal Sex Discrimination Commissioner; Commonwealth Spokesperson, Sydney 2000 Games (1999-2000); First Assistant Secretary, Office of the Status of Women, Department of Prime Minister and Cabinet (1997-1999). *Board Member since 2001. Retired May 2003.*

Bernard McNair

Non-Executive Director
Group Manager, Wesley Health and Counselling Services; Trustee Research Trust Fund, Schizophrenia Fellowship of NSW; Director, Lottie Stewart Hospital, Dundas; Immediate Past President, Schizophrenia Fellowship of NSW; Board Member, Mental Health Council of Australia. *Board Member since 1996. Retired June 2003.*

Michael Shepherd

Non-Executive Director
Vice Chairman, Committee for Sydney; Chairman, Challenger First Pacific Ltd, Vice Chairman, Australian Stock Exchange; National Councillor and Regional Chairman, Securities Institute of Australia; Director, The Shepherd Centre; Governor, The Sir David Martin Foundation; Australia Hearing Services Authority. *Board Member since 2001. Retired November 2002.*

FINANCE

The abridged consolidated financial position accounts and financial performance for the year ended 30 June 2003 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 2003:

	2003	2002
INCOME		
Fundraising	1,060,522	560,338
External grant income	1,396,945	1,076,692
Sundry income	45,065	14,090
Total	2,502,532	1,651,120
LESS EXPENSES		
Research	1,271,908	916,632
Marketing & fundraising	494,397	402,965
Administration	282,729	158,964
Total	2,049,034	1,478,561
Net Surplus/(Deficiency)	453,498	172,559
Opening retained earnings	213,409	21,274
Closing retained earnings	666,907	1,93,833
Transfer (to)/from reserves	221,019	19,576
Retained earnings	887,926	213,409

MAJOR DONORS

Over $50,000

Sylvia & Charles Viertel Foundation

$20,000 - $49,000

Ainsworth, Mrs Margarete
Baulderstone Hornibrook
Breakfast Point Pty Ltd
JS Love Trust
Multiplex Constructions Pty Ltd
Paynter Dixon Constructions (Aust)
Smorgon Steel Group Ltd
St George Foundation Limited
Telstra Foundation
Westfield Contractors/Workers
Wollongong Lord Mayor's Light & Hope Appeal

$5,000 - $19,999

CFMEU NSW Branch
ABC Tissue Products Pty Ltd
AbiGroup Contractors Pty Limited
Adsteam Marine Limited
Andersen Foundation
Australand Holdings Ltd
AW Edwards Builders & Contractors
Barclay Mowlem Constructions
Baxter Charitable Foundation
Building Workers on Jacksons Landing Site
Catts, Prof Stan
Chubb Fire Australia
City Coast Credit Union
CPG Australia
Miners Wesfund
Deutsche Bank
General Cologne Re
Grace, Mr Bill
NSW Club Industry
Leighton Holdings Limited
Lundbeck Australia Pty Ltd
Macquarie Bank
Martin, Mr Ray
South Sydney Junior Rugby League Club Limited
Teer, Mr John
The Austral Brick Company Pty Ltd
Tony Bleasdale & Associates

$1,000 - $4,999

Anywhere Tower Cranes NSW Pty Ltd
Argyle Home Tech Pty Ltd
Australian Overhauls Group Pty Ltd
Barr, Justice Graham
Bomaderry Bowling Club Ltd
BT Financial Group
Calcono Pty Limited
Campbell, Mr Peter
Canberra Trademen's Union Club Inc.
Compbase Training Services Pty Ltd
Fischer, Ms Kate
Forde, Mr Liam
Harrison, Mr Ian
Henley, Mr Thomas
Holmes, Mr Malcolm
Ian Potter Foundation
Jacobs, Mr Nathan
JKB Constructions Pty Ltd
Jomasi,
Jucovic, Mr Thomas
KPMG
Linddales Pty Ltd
Littlewood, Mr Ross
Llubtish Cranes Pty Limited
Maher, Mr Peter
Maritime Union of Australia
Martin, Mr Richard
NSW Retired Teachers Association
NSW TAB
Pittwater RSL Club Limited
Planet Fix Pty Ltd
Polyseal Waterproofing Pty Limited
Rotary Club of Engadine
Rotary Club of Sydney Cove
Schizophrenia Fellowship of Wollongong
Shedden, Mr & Mrs Bryan & Fiona
St Marys Rugby League Club Limited
Swan, Mr Robert
Swan, Mrs Susan
The Bankshouse Mental Health Carers Support Group
Turk, Mr Peter
Tyco Electronics Networks Pty Ltd (Heyday Group)
Tyrrell's Vineyards Pty Ltd
Ward, Prof Philip
Warringah Formwork Pty Limited
Wella Australia
Wideform Constructions Pty Ltd
WT Partnership Aust P/L

$200-$999

5 Star Interactive
Adriatic Concrete Australia Pty Ltd
Arndell Formwork Pty Ltd
Asquith Rugby League Club
Aus Wide
Barton, Mr/Ms H A
Bricon
Bulgin, Mr Don
Burke, Mr Terry
Calligeris, Mr Emmanuel
Camden Valley Golf Resort
Canterbury-Bankstown League Club Limited
Carlton & United Breweries
City East Carpentry
Cleary Bros (Bombo) Pty Ltd
Conflict Management Australasia Pty Ltd
Connery, Mr Maxwell
Corinthian Doors - Workers
Courtly Reo Pty Ltd
Cronulla RSL Memorial Club Limited
Cummins, Mrs Margaret
Dapto Leagues Club
Data Monitoring Services
Davies, Mr David
Dee Why RSL Club Limited

Dewdney, Dr & Mrs John & Micheline
Dilectite, Mr Markus
Dowling, Ms Jennifer
Doyle, Ms Michelle
Dysart, Mr Michael
Eastaway Air Conditioning commercial Pty Ltd
Employees of Wollongong City Council
Falco Australia Pty Ltd
Farrar, Mr L
FB Buildings
Fenaf Pty Ltd
Ferguson, Mr John
Fryer, Dr Judith
George Taktak and Sons
Gluskie, Mrs S C
Graham, Mr Geoffrey
Greenham, Mr Geoffrey
Haines Bros Earthmoving & Drainage
Harris, Mr Anthony
Hawkesbury Race Club Limited
Healthy Buildings International
Hobson, Ms Barbara
Holmes A Court, Mr & Mrs C
Hornsby Ku-Ring-Gai Association Action for Mental Health.
Hume, Ms Denise
IGT Australia
Illawarra Leagues Club
IMB Banking and Financial Services
Infohealth
James, Mr Bruce
Johnson, Mr Peter
Julienne, Ms Stephanie
KL Products Pty Ltd
Konami Australia
Kone Elevators Pty Ltd
Kotzur, Mr & Mrs Earl & Barbara
Larum, Mr & Mrs T & J
Lavezzari, Mrs Carmela
Lee, Mr Jeff
Lewis, Mr & Mrs Bill & Shirley
Lidcombe Plastering Services
Lions Club of Kiama Inc
Lopes, Mrs Anne
Maritime Union of Australia
McCaffery, Ms Robyn
McFadden, Mrs Vickie
Melinda Group Pty Ltd
Minogue, Mr N
Naughton, Mr Terry
NSW Nurses Association
NSW Police Credit Union
Panthers Entertainment Group
Pendall, Mr Stanley
Pioneer Swap Club
Poole, Ms Joan
Poulos, Mr James
Powell, Mr Clive
Rathborne, Mr & Mrs Brian & Jill
Ristrom, N & M
Robberds, Mr Lionel
Roderick, Mr Neil
Rotary Club of Wollongong
Scott, Mr & Mrs Peter & Carol
Services Clubs Association
Sharpe, Mr Michael
Shepherd, Mr Tony
Smith, Mr Dick
Smith, W K
Sprigge, Mrs Janet
Steinberg, Mr Darren
Sutherland, Mrs Gillian
Sydney Labour & Engineering Pty Ltd
Sydney Plasterers and Painters Pty Ltd
Tabak
Taylor & Scott
The Ascot Club
Thomas, Mr Neil
Thorniley, Ms Joanne
Titley, Dr Keith
Tooheys - Lion Nathan
Tyco Australia Pty Ltd
University of Wollongong Library Staff
Vos, Ms Belinda
Walsos Pty Ltd
Wensley, Mr Philip
Willings, Mrs Margaret
Workers on Southern Cross Project

Neuroscience Institute of Schizophrenia and Allied Disorders

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Website: www.nisad.org.au