

CONTACT

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EDUCATION

**Victoria University of Wellington**, Wellington, NZ  
 PhD, School of Chemical and Physical Sciences, March 2009  
*Topic:* Electronic structure of the rare earth nitrides  
*Advisor:* Dr. Ben Ruck  
 BSc (HONS), Physics, November 2005

PROFESSIONAL  
EXPERIENCE

**Experimental condensed matter physics**

I have experience growing nitride thin films using thermal evaporation and pulsed laser deposition; with ultra-high vacuum systems and cryogenics down to liquid helium temperatures; and with the following characterization techniques:

Structural - x-ray diffraction and reflection high energy electron diffraction  
 Magnetization - SQUID magnetometry and magneto-resistance  
 Optical - transmission, reflectance and ellipsometry  
 Transport - high- and low-impedance temperature dependent measurements

**Theoretical condensed matter physics**

I have twice visited Professor Walter Lambrecht at Case Western Reserve University in Cleveland, Ohio. There I used advanced density functional theory **frameworks**, based around the LSDA+U method, to investigate the electronic structure of magnetic semiconducting nitrides.

I have experience with the calculation of atomic energy levels and multiplet spectra of transition metal and rare earth atoms using **Hartree-Fock codes**.

**Synchrotron based experiments**

I have extensive experience with experiments using soft x-ray synchrotron radiation on beamlines X1B and U4B at the National Synchrotron Light Source at Brookhaven National Laboratory in NY, and on beamline 5II at Maxlab in Uppsala, Sweden. In particular I have used the following techniques to probe the electronic structure of novel semiconducting materials:

NEXAFS - near-edge x-ray absorption fine structure  
 RIXS/RXES - resonant inelastic x-ray spectroscopy  
 XPS - x-ray photoemission spectroscopy  
 XMCD - x-ray magnetic circular dichroism

**Communication**

I have presented my work at many conferences. Highlights are two talks at the American Physical Society March meeting in 2007, a talk at the Materials Research Society (MRS) Fall meeting in November 2007, and a talk at the MRS Australia meeting in July 2008.

PUBLICATIONS

6. C. Meyer, B. J. Ruck, J. Zhong, S. Granville, **A. R. H. Preston**, G. V. M. Williams, H. J. Trodahl  
*Near-zero moment ferromagnetism in the semiconductor SmN*  
 Phys. Rev. B **78**, 174406 (2008)

7. **A. R. H. Preston**, B. J. Ruck, L. F. J. Piper, A. DeMasi, K. E. Smith, A. Schleife, F. Fuchs, F. Bechstedt, J. Chai, and S. M. Durbin  
*Band structure of ZnO from resonant x-ray emission spectroscopy*  
Phys. Rev. B **78**, 155114 (2008)
5. H. J. Trodahl, **A. R. H. Preston**, J. Zhong, B. J. Ruck, N. M. Strickland, C. Mitra, W. R. L. Lambrecht  
*Ferromagnetic redshift of the optical gap in GdN*  
Phys. Rev. B **76**, 085211 (2007)
4. **A. R. H. Preston**, S. Granville, D. H. Housden, B. Ludbrook, B. J. Ruck, H. J. Trodahl, A. Bittar, G. V. M. Williams, J. E. Downes, A. DeMasi, Y. Zhang, K. E. Smith, W. R. L. Lambrecht  
*Comparison between experiment and calculated band structures for DyN and SmN*  
Phys. Rev. B **76**, 245120 (2007)
3. A. Koo, F. Budde, B. J. Ruck, H. J. Trodahl, A. Bittar, **A. R. H. Preston**  
*Photocurrent diffusion length in disordered GaN*  
J. Mater. Sci.: Mater. Electron. **18**, 107 (2007)
2. S. Granville, B. J. Ruck, F. Budde, A. Koo, D. J. Pringle, F. Kuchler, **A. R. H. Preston**, D. H. Housden, N. Lund, A. Bittar, G. V. M. Williams, H. J. Trodahl  
*Semiconducting ground state of GdN thin films*  
Phys. Rev. B **73**, 235335 (2006)
1. A. Koo, F. Budde, B. J. Ruck, H. J. Trodahl, A. Bittar, **A. R. H. Preston**, A. Zeinert  
*Photoconductivity in nanocrystalline GaN and amorphous GaON*  
J. Appl. Phys. **99**, 034312 (2006)

## REFEREES

**Dr. Ben Ruck** ([ben.ruck@vuw.ac.nz](mailto:ben.ruck@vuw.ac.nz))

*PhD supervisor*

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