



The Australian and New Zealand  
Magnetic Resonance Society

**2015 CONFERENCE**

29 November – 3 December 2015 • Copthorne Hotel and Resort • Bay of Islands • New Zealand

## Tuesday 1 December 2015

|               |                                                                               |                                                                                                                                                                                  |                       |
|---------------|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| 08.30 – 17.30 | <b>Registration Desk Open</b>                                                 |                                                                                                                                                                                  | Treaty Room Foyer     |
| 09.00 – 10.30 | <b>Imaging in Physiology, Psychology and Medicine I – Chair: Caroline Rae</b> |                                                                                                                                                                                  | Treaty Room           |
|               | 09.00 – 09.30                                                                 | I-07: TOWARDS AN UNDERSTANDING OF RADIATION NECROSIS AND ITS TREATMENT: LESSONS FROM A PRECLINICAL MODEL<br><b>Joel Garbow</b>                                                   |                       |
|               | 09.30 – 09.45                                                                 | O-16: LIVER STIFFNESS IN PEDIATRIC SUBJECTS IS LOWER THAN IN ADULTS, AND INCREASES WITH AGE: A MULTIFREQUENCY MR ELASTOGRAPHY STUDY<br><b>Lynne Bilston</b>                      |                       |
|               | 09.45 – 10.00                                                                 | O-17: FAST UNWRAPPING USING DISCRETE GRADIENT EVALUATION (FUDGE): ANALYTICAL CORRECTION TO THE LAPLACIAN-BASED PHASE UNWRAPPING TECHNIQUE<br><b>Amanda Ng</b>                    |                       |
|               | 10.00 – 10.15                                                                 | O-18: EFFICIENT NUMERICAL INTEGRATION OF THE BLOCH EQUATIONS WITH OFF-RESONANCES<br><b>Leigh Johnston</b>                                                                        |                       |
|               | 10.15 – 10.30                                                                 | O-19: DEVELOPMENT AND CHARACTERISATION OF ADVANCED MRI CONTRAST AGENTS<br><b>Bill Price</b>                                                                                      |                       |
| 10.30 – 11.00 | <b>Morning Tea</b>                                                            |                                                                                                                                                                                  | Waitaha Events Centre |
| 11.00 – 12.15 | <b>Solids, Membranes and Complexes – Chair: Daniel Gunzelmann</b>             |                                                                                                                                                                                  | Treaty Room           |
|               | 11.00 – 11.30                                                                 | I-08: A MULTINUCLEAR SOLID STATE NMR AND GIPAW DFT APPROACH TOWARDS THE EVALUATION OF THE PROPOSED STRUCTURAL MOTIFS OF VATERITE<br><b>John Hanna</b>                            |                       |
|               | 11.30 – 11.45                                                                 | O-20: PROTEIN STRUCTURE AND LIPID INTERACTIONS IN INFLUENZA BUDDING STUDIED BY SOLUTION-STATE NMR<br><b>Jolyon Claridge</b>                                                      |                       |
|               | 11.45 – 12.00                                                                 | O-21: WHAT CAN SSNMR TELL US ABOUT THE STRUCTURE, ASSEMBLY AND INTERACTIONS OF A FUNCTIONAL AMYLOID FROM FUNGI?<br><b>Ann Kwan</b>                                               |                       |
|               | 12.00 – 12.15                                                                 | O-22: CALCULATION OF $^{17}\text{O}$ NMR SHIFTS OF POLYOXOMETALATES<br><b>C. André Ohlin</b>                                                                                     |                       |
| 12.15 – 13.30 | <b>Lunch (NNNA Meeting at 12.45)</b>                                          |                                                                                                                                                                                  | Waitaha Events Centre |
| 13.30 – 15.00 | <b>Natural and Novel Materials – Chair: Steffen Merz</b>                      |                                                                                                                                                                                  | Treaty Room           |
|               | 13.30 – 14.00                                                                 | I-09: SURPRISING STRUCTURAL DETAIL AND BIOLOGICAL INSIGHT FROM NMR OF COMPLEX NATURAL POLYMER MIXTURES (PLANT CELL WALLS)<br><b>John Ralph</b>                                   |                       |
|               | 14.00 – 14.15                                                                 | O-23: IN SITU MRI OF SOLID STATE ELECTROLYTES BASED ON IONIC PLASTIC CRYSTALS<br><b>Konstantin Romanenko</b>                                                                     |                       |
|               | 14.15 – 14.30                                                                 | O-24: MAGNETIC RESONANCE ROCK CORE ANALYSIS AT RESERVOIR-LIKE CONDITIONS<br><b>Huabin Liu</b>                                                                                    |                       |
|               | 14.30 – 14.45                                                                 | O-25: ELUCIDATION OF THE CHEMICAL AND MORPHOLOGICAL STRUCTURE OF DOUBLE NETWORK (DN) HYDROGELS BY HIGH RESOLUTION MAGIC ANGLE SPINNING (HRMAS) NMR<br><b>Pavletta Shestakova</b> |                       |
|               | 14.45 – 15.00                                                                 | O-26: MOLECULAR STRUCTURE OF CONDENSED CARBON MATERIALS<br><b>Aditya Rawal</b>                                                                                                   |                       |

## **Elucidation of the Chemical and Morphological Structure of Double Network (DN) Hydrogels by High Resolution Magic Angle Spinning (HRMAS) NMR**

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Polymeric hydrogels are materials with high swelling capacity in water, and with promising potentials to advanced pharmaceutical applications (gastric retention, controlled drug delivery) as well as in the field of tissue engineering and regenerative medicine (as scaffolds, tissue culture media). The main drawback of hydrogels is their poor to medium mechanical performance limiting their even wider practical applications. Exceptions are the Double Network (DN) hydrogels displaying extremely high toughness and remarkable mechanical properties.

In our study HRMAS NMR was applied to gain insight at molecular level into the structure of DN hydrogels prepared from poly(2-acrylamido-2-methyl-1-propanesulfonic acid) (PAMPS) and poly(acrylamide) (PAAm), with different ratios of the two polymers, using N,N'-methylene *bis*(acrylamide) (MBAA) as a cross-linker. Diffusion filtered <sup>1</sup>H spectra, <sup>2</sup>H, <sup>13</sup>C, HSQC and ROESY spectra were used to investigate the influence of chemical composition on structure and dynamic properties of the DN. The analysis of the HRMAS NMR data of PAMPS/PAAm hydrogels prepared with increasing AAm concentration shows the formation of covalent bonds between the two polymer networks through the non-reacted double bonds of the cross-linker MBAA. Evidence to the existence of strong hydrogen bond network between the side chain fragments based on N-H group of the PAMPS as hydrogen bond donor and C=O group of the PAAm as hydrogen acceptor is provided by characteristic ROESY cross-peaks. These findings contribute to clarify important questions about the molecular origin and interactions responsible for the exceptional mechanical properties of the DN hydrogels.

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## ***Certificate of Attendance***

**THE AUSTRALIAN AND NEW ZEALAND MAGNETIC  
RESONANCE SOCIETY 2015**

**29 November - 3 December 2015**

***Professor Pavletta Shestakova***

**The above individual has attended the Australian and New Zealand Magnetic Resonance Society Conference which was held at the the Copthorne Resort Bay of Islands in New Zealand. The conference programme ran from Sunday 29th to Thursday 3rd December 2015.**

**Signature of ANZMAG 2015 Conference Chair:**

Petrik Galvosas  
Victoria University of Wellington

Date: 3<sup>rd</sup> December