Winning over gambling

By Katynna Gill

Putting down a bet, having a flutter on the pokies or buying a lotto ticket are all accepted recreational activities in our culture. But gambling can get out of hand for some people costing them not only money, but their relationships, jobs and psychological well-being.

The federal government Productivity Commission in 1999 estimated 2.1% of Australian adults have gambling problems that lead to depression (50% of problem gamblers suffer from major depression), suicide (40% of problem gamblers report suicidal thoughts and 1.7% of Australian suicides are purported to be gambling-related), and substance abuse (30-40%).

Problem gambling is a serious issue, estimated to cost between $1.4 to $4.3 million per year in Australia due to related social costs such as health care, lost work time, increased crime, bankruptcies and financial hardships faced by families.

Scientists at the University of Sydney are investigating the most effective way to put a stop to problem gambling on electronic gaming machines, such as pokies, which are the most common form of game reported by gamblers in treatment. Electronic gaming machines account for 60% of government gambling revenue in Australia. Erroneous and irrational beliefs; a misunderstanding of randomness and probabilities are considered important factors in maintaining problem gambling.

Sally Monaghan, a PhD student in the School of Psychology, has been awarded a prestigious Sir Robert Menzies Memorial Research Scholarship for Allied Health Sciences for 2008-2010 to carry out research investigating how effective pop up messages are putting a stop to continuous gambling on electronic gaming machines.

“We’ve found that dynamic warning messages that scroll across the screen while people are gambling on electronic gaming machines have more of an impact on gamblers in terms of being remembered better than static warning messages,” said Sally.

“The NSW government have supported the introduction of dynamic pop up messages warning gamblers of the risks associated with gambling, but there needs to be more research into how best to deliver the messages and which content is most effective.”

With her supervisor Professor Alex Blaszczynski, the next step in her research, is to build on the success of their findings and evaluate the effect of pop up messages that contain information designed to reduce irrational beliefs, such as superstitions and illusions of control.

“It’s unclear whether problem gambling is due to irrational cognitions in the gambler, such as feeling they control the outcome of each game rather than recognising the randomness of chance events,” said Sally. “Current warning signs on pokies assume that irrational thoughts underlie continuous gambling, but there is evidence that this may not be the case. So our research will provide important data to clarify the conceptual model of problem gambling and how best to overcome it.

“We really want to work out what makes people continue to play on these machines despite their lives falling apart around them as a result of their gambling. Our first study with 127 regular electronic gaming machine users playing games in the laboratory, found that pop up messages are recalled significantly more than static messages. But more importantly, we found that the content of the messages is really important – messages that made the gambler realise how long they had been playing and how much money they’d spent had the biggest impact on their thoughts and behaviour.

“The effects of these self appraisal pop up messages were still significant two weeks later, compared to informative messages and unrelated messages used as a control. Our next step will be to take this study to a normal gambling venue, such as a pub, to see what effect the environment has on the effectiveness of the pop up message content.

“It’s really important research which we hope will not only help problem gamblers take control of their gambling, but also provide important psychological information on how this obsessive behaviour occurs,” concluded Sally.

The research is supported by the Australian Gaming Machines Manufacturers Association, as well as the NSW government. Sally will present the results of the research at the 8th Annual National Centre for Responsible Gaming Conference on Gambling and Addiction, held in Las Vegas, USA, in November 2007.
The first outreach activity of the Sydney node of the Australian Microscopy and Microanalysis Research Facility (AMMRF) was to take the Microscopes on the Move (MOTM) exhibition to Central Australia.

MOTM is an education initiative from the Australian Key Centre for Microscopy and Microanalysis (AKCMM) that began taking its travelling microscopy exhibit to schools in 2000. In that time it has travelled extensively in NSW and down through country Victoria and also into Queensland. In September 2007 Tony Romeo travelled to Alice Springs with the MOTM program. In doing so they broke new ground in microscopy outreach in Australia, with a JEOL T200 scanning electron microscope and a suite of light microscopes in tow.

The invitation came via a consortium of high schools in Alice Springs and neighbouring areas (one group travelled from Tennant creek – approx 400 km away) that had together successfully applied for Federal Government funding through the Australian School Innovation in Science, Technology and Mathematics (ASISTM) project. The aim was to bring “hands-on” science activities into these relatively isolated schools to help supplement the related theory in the school curriculum.

The process of organising the logistics for the visit revealed just how geographically isolated these communities actually are – the distances (and the terrain) to be covered are quite daunting and the funding required to make it all happen equally overwhelming.

But it’s a credit to the determination of the teachers, a desire to do what they could to make the visit happen – even when initial estimates indicated that the original funding allocated would need to be increased approximated three fold.

Despite initial concerns about whether the equipment would arrive on time and in good condition, the entire week was incident free. A total of seven classes a day were run in addition to a teacher professional development session and a four hour community night – all going without a hitch.

It was a wonderful teaching experience and the enthusiasm of the local science teachers was certainly contagious. There was a chance to socialise and get to know the teachers at a BBQ on the arrival evening as well as working with them through the course of the school visits and development sessions.

Around 1000 students and visitors attended the exhibit - from a broad range of science levels and interests and it was great to see the high percentage of indigenous children within the groups. Approximately 500 students received hands-on experience on the scanning electron microscope. Students were able to image specimens such as a fly, a plant leaf and radiolarians at much higher resolutions than they had ever seen before. The new visual world and the scientific relevance of the experience will hopefully remain with the students for a long time to come.
Modelling the missing half of the brain

By Bill Gibson and James Edwards

For most of last century, research into brain and nervous system function was centred on neurons and their ability to communicate via electrical signals that they both generate and detect. However, over the past decade this neuron-centric viewpoint has been broadened to include information processing involving other cell types, principally glial cells, that actually outnumber neurons in the brain.

Previously, these glial cells attracted only limited interest from experimentalists and theorists alike, as it was assumed they acted mainly as a support system for neurons, transporting nutrients and recycling neurotransmitter chemicals. (But it is interesting to note that an autopsy on Einstein's brain, performed in the early 1980's, showed no significant difference in number of neurons, but a statistically significant increase in the number of glial cells in a key area, suggesting a possibly more important role for these cells.)

A breakthrough occurred when experimentalists used modern imaging techniques to demonstrate that glial cells were both talking to each other and to neurons using chemical transmitters. By attaching fluorescent markers to calcium ions, they were able to observe increases in the calcium ion concentrations. These occurred in an orderly fashion and gave rise to a wave of current that passed from cell to cell. A chemical messenger, IP3, was found to pass between cells and propagate calcium release from stores inside cells. However, this is not the whole story, as demonstrated by experiments in which the calcium wave passed from cells on one side of a cell-free zone to those on the other side. This led to the conclusion that calcium release could be initiated by an agent that diffused in the space outside the cells, later shown to be ATP.

As part of an on-going collaboration with Professor Max Bennett and his group at the Brain and Mind Research Institute at the University of Sydney, a group in the School of Mathematics and Statistics (Associate Professor Bill Gibson, Senior Research Associate Les Farnell and research student James Edwards) have been involved in modelling interactions between glial cells and more recently between glial cells and neurons.

Most people are familiar with the images produced by functional Magnetic Resonance Imaging (fMRI). A person is placed with his head in a strong magnetic field and different areas of the brain are then shown as being more active that others when certain mental tasks are performed. But the imaging technique is actually picking up what is called the BOLD (Blood Oxygen Level Dependent) signal, which is a measure of changes in blood oxygenation in a region of the brain. It is still an open question as to what precise relation this bears to the level of neural activity, and in particular how the active neurons signal to the neighbouring blood vessels that they should dilate and thus provide more oxygenated blood. Recently, it has become clear that a certain type of glial cell, called an astrocyte because of its star-like appearance resulting from many spiky projections coming from the cell body, forms a vital link in this communication chain. Our group has developed a theoretical model that describes the linkage and predicts the observed blood flow changes and fMRI images resulting from increased neural activity.

The discovery that neurons and glial cells interact has raised many intriguing possibilities. The close association they form with the synaptic connection between neurons suggests they influence the strength of these connections, and hence memory storage. Glial cells also modulate the signals transmitted by retinal neurons, and hence help determine the images that are "seen" inside the brain. Other vital areas of brain function, linked to disorders such as migraines, neuropathic (persistent) pain, bipolar disorder and schizophrenia, have recently been associated with glial cells. Such discoveries have led one author to ask "Has science missed one half of the brain?" Now both experimental and theoretical work at the University of Sydney is helping to rectify this.

Keen & Green

The 34th Professor Harry Messel International Science School (ISS) - ecoscience - was held at the School of Physics within the University of Sydney in July 2007. 140 of the best and brightest Year 11 and 12 students from Australia, China, Japan, India, Malaysia, New Zealand, Singapore, Thailand, the UK and the USA attended the two week long school. With lecturers including Professor Michael Oppenheimer, Professor Lord Robert Winston, Dr Ian Lowe and Professor Fred Watson urging the ISS scholars to reach new heights in science, it was an inspiring time all round. The ISS 2007 - ecoscience - lectures were recorded, by visiting www.scienceschool.usyd.edu.au, you too can be inspired.

The Science Foundation for Physics runs the ISS established by Professor Harry Messel in 1962, biennially. The next ISS will take place early in July 2009. For more information visit www.physics.usyd.edu.au/foundation.
Cosmos' inaugural Bright Sparks award recognises Australia's top 10 scientific minds under the age of 40. This year, two out of 10 bright sparks were from the University of Sydney. Dr Andrew Harris from the Laboratory for Sustainable Technology, School of Chemical and Biomolecular Engineering and Professor Ben Eggleton, ARC Federation Fellow and Director of the ARC Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS) from the School of Physics.

Below is the profile of Professor Eggleton from the October/November issue of COSMOS:

Ben Eggleton's fascination with optical communications began when he was an undergraduate, using optical telescopes to peer into the early universe. "But rather than getting excited about astronomy, I got excited about the optical fibres that were used in the instruments," he explains.

It was an apt beginning to a stellar career. Eggleton is now director of the Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS), a consortium involving six Australian universities, with 100 researchers. It's here that he's working to develop a device that promises to increase the speed of the Internet a thousand-fold.

For most of its journey, data on the Internet hurtles along optical fibres at the speed of light. But every time it hits a router – a device that directs data to its intended destination – it has to be converted from light to electronic signals and back again, a slow and energy consuming process.

To remove these bottlenecks, Eggleton and his colleagues are developing a photonic chip, a thumbnail-sized device that uses light rather than electronic signals – thus cutting out the middle man in routing data.

Optical processing was the subject of Eggleton's doctorate, which drew international attention and saw the young researcher recruited to the prestigious Bell Laboratories in the USA, an institute with a long history of pioneering in communications.

At the end of 2002, he returned to the University of Sydney and founded CUDOS to develop the photonic chip. Since then, his team has made several crucial breakthroughs.

Last year they made headlines by slowing light to a fraction of its usual speed without changing the wave shape. This is significant because all-optical networks will need to be able to manage the speed of the light pulses without corrupting the information contained therein.

Eggleton predicts the photonic chip will see its first applications within five years. Beyond that, he thinks all-optical networks will revolutionise health, education and defence by offering faster, more energy-efficient communications systems.

For more information visit: http://www.physics.usyd.edu.au/cudos/
Warm up the car by idling
I've had a lot of fun teaching the Junior Members of my Family how to drive the Family Chariot. But along the way, I realised that something I had done for a long time was actually wrong. Previously, I tried to be “kind” to my car’s engine by giving it a nice long idle before I pulled away from the kerb. But when I went looking, I found that long idle was actually harming the engine, and the environment, and my wallet.

The powertrain of a car is the mechanical stuff that makes it go. The power starts at the engine, goes through the gearbox and finishes at the driving wheels. Les Ryder, the chief powertrain engineer from Ford, USA, said in the January 2007 issue of Popular Mechanics, “Engines run best at their design temperature”. In other words, Mr. Ryder is telling us that engines run most cleanly and efficiently somewhere between 85°C and 95°C. Idling is not the best or quickest way to warm up your engine. Gentle driving is.

The Canadian Office of Energy Efficiency agrees that the best way to warm up your engine is to drive it. Even if the outside temperature is -20°C, they recommend that you idle the engine for only 15-30 seconds before you pull out onto the road. You need even less idling time at the temperatures we usually experience in Australia.

Idling an engine is bad in so many ways. The fuel is not completely burnt, so it condenses in drops on the cylinder walls. This leads to both extra wear of the cylinder walls (because the fuel washes the lubricating oil off the walls), and unburnt fuel flowing down the walls and contaminating the oil in the sump. Idling also drops the temperature of the spark plugs, leading to dirty plugs, which can worsen your fuel consumption by some 5%.

You might have noticed a vapour coming out of the exhaust of some cars in the early morning. That vapour is not the oil vapour of a worn engine, but the normal water vapour from a cold engine. So the longer you idle the engine, the longer it will take to warm up, and so more water droplets will be deposited inside your exhaust system – making it rust sooner.

A long time of idling means that the engine will produce a lot more unwanted pollutants. For example, modern cars have catalytic converters. When they get to their normal operating temperature (400-800°C, which is a lot hotter than the engine), they convert nasty pollutants into much less nasty chemicals. And you guessed it, the quickest way for catalytic converters to get to their normal operating temperature is by driving, not idling. The longer the time that you idle your engine, the longer that your catalytic converter is too cold to do its job.

Canada has started a national campaign to reduce unnecessary idling of engines. There are similar regional campaigns in Japan and the UK, and in the USA, 13 states have now passed laws regulating idling of engines. The ski resort town of Aspen, in Colorado, has passed laws making it illegal for car engines to idle for more than 5 minutes.

People are now talking about the benefits of switching off your engine in traffic, if you are going to be stopped for more than 10 seconds. But this is exactly opposite to the Remote Start function, available in some US cars, which lets you start the engine from some 60 metres away. The advantage is that you walk out of your house into a nice warm car. The disadvantage is that in 10 minutes of idling, you burn about half-a-litre of fuel.

The Canadian Office of Energy Efficiency crunched the numbers for the hypothetical situation of each Canadian driver idling their engine for 5 minutes fewer each day. Over a year, that reduced idling would save Canadian drivers C$646 million, and stop 1.6 million tonnes of greenhouse gases from escaping into the atmosphere.

When you idle a car, you get zero miles per gallon, lots of pollution, and a hole in your wallet.

Dr Karl’s Shameless Self Promotion!
My new book ‘Please Explain’, published by Harper Collins, is out this month!

It’s available at all good book stores.
The psychology behind ostracism

By Katynna Gill

We’ve all been left out in a social situation at some point, and it can really hurt our feelings. Ostracism – the act of being excluded and ignored – has damaging psychological, behavioural and physiological consequences, but this phenomenon has only recently been the focus of empirical investigation.

Ostracism is a far reaching phenomenon, demonstrated by animals and young human children, as well as adults across cultures. It’s even made formal within institutions, for example, time out in classrooms and excommunication from churches.

Dr Lisa Zadro, from the University of Sydney’s School of Psychology, has been investigating how ostracism operates in the psychology of the targets (those left out) and sources (those doing the leaving out).

“It’s amazing that we’re only at the early stages of scientifically investigating how ostracism works, when it is such a powerful psychological phenomenon,” said Lisa. “Being ostracised can have a profound effect in a short time frame, affecting the four fundamental human psychological needs: belonging, control, self esteem and meaningful existence.”

Ostracism in the classroom

Understanding how children learn to fit in and make friends – avoiding ostracism – is one of the key areas of research for Lisa and Sydney University psychology researchers Dr Marc de Rosnay and Dr Caroline Hunt. Having received an Australian Research Council (ARC) grant starting in 2008 of $330 000, the team will be researching the psycho social underpinnings of children’s adaptation to school.

“We’re really excited about this new research into how children learn to fit in and make friends,” said Lisa. “The effects of ostracism can be particularly devastating for young children, so the results of this research will be really important for researchers, educators and clinicians.

“How children integrate socially in the classroom is important to analyse in a scientific way, helping us identify the factors that place children at risk of social exclusion. Early identification of these children at risk of ostracism will help us develop ways of overcoming these difficulties and making children ready for school.”

“As part of this research, we’re looking to recruit parents and young children to take part in our study,” said Lisa.

Unravelling ostracism

Unravelling how ostracism works in the real world and the laboratory has led to some interesting findings about the immediate and long term effects of ostracism.

“We conducted structured interviews with forty adults who had been ostracised in the real world, plus we received 120 letters from others who’d experienced ostracism,” Lisa explained. “From these, we found that the immediate effects included feelings of hurt, sadness and anger, plus physiological arousal and stress. These lead to lower levels of belongingness and self esteem, less perceived control over situations, and a lower perception of having a meaningful existence.

“After prolonged or repeated exposure to ostracism, psychological resources became depleted and needs became internalised, which led to feelings of alienation, learned helplessness, depression, worthlessness, and loss of purpose,” said Lisa. “We also found negative health effects of prolonged exposure to ostracism.”

Seeking to discover more about the effects on people who have been ostracised, Lisa and her team have conducted a series of lab based experiments to find out details such as how ostracism compares to other forms of conflict; whether ostracism leads to aggression; whether the identity of the source of ostracism matters; and whether ostracism leads to bad relationship choices.

“One of the neat experiments our colleagues at Macquarie conducted tested whether ostracism leads to aggression,” said Lisa. “They set up a scenario where three people in a waiting room play a ‘spontaneous’ ball game – one of them unaware of the experiment and the other two experimenters. The third person is cut out of the ball game suddenly, introducing ostracism.

“They wanted to see whether this spontaneous ostracism would lead to aggression, so they compared people who had experienced four different conditions: ostracism with an uncontrollable annoying noise; ostracism with a controllable annoying noise; inclusion with an uncontrollable annoying noise; and inclusion with a controllable annoying noise.

“Participants were then asked to pour out serves of very hot chilli sauce for another person ostensibly as part of another experiment, following on from their waiting room experience. The results were fascinating – the ostracised people who had experienced the uncontrollable noise had significantly different results from the others,” said Lisa. “They served out an average of 26 grams of hot chilli sauce, compared to 6 grams poured out by those who had been ostracised but could control the noise.

“It looks like ostracism can lead to aggressive behaviour when there are additional uncontrollable factors – very interesting results that impact the way in which we can develop coping strategies for those who experience ostracism in real life.”

Recently, Lisa and co-investigator Michelle Moulds, have received an ARC Discovery Grant of $200 000 to do just that – develop strategies to ameliorate the aversive effects of ostracism.