

Ph.B. Student Conference: 2013

24th October, 10:30am – 4:15pm

Time	Speaker	Title	Abstract
10:30am	Professor Kiaran Kirk	Keynote Presentation: A Career in Science	
11:00am	Rohana Prince	<i>Whose island is it anyway? Why China won't give up on the Diaoyu/Senkaku dispute</i>	Since the 1960s, the Diaoyu/Senkaku islands have been hotly disputed and desired territory. The discovery of major hydrocarbon deposits beneath the islands caused China and Japan to re-ignite the debate over the islands' ownership. Located in the East China Sea, the 5 islands (and 3 rocks), have immense strategic value as whoever controls the islands as sovereign territory can extend a 200 mile exclusive economic zone out from them. Despite the islands currently being under Japanese administration, the People's Republic of China (and indeed the Republic of China – Taiwan) hold that the islands are rightfully theirs. For the last 2 decades, the Chinese Communist Party have adamantly claimed the islands as sovereign Chinese territory, enflaming tensions with the Japanese while promoting nationalist fervour at home. This presentation will explore the reasons why China won't be giving up on the dispute any time soon, even though it appears they will never really get what they want.
11:20am	Han Ling Fam	<i>The role of macrophage in a model of Age-related Macular Degeneration</i>	Age-related macular degeneration (AMD) is a progressive degeneration of the human macula, the area on the retina which is concentrated with cones. It commonly affects people over 60 years of age and is the leading cause of severe visual impairment in the developed world and is responsible for one-third of non-correctable vision loss. It is the third highest cause of blindness worldwide, and the first in industrialised countries. To date, there is no effective treatment to this disease, hence research in this area, in particular pathogenesis of AMD, is crucial to the development of AMD treatment. A model of AMD, the light damage model is used to investigate the role of macrophage in the progression of AMD. Rats are exposed to bright continuous light to investigate the extent of damage caused and to analyse the presence and distribution of macrophages.
11:40am	Morning tea		
12:00pm	Karun Paul and Dale Drummond	<i>Semi-Classical Gravity and its Tests: Torsion Pendulums and Levitating Mirrors</i>	Recent efforts to unify general relativity with quantum mechanics have resulted in the birth of theories of incredible mathematical complexity and richness. However, these theories are experimentally unverifiable and there is no way of determining which, if any, are true descriptions of our universe. To proceed, one possible avenue of research is into semi-classical gravity, a theory which, while far from being fundamental, may prove to be an effective theory of dealing with quantum gravity. Most importantly, SCG has recently come into the fringes of testability allowing for the first experimental verification of a quantum gravitational theory in decades. The predictions made by the theory regard the power spectrum of harmonic oscillators and the proposed experimental relies on the operation of a very special oscillator: a levitating mirror.

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12:20pm	Chin Chin Gan	<i>Should Gravity be Quantized?</i>	The search for a new theory that describes the interaction between classical and quantum systems has been going on for the past fifty odd years with no clear consensus on the correct form of the theory. One of the main concerns in realising this new theory is the need to quantize gravity. This project examines the main arguments for and against quantizing gravity in this new theory by drawing a comparison between them and examining results from recent achievements whenever possible. While there is currently no conclusive empirical evidence to support either side of the argument, there are philosophical and practical reasons to believe either way. This project aims to arrive at an opinion on whether gravity should be quantized based on available arguments
12:40pm	Victor Wang	<i>Reproduction, Dispersal and the Founder Effect: How paths of migration carve out patterns of biodiversity</i>	There is an invisible thread connecting hedgehogs, bull kelp and the Amish. Almost conspiratorially, genetic analyses of vast numbers of species show certain unifying geographic trends globally. Investigations into well-documented events like post-glacial migrations, Out-Of-Africa and island biogeography reveal that distinct genetic patches of the same species can be maintained on very small spatial scales even with no fitness correlates. I speak of a pervasive founder effect, a “founder space race”, on massive spatial and temporal scales associated with waves of colonisation and extinction. Using a combination of case studies, simple computer models built with simpler mathematical rules, I aim to show how rates of dispersal and reproduction collude to win the genetic monopoly.
1:00pm	Lunch		
1:40pm	Amitesh Datta	<i>An Introduction to Algebraic Topology</i>	No Abstract
2:00pm	Jack Muir	<i>Probing the convection of stars using astroseismology</i>	The behaviour of convection in the outer layers of a star is one of the key concerns of stellar physics. As well as being an intrinsically worthy goal, accurate models of convective behaviour also directly impact our calculations of elemental abundances in stellar atmospheres, which in turn feed our knowledge of stellar evolution and possibly planetary formation. Our understanding of the convective behaviour of the sun is now well developed, and is facilitated by high quality measurements of the solar surface. However, for distant objects, many of these measurements are impossible due to the inability to spatially resolve the stellar surface. One possibility that exists for placing constraints on convective behaviour is the use of astroseismology --- that is, the vibrations of stars. All stars vibrate at characteristic frequencies, called eigenmodes. As it turns out, the majority of energy input into these modes takes place in the convective outer layer of stars. It is possible to measure the rate at which energy flows into the eigenmodes, and so by studying these excitation properties, we learn more about the behaviour of convection in the star. In this study, we use the high quality convective models of the StaggerGrid, coupled with the new stellar evolution software MESA and eigenmode calculation software GYRE to create synthetic mode excitation spectra for the sun and other stars.

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2:20pm	Louis Klee	<i>The Refugee: Contesting Human Rights, Sovereignty and the Nation-State</i>	<p>For almost a century now the refugee has, to use Hannah Arendt's words, formed the most "symptomatic group" of contemporary politics and the "vanguard" of politics to come. First emerging as a mass phenomenon in the aftermath of the First World War, there are now an estimated 45.2 million people who fit the definition of a potential political subject indefinitely and forcefully excluded from membership in a political community. The problematic status of the refugee invites us to rethink human rights discourse, sovereignty and the nation state. In particular, the refugee emerges as the site of the auto-deconstruction of sovereignty by opening the way to the impossible but necessary task of separating unconditionality and sovereignty. In this sense, the figure of the refugee creates the space for a politics to come, in which our political notions can be re-imagined in terms of the unconditional other that cannot be appropriated or foreclosed.</p>
2:40pm	Yale Wong	<i>Park and Ride in the ACT: A GIS-Based Investigation of Service Catchments</i>	<p>Canberra's network of 14 Park and Ride facilities form an integral part of the ACT Government's transport strategy. This investigation employs Geographic Information Systems (GIS) to evaluate the service catchments of these sites with reference to population distribution data obtained from the Australian Bureau of Statistics. A distance-based model is first developed to determine the population catchments within 1km and 2km on the road network from each facility. The results show significant lapses in coverage for vast areas of Canberra. A more sophisticated model is then built comparing the journey time from each household to the city by automobile and under Park and Ride. Three scenarios were investigated, each with various impedances on automobile travel. The findings from this show that Park and Ride in the ACT is not time competitive with automobile travel. It implies that current usage must be based upon other considerations, such as those measured by the Automobile Cost Deterrence Factor (ACDF) – a metric devised to quantify commuters' willingness to avoid automobile costs. This study offers valuable insights to direct future transport policy in the ACT, as well as contributing to the debate around the merits of Park and Ride programs around the world more broadly.</p>
3:00pm	Afternoon tea		
3:20pm	Vincent Aw	<i>Is Ubc9 expression restricted to specific tissues during murine embryogenesis?</i>	<p>SUMOylation is a post-translational modification central to a range of cellular and proliferative processes, including DNA replication and repair, regulation of Chromatin structure, chromosome segregation, nuclear integrity and transcriptional regulation. Moreover, SUMOylation has been implicated in regulating Wnt signalling and Zic transcription factor activity which are crucial particularly during early embryonic development. It is hypothesised that SUMOylation plays a critical role during embryogenesis. To test this, a riboprobe was synthesised for the E2 ligase of the SUMOylation pathway, Ubc9, and tested on murine embryos using whole mount in situ hybridisation. The murine Ubc9 expression shows strong,</p>

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3:40pm	Bostan Nurlanov	<i>Strange Loops and Semiotics</i>	<p>Hofstadter’s <i>I Am A Strange Loop</i> presents a speculative answer to the “hard problem” of consciousness based on this analogy: just as paradoxes can be created by self-referential propositions in complex systems like language (the liar’s paradox) and number theory (Godel’s Incompleteness Theorem), consciousness arises when complex enough organisms represent themselves – creating a feedback loop between themselves, and their idea of themselves, such that the idea can appear to be higher in hierarchy. This theory seems intuitively powerful but, in its current form, open to two damning criticisms: the ability to represent <i>anything</i> seems to presuppose something like qualia, and there is no mechanism provided for the loop occurring other than complexity. Using an adjusted version of Peirce’s early semiotic theory to reframe the loop, both these problems are solved – pre-loop qualia is explained away by the “meaning collapse” inevitable in short semiotic chains, and the strange loop becomes a semiotic loop between two or more aspects of the same sign (the sign being yourself). This leaves us with an interesting story about consciousness in which our loop’s most important attribute is not hierarchy confusion but its ability to preserve conceptual movement – turning “stills” of experience into a moving picture.</p>
4:00pm	Presentation of Awards		