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Part Proceedings of the Tenth International Meeting on

Hole Burning, Single Molecule and Related Spectroscopies: Science and Applications

Held in Palm Cove, Queensland, Australia
22 – 27 June 2009

HBSM 2009

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Preface

The 10th International Conference on Hole Burning, Single Molecule and Related Spectroscopies: Science and Applications (HBSM) was held in the resort village of Palm Cove in North Queensland, Australia, adjacent to the Great Barrier Reef from June 22 to 27, 2009. The Conference was Chaired by Neil Manson from the Laser Physics Centre, Research School of Physics and Engineering, The Australian National University.

The HBSM conference series has its origins in a meeting that took place in Tallinn, Estonia in 1987 although there was interest in the field before this and other meetings on the topic. The investigations are largely associated with zero-phonon lines in solids and spectral hole burning of these lines was discovered in the 1970's. This can occur where there is an inhomogeneous distribution of transition frequencies in the solid and the hole burning phenomenon provides the opportunity to explore materials at a resolution that is orders of magnitude beyond that imposed by the limit of the inhomogeneous broadening. A very wide range of materials, from vey inorganic to very biological, can be investigated by hole burning spectroscopy. Consequently, the conference series has brought together physicists, chemists and life scientists for whom hole burning has provided a new tool for exploring the relevant statics and dynamics of optical transitions in solids. However, the ultimate limit in resolution is not imposed by hole burning but rather by detecting single centres. Thus single 'molecule' spectroscopy has become an important part of the conference series since 1991. New spectroscopic techniques continue to be developed by researchers involved with the hole burning and single molecule field and this aspect was alive and well in the present conference, for example, with discussion of resolutions below the wavelength limit. In addition to the ability to probe materials at the fundamental level there are also numerous applications. Narrow spectral lines equate to long coherence times and using coherent techniques for signal processing and memory storage has been a theme since the first HBSM conference. It is now a mature field with capabilities of optically processing signals and optically based spectrum analysers. The long coherence time materials are exactly those suitable for the now topical area of quantum information processing and the hole-burning community has been somewhat "high-jacked" by this new emphasis. Thus it is not surprising that members of the HBSM community are playing a leading role in demonstrating the strengths of solid state materials in this new field. Applications to biological systems is another area in which hole-burning and single molecule spectroscopy continue to flourish.

The conference has been held all over the world; Europe, North America, Asia and now Australia. The more recent meetings have been in Japan, USA (Minnesota) , France, Taiwan, USA (Montana) and the last one was back in France. The present one was the first in the Southern Hemisphere and held in the middle of the its winter. It took part in Queensland, (northern state of Australia) where the saying is "beautiful one day, perfect the next" and we note here that not only the weather lived up to this expression.

There were 65 participants from 15 countries. The conference program had 54 talks and 50 posters. Talks were given by a wide range of speakers, from experienced academics to PhD students, and all were of high standard with active discussions afterwards. There was certainly no sign that the HBSM conference series had run its course.

A tragic and sad event overshadowed HBSM 2009: Only 3 weeks before HBSM2009 we lost two of our colleagues, Olivier Guillot-Noël (l'Ecole Nationale Supérieure de Chimie de Paris) and Ivan Lorgeré (Laboratoire Aimé Cotton, University Paris-Sud). Ivan was Co-Chairman for HBSM 2006. They both had submitted papers to this conference and the abstracts of these were included in the conference program. At the conference a tribute was paid to Olivier and Ivan and in addition there was an oral session on the topic of their recent passion of rare earth ions for quantum information processing. Also a Special Issue of the Journal of Luminescence will be dedicated to Olivier and Ivan

The conference proceedings will be published in two parts; an issue of Physics Procedia and in the Special Issue of the Journal of Luminescence.

The next HBSM will be in Germany hosted by Alfred Meixner's group at the University of Tubingen. There is an understanding with DPC (Dynamical Processes in Excited States of Solids) and

the International Luminescence Conference that these conferences will be held in consecutive years and so it is expected that the next HBSM will be held in the summer of 2012.

The present conference received support in various forms from universities around Australia, including Macquarie University, University of Melbourne, University of Queensland, University of New South Wales at ADFA and the Australian National University. There was also significant support from the Australian Research Council Networks: ARC Nanotechnology Network and Australian Research Network for Advanced Materials. We are grateful to the International Advisory Committee and to all members of the Local Committee for their input.

The conference was also more memorable as a consequence of "extra curricular activities" such as banquets on the golf course, a trip on Old Steam Train and rides over the rainforest, thanks to the excellent organisation by Vicki Woodburn and her six-month old helper. We were all thrilled when Tjapukai (Aboriginal Cultural Park) had us dancing in the streets to send the conference out in style. Afterwards we all had the task of returning home to work off weight gain.

Hans Riesen
Matt Sellars
Neil Manson

Guest editors