

School of Physics, University of NSW

# Gordon Godfrey Workshop

## **Spins and Strong Correlations**

26 – 29 October 2009



## Gordon Hay Godfrey

### **Acting Head, School of Applied Physics 1951-1952**

Gordon Godfrey was born in Sydney in 1892, and studied at Fort Street High School and the University of Sydney. He took his BA with first class honours in 1914, and his MA with first class honours and the University Medal (the second ever awarded) in 1919. He graduated with his BSc in 1922.

Godfrey entered the NSW teaching service in 1916, and was an assistant master at both Sydney Boys High School and Parramatta High School. From 1921 he was head teacher of physics, and later lecturer-in-charge of the Department of Physics, at the Sydney Technical College. At the college he developed the new diploma course in optometry and then created the diploma course in physics. In 1951 he was appointed an Associate Professor of the NSW University of Technology (later renamed the University of New South Wales) - he was the first representative of theoretical physics at the University.

Professor Godfrey served as Acting Head of the School of Applied Physics during 1951 and 1952, until Professor Milner commenced his position as Head of School. Professor Godfrey remained Deputy Head of School until his retirement in 1958, and Professor Milner claimed "no Head of School could have had a more-loyal or more-helpful deputy." After his retirement, he continued to teach in the School of Physics until well into the 1970's. He held an appointment for a time as Honorary Visiting Professor at UNSW, and until his death that of Honorary Associate of the School of Physics.

Professor Godfrey was a highly engaged and sincere teacher during his entire working life - a career that spanned nearly 60 years. In recognition of his services to optometrical education he was made an Honorary Life Fellow of the Institute of Optometrists (NSW).

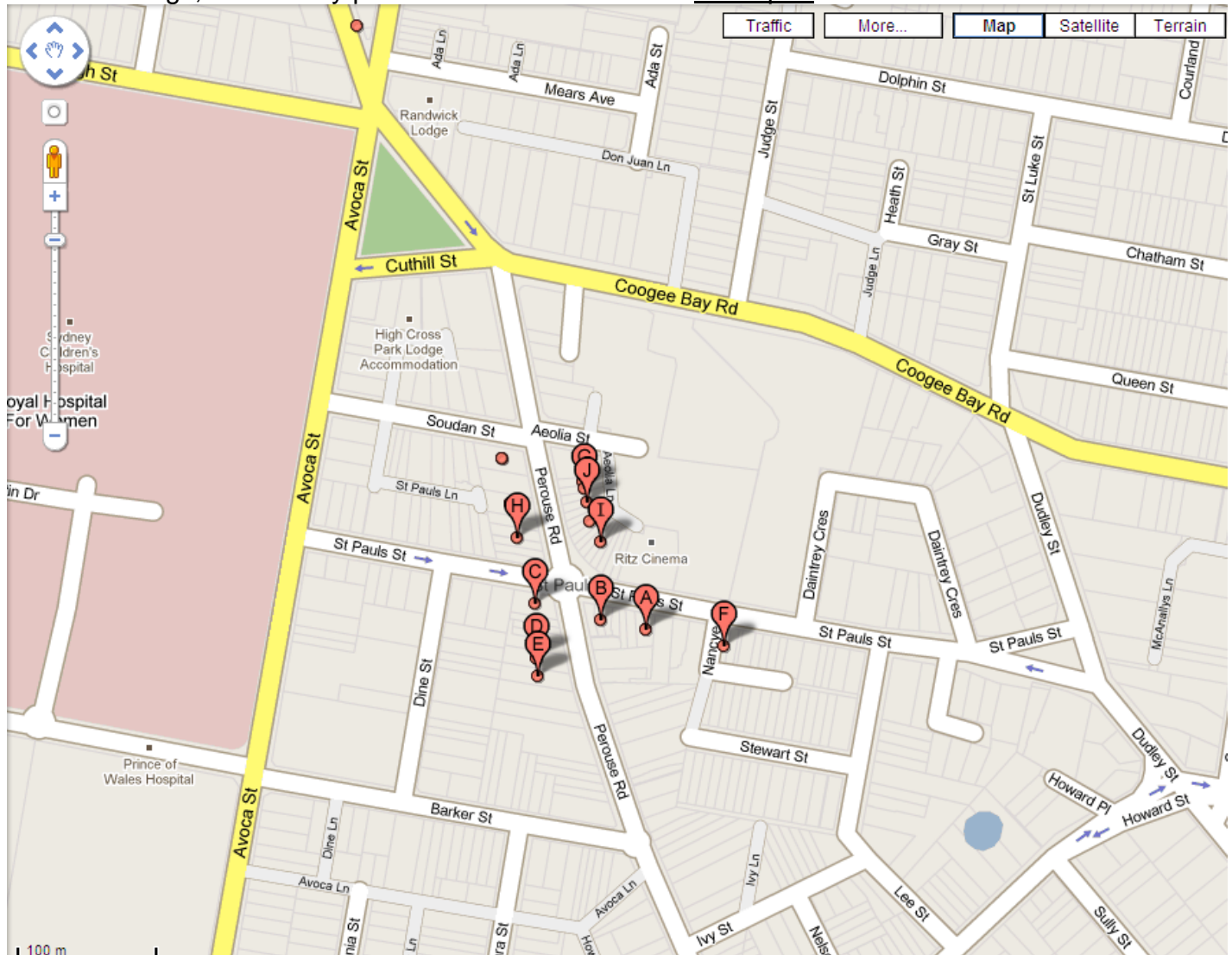
Gordon Godfrey also made several contributions in research. His MA thesis, written in 1919, was probably the first paper written in Australia on special relativity. He also published work on atmospheric radio propagation and on the reflectance characteristics of multilayer coatings. After his retirement he turned to a long standing research interest in the presentation of quantum mechanics, especially the uncertainty principle.

Following the death of Professor Gordon Godfrey in 1979, and his wife Mrs Mabel Godfrey in 1980, the Godfrey Bequest was established. This gift funds a number of initiatives supporting theoretical physics at UNSW, primarily by providing financial support to assist in the travel and accommodation expenses of academic visitors to the University, but also by funding undergraduate prizes, postgraduate scholarships, and a biannual workshop in theoretical physics.

## Eating and Drinking in and around the University

The campus has some cafes which do sandwiches and warm meals, as well as a small food court, which are marked on the campus map. Visitors are welcome to try different coffee outlets and rank them.

In the evenings, reasonably priced food can be found in The Spot:



## INTERNET ACCESS

During the workshop, wireless internet access is available in rooms 5, 8 and 64 – just down the corridor from the Physics Lecture Theater.

## DISCUSSION ROOMS

Tutorial rooms with whiteboards etc are available on the floor above the physics lecture theater.

# **PROGRAM of the 2009 Gordon Godfrey Workshop** **on Spins and Strong Correlations**

**MONDAY, 26th of October 2009**

**8.00 – 9.00** Registration

**9.00 – 9.30** Opening

Les Field, Deputy Vice-Chancellor Research, UNSW

## **Multiferroics**

**9.30 - 10.20** D. Khomskii, Cologne University  
Multiferroics and beyond.

**10.20 – 11.00** A. Mulders, Curtin University  
Charge Order and Orbital Glass State in Multiferroic  $\text{LuFe}_2\text{O}_4$

**11.00 – 11.30** Break

## **Nanowires**

**11.30 – 12.10** C. Jagadish, , Australian National University  
III-V compound semiconductor nanowires for optoelectronics applications

**12.10 – 12.50** H. Xu, Lund University  
Few-electron InSb Nanowire Quantum dots

**12.50 - 14.30** Lunch

## **1D strongly correlated systems**

**14.30 – 15.10** L. Glazman , Yale University  
Nonlinear Luttinger Liquids.

**15.10 – 15.50** T. Tohyama, Yukawa Institute, Kyoto University  
Dynamical DMRG Study of Frustrated and Electron-Phonon Coupled Systems

**15.50 – 16.20** Break

## **Quantum dots**

**16:20 – 17:00** M. Simmons, University of New South Wales  
Valley splitting in silicon based quantum dots

**17:00 – 17:40** A. Dzurak, University of New South Wales  
Spin qubits based on single donors in silicon

**17:40 – 18:20** D. Reilly, Sydney University  
Nuclear Spin Control with Single Electrons

**TUESDAY, 27th of October 2009**

**Quantum wires: Kondo or no Kondo**

**9.00 – 9.40** Y. Meir, Ben Gurion University  
Kondo physics in quantum point contacts

**9.40 – 10.20** A. Milstein, Budker Institute  
Correlated electron current in a QPC: 0.7 structure in conductance

**10.20 – 10.50** Break

**Quantum wires expt.**

**10.50 – 11.30** F. Sfigakis, University of Cambridge  
Zero-bias anomaly and Kondo in undoped quantum wires

**11.30 – 12.10** S. Fischer, Ruhr Universitat Bochum  
Novel observations of conductance enhancement in quantum point contacts

**12.10 – 12.50** Y. Komijani, ETH Zurich  
Spin Splitting and Correlations in p-GaAs Quantum Point Contacts

**12.50 - 14.30** Lunch

**Iron Pnictides**

**14.30 – 15.10** I. Eremin, Max Planck Institute for the Physics of Complex Systems, Dresden  
Metallic spin density wave in iron-based superconductors

**15.10 – 15.50** X. Wang, University of Wollongong  
REFeAsO and BaFe<sub>2</sub>As<sub>2</sub> based superconductors

**15.50 – 16.20** Break

**NMR, Titanates & Vanadates**

**16.20 – 17.00** J. Haase, University of Leipzig  
Inhomogeneities of charge and spin of the hole-doped cuprates from NMR

**17.00 – 17.40** C. Ulrich, University of New South Wales  
Spin and orbital excitations in Titanates and Vanadates

**17.40 – 18.20** N. Perkins, University of Wisconsin Madison  
Spin-orbital physics in frustrated vanadium oxides

**WEDNESDAY, 28th of October 2009**

**Mott insulator under doping**

**9.00 – 9.40** A. Chubukov, University of Wisconsin Madison  
Evolution of Fermi surface in underdoped cuprates

**9.40 – 10.20** W. Chen, University of New South Wales  
Disorder Effects on ARPES and NQR Spectra in Cuprates

**10.20 – 10.50** Break

**Mott-Hubbard, perturbative regime**

**10.50 – 11.30** R. McKenzie, University of Queensland  
Destruction of quasi-particles near the Mott-Hubbard MIT

**11.30 – 12.10** D. Manske, Max Planck Institute for Solid State Research, Stuttgart  
Electron-Phonon Coupling and Self-Energy Effects in  $\text{YBa}_2\text{Cu}_3\text{O}_7$ : kinks vs. d-wave pairing

**12.10 – 12.50** B. Powell, University of Queensland  
Unified explanation of the Kadowaki-Woods ratio

**12.50 – 14.30** Lunch

**Strongly correlated 2D systems**

**14.30 – 15.10** V. Pudalov, Lebedev Institute  
Metal-insulator transition in strongly correlated 2D electrons system

**15.10 – 15.50** D. Neilson, University of Camerino  
Dissipative processes in low density strongly interacting 2D electron systems

**18.30 – 20.30** Sydney Opera House Bar, Circular Quay  
Get together

**THURSDAY, 29th of October 2009**

**Graphene**

**9.00 – 9.40** J. Schmalian, Ames Laboratory / Iowa State University  
Graphene, a nearly perfect fluid

**9.40 – 10.20** C. Zhang, University of Wollongong  
Linear and nonlinear optical spectra of graphene and graphene nanoribbons

**10.20 – 10.50** M. Polini, Plasmons in helical Fermi liquids:  
from graphene to spin-orbit-coupled 2DEGs

**10.50 – 11.30** Break

**Quantum systems I**

**11.30 – 12.10** C. Hamer, University of New South Wales  
Spin-wave Approach to the spin-1 Heisenberg Magnet with Uniaxial Anisotropy in a Field

**12.10 – 12.50** M. Smith, University of Queensland  
Apparent Wiedemann-Franz violation near a quantum critical point in a heavy fermion metal

**12.50– 14.30** Lunch

**Spin in mesoscopics**

**14.30 - 15.10** U. Zuelicke, Massey University  
Spin-related quantum phases in hole rings

**15.10 – 15.50** M. Governale, Victoria University of Wellington  
Spin and charge pumping through interacting quantum dots

**15.50 – 16.30** O. Klochan, University of New South Wales  
Spin splitting in hole quantum wires

**16.30 – 17.00** Break

**Quantum systems II**

**17.00 – 17.40** C. Batista, Los Alamos National Laboratory  
Spontaneous quantum Hall effect in frustrated magnet

**17.40 – 18.20** A. Sandvik, Boston University  
Spinon deconfinement in near-critical quantum antiferromagnets

**18.20 - 18.30** Concluding remarks

## **PARTICIPANTS OF THE 2009 GORDON GODFREY WORKSHOP**

Bernhard Altvater, *University of New South Wales*

Maciej Bartkowiak, *ANSTO*

Cristian Batista, *Los Alamos National Laboratory*

Joel Bertinshaw, *University of New South Wales, ANSTO*

Ben Cassidy, *University of New South Wales*

Jason Chen, *University of New South Wales*

Wei Chen, *University of New South Wales*

Kyloon Chuah, *University of New South Wales*

Andrey Chubukov, *University of Wisconsin Madison*

Mukunda Das, *Australian National University*

Richard Davis, *University of Queensland*

Juan Dehollain, *University of New South Wales*

Andrew Dzurak, *University of New South Wales*

Klaus Ensslin, *ETH Zurich (tbc)*

Ilya Eremin, *Max Planck Institute for the Physics of Complex Systems, Dresden*

Chris Escott, *University of New South Wales*

Saskia Fischer, *Ruhr Universitat Bochum*

Sebastian Fricke, *University of New South Wales*

Leonid Glazman, *Yale University*

Michele Governale, *Victoria University of Wellington*

Juergen Haase, *University of Leipzig*

Chris Hamer, *University of New South Wales*

Alex Hamilton, *University of New South Wales*

Lap-hang Ho, *University of New South Wales*

Adam Holmes, *University of North Carolina*

Michael Holt, *University of New South Wales*

Jacky Hu, *University of New South Wales*

Chennupati Jagadish, *Australian National University*

Daniel Khomskii, *Cologne University*

Oleh Klochan, *University of New South Wales*

Yashar Komijani, *ETH Zurich*

Wee Lim, *University of New South Wales*

Nicholas Loh, *University of Western Australia*

Dirk Manske, *Max Planck Institute for Solid State Research, Stuttgart*

Ross McKenzie, *University of Queensland*

Yigal Meir, *Ben Gurion University*

Alexander Milstein, *Budker Institute*

Emma Mitchell, *CSIRO*

Andrea Morello,

*University of New South Wales*

Khalid Muhieddine, *University of New South Wales*

Anna Mulders, *Curtin University*

David Neilson, *University of Camerino*

Richard Newbury, *University of New South Wales*

Rashmi Nigam, *University of Wollongong*

Jaan Oitmaa, *University of New South Wales*

Natalia Perkins, *University of Wisconsin Madison*

Marco Polini, *Scuola Normale Superiore di Pisa*

Ben Powell, *University of Queensland*

Vladimir Pudalov, *Lebedev Institute*

Peter Reece, *University of New South Wales*

David Reilly, *Sydney University*

Onofre Rojas, *University of New South Wales*

Anders Sandvik, *Boston University*

Borislav Savkovic, *University of New South Wales*

Giordano Scappucci, *University of New South Wales*

Joerg Schmalian, *Ames Laboratory / Iowa State University*

Francois Sfigakis, *University of Cambridge*

Michelle Simmons, *University of New South Wales*

Michael Smith, *University of Queensland*

Oleg Sushkov, *University of New South Wales*

Kuan Yen Tan, *University of New South Wales*

Paul Tinashe, *University of New South Wales*

Takami Tohyama, *Yukawa Institute, Kyoto University*

Wendy Truong, *University of New South Wales*

Clemens Ulrich, *University of New South Wales*

Rashid, Umar, *University of New South Wales*

Xiaolin Wang, *University of Wollongong*

Andreas Wieck, *Ruhr Universität Bochum*

Lauren Willems van Beveren, Lauren, *University of New South Wales*

Nicholas Wong, *University of New South Wales*

Tony Wright, *University of Wollongong*

Hongqi Xu, *Lund University*

Rui Xu, *University of New South Wales*

Jianliang Jack Yang, *University of New South Wales*

Lareine Yeoh, *University of New South Wales*

Mona Yethiraj, *ANSTO*

Chao Zhang, *University of Wollongong*

Ulrich Zuelicke, *Massey University*

Floris Zwanenburg, *University of New South Wales*

# Drinks at the Opera Bar, 28<sup>th</sup> of October, 6.30pm – 8.30pm

Location: Lower Concourse Level, Sydney Opera House, Circular Quay. Tel:02 9247 1666,



## LOCATION & MAP

Opera Bar is nestled on the water's edge between two of the world's most famous icons - the Sydney Opera House and the Sydney Harbour Bridge.

Head for the Sydney Opera House and make your way down toward the water (via the escalators or stairs) to the Lower Concourse Level. Opera Bar is a 3 minute walk from Circular Quay train station and ferry terminal. Buses and taxis are easily accessed on Macquarie Street.

Parking is available at the Sydney Opera House carpark. 02 9247 7599 or [www.wilsonparking.com.au](http://www.wilsonparking.com.au)



Mobile Phone contacts: 0421273772 (Oleg) / 0434565595 (Alex)

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## SYDNEY: magic entertainment.

**Explore, discover and enjoy the best places in Sydney.**

### **Walk from Coogee Beach to Bondi Beach**

Directions: Coogee is the closest beach to University of NSW (25 minutes). The main Coogee Bay Road runs directly to the beach.

Magic moment: The coastal walk north from Coogee Beach to Gordon Bay, Clovelly, and on to Bronte beach, Tamarama and Bondi beach. Walking time is around 3 hours.

### **Opera House and Royal Botanic Gardens**

Directions: You can walk to the Opera House from the east side of Circular Quay. Buses 392, 394, 396, 397 go from UNSW. The Royal Botanic Gardens lies to the east of the Opera House. The park is free, open daily, 7 am – sunset.

Magic moment: Enjoy a view at Mrs Macquarie's Point with the panorama of the city, harbour, Opera House and Harbour Bridge. The Royal Botanic Gardens is one of the treasures of Sydney. The collection of plants and trees is extraordinary. Visit the Rose Garden, Herb Garden, Rare and Threatened Plants, Oriental Garden, Tropical Centre.

### **Aquarium and Darling Harbour**

Directions: Darling Harbour is just to the west of the city centre, 15 mins walk. You can walk there from Market Street or George Street across Pyrmont Bridge or ferry service from Circular Quay.

Magic moment: The collection of major attractions: Sydney Aquarium, National Maritime Museum, Powerhouse Museum, Darling Walk, Harbourside Shopping Centre, Star City Casino, Chinese Garden and Cockle Bay Wharf.

### **The Rocks, Harbour Bridge & Observatory Hill**

Directions: The Rocks lies on the western side of Circular Quay. It is easy walking distance from the city centre as well. The best approach is on foot via George Street.

Magic moment: Strolling along the boardwalk at Campbells Cove with its panorama of historic buildings, Harbour Bridge, Opera House and Harbour.

### **Taronga Zoo**

Directions: Taronga Zoo is in Mosman, best reached by a delightful 12-minute ferry ride from Wharf at Circular Quay. The Zoo is open daily, 9am – 5pm. Sydney Ferries offers a Zoo pass which includes the ferry ride and zoo admission.

Magic moment: Having your picture taken next to kangaroos and a koala.

### **Art Gallery of NSW**

Directions: The Art Gallery of NSW is on Art Gallery Road, The Domain. It is a pleasant 15-minute walk from the city centre or Circular Quay. The gallery is open daily, 10am-5pm, entry free. There are daily tours and special exhibitions. Late closing every Wednesday: 9pm.

Magic moment: Viewing the wonderful collection of 19<sup>th</sup> and 20<sup>th</sup> century Australian art. The collection of Aboriginal paintings is a must see. The Domain is ideal for a relaxing walk.

## **Circular Quay & Parramatta river cruise**

Directions: Circular Quay is the main hub for harbour ferries and a centre for buses and trains. It is pleasant walking distance from Circular Quay to the Opera House, The Rocks and city centre.

Magic moment: Take Parramatta river cruise and enjoy sitting on the back of a ferry. Day or night, the view is sensational. The ferry is regular and pulls out of Circular Quay from 6.55am till 6.15pm. Travelling time is 2 hours.

## **Manly beach and Manly walks**

Directions: Manly is 30 mins by ferry from Circular Quay. The ferry runs regularly, 6.00am – 9.30 pm. There are several scenic walks in Manly.

Magic moment: It is a classic Sydney experience. Walk along Marine Parade to Fairy Bower and Shelly Beach from the southern end of Manly Beach (45 mins to the top scenic lookout).

Also you can do the Manly to Spit walk or part of it. The entire walk is 10 km long and takes three to four hours one way.

## **Centrepont, Queen Victoria Building & Hyde Park**

Directions: Centrepont, Queen Victoria Building & Hyde Park located in the centre of the city.

Magic moment: Take in the panoramic views of Sydney from the Observation level of the tower (250 metres above the city). The tower is open daily, 9.00am – 10.30 pm.

Shopping hours of the Queen Victoria Building is 9am – 6pm (Sunday 11am-5pm). You must see the Great Australian Clock in the northern end of the building, the world's largest animated clock, with 100 scenes of Australian history. Hyde Park offers a calm and peaceful walk around fig trees.

## **Centennial Park**

Directions: Walking distance from UNSW to Centennial Park is 20 mins.

Magic moment: Find a wide variety of activities in Centennial Park: birds, cycling, gardens, picnicking, natural ponds, jogging, running.

## **Watson Bay & South Head**

Directions: Watson Bay lies on South Head. Buses 324 and 325 operate from Circular Quay.

Magic moment: The beautiful walk from Camp Cove past Lady Jane Beach to Hornby Lighthouse at South Head. Walking time is around 2 hours. Enjoy a long lunch at Doyle's seafood restaurant on the Beach at Watson Bay.

## **Nielsen Park**

Directions: Nielsen Park lies on the harbour side of South Head, beyond Rose Bay. Bus 325 goes from Circular Quay.

Magic moment: This is one of the best parks and it offers beautiful foreshore walks, panoramic view of the harbour and a pleasant beach. Relax on Shark Beach with its delightful views of the harbour.

