Euan Neirin Bassey

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EDUCATION AND ACADEMIC QUALIFICATIONS:

February 2025 – Present: Post-Doctoral Researcher, Centre de Résonance Magnétique Nucléaire à Très Hauts Champs, Lyon, France

- Affiliated with the research groups of Profs. Andrew Pell and Guido Pintacuda
- Research projects focussing on the development of novel experimental and theoretical methods for the acquisition and assignment of nuclear magnetic resonance (NMR) spectroscopy

November 2022 – January 2025: Post-Doctoral Researcher, University of California, Santa Barbara, United States of America

- Affiliated with the research groups of Profs. Anton Van der Ven and Raphaële Clément
- Research projects focussing on theoretical and experimental characterisation of Li- and Na-ion battery cathodes using magnetometry, NMR and electron paramagnetic resonance (EPR) spectroscopies, primarily using *operando* techniques, as well as development of new statistical mechanics cluster expansion techniques for the prediction of materials' magnetic properties
- Assisted with development of CASM software
- Collaborations with multiple institutions (nationally and internationally) to prepare samples for and carry out diffraction, NMR and EPR measurements; collaborators include:
    - Diamond Light Source, Oxford, UK
    - Institut Laue-Langevin, Grenoble, France
    - MAGLAB, Tallahassee, United States of America

July 2022 – November 2022: Post-Doctoral Research Associate, University of Cambridge

- Affiliated with the research group of Prof. Dame Clare Grey and Faraday Institution NEXGENNA team
- Research projects focussing on experimental and theoretical studies of Na-ion cathode materials, focussing on magnetic resonance techniques: NMR, EPR and magnetic property measurements

October 2018 – June 2022: Undergraduate Supervisor, University of Cambridge

- Taught small groups of undergraduates in the form of classes supplementary to lectures, and in laboratory classes

October 2018 – July 2022: PhD in Chemistry, University of Cambridge

- Research projects as part of research group of Prof. Dame Clare Grey focussing on experimental and theoretical studies of high-capacity cathode materials for lithium- and sodium-ion batteries, focussing on NMR and EPR

- Collaborations with several institutions (nationally and internationally) to prepare samples for and carry out NMR and EPR measurements; collaborators include:
    - Department of Physics, University of Cambridge, UK
    - Materials Department, Imperial College London, UK
    - School of Chemistry, University of Nottingham, UK
    - School of Chemistry, University of St Andrews, UK
    - Diamond Light Source, Oxford, UK
    - ISIS Pulsed Neutron and Muon Source, Oxford, UK
    - Centre de RMN à Très Hauts Champs, Ecole Normale Supérieure de Lyon, France
    - Laboratoire National des Champs Magnétiques Intenses, Grenoble, France
    - School of Earth and Environmental Sciences, Seoul National University, Korea
    - Materials Department, UC Santa Barbara, United States
- Independent laboratory skills developed
- Theoretical techniques learnt: hybrid density functional theory calculations of battery electrode materials
- Scientific communication skills developed through writing research articles and presenting at conferences and to research groups

October 2017 – October 2018: MSci in Natural Sciences, University of Cambridge

- Specialised in physical and inorganic chemistry
- Class I (rank: 5/60)
- Research project carried out as part of the Grey Group
    - Synthesis and physical characterisation of two-dimensional magnetic materials
    - Independent laboratory skills learnt

October 2014 – June 2017: BA (Hons.) Natural Sciences, University of Cambridge

- Specialised in chemistry
- Class I in first (rank 62/626), second (rank unknown) and third (rank 12/104) years
- Laboratory techniques such as use of Schlenk lines, recording and analysing NMR and infrared spectra
- Studied materials science throughout first and second years; physics and mathematics also studied in first year

LABORATORY WORK EXPERIENCE:

October 2021: Clément Group, Materials Department, University of California, Santa Barbara

- Worked alongside Mr H. Nguyen
- Performed *operando* and *ex situ* EPR and magnetic studies of sodium-ion cathode materials

June – August 2017: Grey Group, Department of Chemistry, University of Cambridge

- Worked alongside Dr M.J. Cliffe
- Synthesised and characterised inorganic framework materials; characterisation techniques including: powder XRD, magnetic property measurements and TGA

June – August 2016: Gallium Nitride Group, Department of Materials Science and Metallurgy, University of Cambridge

- Worked alongside Dr F. Massabuau
- Studied gallium nitride semiconductor and light emitting diode materials using atomic force microscopy (AFM) and scanning electron microscopy

July 2013: Biophysics Research Group, Physics and Astronomy Department, University of Exeter

- Worked alongside Dr J. Mansfield
- Studied the effect of osmotic pressure and different electrolyte solutions on the extracellular matrix of intervertebral discs of horses and pigs, using polarised light and confocal microscopy; basic dissection skills also learnt
- One of only two such awards given in the UK

RESEARCH, LABORATORY AND DATA ANALYSIS SKILLS

- Solid-state synthetic techniques: use of furnaces, ball mills and gloveboxes for air-sensitive sample handling and preparation
- Wet synthetic chemistry techniques (including Schlenk and vacuum lines)
- Electrochemical techniques, including coin and Swagelok cell assembly, galvanostatic and potentiostatic analysis
- Powder and single-crystal X-ray diffraction: sample preparation, data acquisition and analysis through Rietveld refinement
- Powder neutron diffraction: sample preparation, data acquisition and analysis through Rietveld refinement and structural distortion analysis
- Scanning and transmission electron microscope sample preparation, data acquisition and analysis
- Magnetic property measurements: sample preparation, data acquisition and analysis
- Solid-state NMR spectroscopy (specialising in paramagnetic and quadrupolar systems): sample preparation, data acquisition (including variable temperature experiments), fitting spectra and analysis
- Solid- and liquid-state EPR spectroscopy: sample preparation, data acquisition (including variable temperature experiments), fitting spectra and analysis
- X-ray absorption spectroscopy: sample preparation, data acquisition, modelling and analysis of data
- Diffuse reflectance spectroscopy: sample preparation, data acquisition and analysis
- Thermogravimetric analysis: sample preparation, data acquisition and analysis
- Atomic force microscopy: sample preparation, data acquisition and analysis
- Confocal and polarised light microscopy: sample preparation, data acquisition and analysis
- Chemical informatics: use of Mendeley, Reaxys, Web of Knowledge and Scopus
- Computing:
    - Highly skilled: Python, VASP, CRYSTAL, CASM, TOPAS Academic, MATLAB, Inkscape, DMFit, VESTA, Microsoft Office Suite (Excel, Word, Powerpoint)
    - Moderate experience: C++, Linux command line, Mathematica
    - Basic knowledge: Fortran code

RESEARCH INTERESTS:

- Solid-state chemistry, focussing on magnetic and electronic structure-property relationships in materials
- Characterisation techniques: both ‘traditional’ (e.g. NMR, XRD and magnetic property measurements) and ‘unusual’ (e.g. high-frequency EPR, paramagnetic NMR and *operando* electrochemical and magnetic property measurements)
- Theoretical techniques: using density functional theory to obtain information about a system and predict the magnetic and electronic properties of materials
- Identifying, exploring and exploiting structure-property relationships in materials to design new compounds with desirable properties for devices

PUBLICATIONS:

Published:

(1) Hanna Z. Porter, Emily E. Foley, Wen Jin, Eric Chen, Erick A. Lawrence, Euan N. Bassey, Raphaële J. Clément, Impact of Mg substitution on the structure and properties of the $Na_2Fe_2F_7$ weberite cathode, *ACS Materials Au*, 2025, **5(1)**, 170-181

(2) Euan N. Bassey, Howie Nguyen, Teresa Insinna, Jeongjae Lee, Anne-Laure Barra, Giannantonio Cibin, Peter Bencok, Raphaële J. Clément, Clare P. Grey, Strong Magnetic Exchange Interactions and Delocalised Mn−O States Enable High-Voltage Capacity in the Na-Ion Cathode P2–$Na_{0.67}[Mg_{0.28}Mn_{0.72}]O_2$, *Chemistry of Materials*, 2024, **36 (19)**, 9493–9515

(3) Tianyu Li, Tullio S. Geraci, Krishna Prasad Koirala, Arava Zohar, Euan N. Bassey, Philip A. Chater, Chongmin Wang, Alexandra Navrotsky and Raphaële J. Clément, Structural Evolution in Disordered Rock Salt Cathodes, *Journal of the American Chemical Society*, **146 (35)**, 24296–24309

(4) Howie Nguyen, Euan N. Bassey, Emily Foley, Daniil A. Kitchaev, Raynald Giovine, Raphaële J. Clément, *Operando* Spin Probes for the Study of Battery Processes*. Journal of Magnetic Resonance*, 2024, **368**, 107772

(5) Madeleine Geers, Thomas B. Gill, Andrew D. Burnett, Euan N. Bassey, Oscar Fabelo, Laura Cañadillas-Delgado, Matthew J. Cliffe, Magnetic Structure and Properties of the Honeycomb Antiferromagnet $[Na(OH_2)_3]Mn(NCS)_3$, *Physical Chemistry Chemistry Physics*, 2024, **26**, 15844–15849

(6) Annalena R. Genreith-Schriever, Chloe S. Coates, Katharina Märker, Ieuan D. Seymour, Euan N. Bassey, and Clare P. Grey, Probing Jahn–Teller Distortions and Antisite Defects in $LiNiO_2$ with ^7Li NMR Spectroscopy and Density Functional Theory, *Chemistry of Materials*, 2024, **36(9)**, 4226–4239

(7) Euan N. Bassey, Ieuan D. Seymour, Joshua D. Bocarsly, David A. Keen, Guido Pintacuda, Clare P. Grey, Superstructure and Correlated Na+ Hopping in a Layered Mg-Substituted Sodium Manganate Battery Cathode are Driven by Local Electroneutrality, *Chemistry of Materials*, 2023, **35(24)**, 10564–10583

(8) Juan R. Chamorro, Julia L. Zuo, Euan N. Bassey, Aurland K. Watkins, Guomin Zhu, Arava Zohar, Kira E. Wyckoff, Tiffany L. Kinnibrugh, Saul H. Lapidus, Susanne Stemmer, Raphaële J. Clément, Stephen D. Wilson, Ram Seshadri, Soft-Chemical Synthesis, Structure Evolution, and Insulator-to-Metal Transition in Pyrochlore-like λ-RhO2, *Chemistry of Materials*, 2024, **36(3)**, 1547–1558

(9) Teresa Insinna, Euan N. Bassey, Katharina Märker, Anne-Laure Barra, Clare P. Grey, Graphite Anodes for Li-Ion Batteries: An Electron Paramagnetic Resonance Investigation, *Chemistry of Materials*, 2023, **35(14)**, 5497–5511

(10) Annalena R. Genreith-Schriever, Hrishit Banerjee, Ashok S. Menon, Euan N. Bassey, Louis F. Piper, Clare P. Grey, Oxygen Hole Formation Controls Stability in $LiNiO_2$ Cathodes: DFT Studies of Oxygen Loss and Singlet Oxygen Formation in Li-ion Batteries, Joule, 2023, **7(7)**, 1623–1640

(11) Euan N. Bassey, Philip J. Reeves, Ieuan D. Seymour, Clare P. Grey, ^{17}O NMR Spectroscopy in Lithium- and Sodium-ion Batteries: Challenges and Interpretation, *Journal of the American Chemical Society*, 2022, **144(41)**, 18714–18729

(12) Eun Jeong Kim, Philip Maughan, Euan N. Bassey, Raphaële J. Clément, Le Anh Ma, Laurent C. Duda, Divya Sehrawat, Reza Younesi, Neeraj Sharma, Clare P. Grey, A. Robert Armstrong, Importance of superstructure and synthetic control in stabilising oxygen redox in P3-structure $Na_{0.67}Li_{0.2}Mn_{0.8}O_2$, *Advanced Energy Materials*, 2022, **12**, 2102325

(13) Euan N. Bassey, Philip J. Reeves, Michael A. Jones, Jeongjae Lee, Ieuan D. Seymour, Giannantonio Cibin, Clare P. Grey, Structural Origins of Voltage Hysteresis in the Na-ion Cathode P2-$Na_{0.67}[Mg_{0.28}Mn_{0.72}]O_2$: a Combined Spectroscopic and Density Functional Theory Study, *Chemistry of Materials*, 2021, **33(13)**, 4890–4906

(14) Euan N. Bassey, Joseph A. M. Paddison, Evan N. Keyzer, Jeongjae Lee, Pascal Manuel, Ivan da Silva, Siân E. Dutton, Clare P. Grey, and Matthew J. Cliffe, Strengthening the Magnetic Interactions in Pseudobinary First-Row Transition Metal Thiocyanates, $M(NCS)_2$, *Inorganic Chemistry*, 2020, **59(16)**, 11627–11639

Under Review:

Mark E. Carrington, Erlendur Jónsson, Christopher A. O'Keefe, Yao Fua, Euan N. Bassey, Kamil Sokolowski, Oren A. Scherman, Clare P. Grey, Control over diradical species formation in bispyridinium redox flow batteries, *Nat. Chem.*

Graciela E. García Ponte, Sesha Sai Behara, Euan N. Bassey, Raphaële J. Clément, Anton Van der Ven, Elucidating the Magnetic Properties of $LiNi_{0.5}Mn_{1.5}O_4$ Spinel using Statistical Mechanics Methods, *Chem. Mater.*

Seongkoo Kang, Jihyun Kim, Suwon Lee, Youngju Choi, Jean-Claude Badot, Leo W. Gordon, Euan N. Bassey, Raphaële J. Clément, Olaf J. Borkiewicz, Olivier Dubrunfaut, Yong-Mook Kang, Modulating the Interlayer Structure of a Layered Sodium Manganese Cathode Toward Superior Na Ion Kinetics and Reversible Phase Transitions, *J. Am. Chem. Soc.*

Vincent C. Wu, Erick A. Lawrence, Tianyu Li, Euan N. Bassey, Chia-Yu Chang, Julia Ong, Bing Joe Hwang, Pierre-Etienne Cabelguen, Raphaële J. Clément, High energy density and micrometer-sized d^0-free disordered rocksalt cathodes, *Nat. Mater.*

Steven J. Gomez Alvarado, Yiming Pang, Pedro A. Barrera, Dibyata Rout, Claudia Robison, Zach Porter, Hanna Z. Porter, Erick A. Lawrence, Euan N. Bassey, Stephen D. Wilson, High-pressure floating zone crystal growth of Sr_2IrO_4, *Phys. Rev. Mater.*

Conferences and Presentations

April 2024: Presentation to the CRMN: "Constructing a Paramagnetic NMR Cluster Expansion Toolkit"

December 2023: Invited talk at the NMR Seminar Series (Department of Chemistry, University of Cambridge), “Introduction to Phase Cycling and Pulse Programming”

November 2023: Materials Research Society Fall Meeting: presented two posters (“Strain-Magnetism coupled cluster expansion in $NaMnO_2$”; “A Paramagnetic NMR Cluster Expansion Toolkit for Li-ion Battery Cathodes”) and one talk (“Characterisation of Strongly Paramagnetic Cathodes using EPR and DFT”)

May 2023: Invited talk at the Collaborative Computational Project for NMR Crystallography webinar on DFT calculations for paramagnetic NMR: “Assigning NMR Spectra of Strongly Paramagnetic Materials”

March 2023: Royal Society of Chemistry JEOL Medal Session: presented characterisation of strongly paramagnetic Li-ion battery cathodes using multi-frequency, variable-temperature EPR combined with DFT calculations: “Characterizing Paramagnetic Battery Cathodes with EPR and DFT”

February 2023: Invited talk at the International Virtual EPR Meeting: “Eyes to the Spin: Characterizing Paramagnetic Battery Cathodes with EPR and DFT”

March 2022: Invited talk at the Global NMR Discussion presentation: provided an overview of paramagnetic NMR applied to sodium-ion batteries to researchers from across the globe (“Motion, Migration, Charge Compensation in a Na^+-ion Battery Cathode: Tales from the Paramagnetic NMR Storybook”)

March 2022: Three-Minute Thesis Presentation to undergraduate and postgraduate students and fellows at Selwyn College, Cambridge. Provided an overview of my PhD research on applying magnetic resonance techniques to sodium-ion batteries. Awarded first prize for the talk.

October 2021: Invited presentation to Clément, Van der Ven and Seshadri Groups at the University of California, Santa Barbara about characterising the electronic, magnetic and chemical structure changes induced on electrochemically cycling sodium-ion battery cathode materials

March 2021: Virtual Presentation to Selwyn College Natural Sciences Society about undertaking a PhD in Chemistry and my research on lithium- and sodium-ion batteries

March 2021: Virtual Presentation to Cliffe Group at the School of Chemistry in the University of Nottingham about studying structural changes in sodium-ion battery cathodes

January 2020: Presentation to the research groups based at the Centre de RMN à Très Hauts Champs in the Ecole Normale Supérieure de Lyon (France) about using NMR to study sodium-ion dynamics in sodium-ion battery cathodes

November 2019: Poster presentation at the European Federation of Electron Paramagnetic Resonance school in Brno (Czech Republic) about using EPR spectroscopy in battery materials

May 2019: Presentation to postgraduate research students at Selwyn College about studying sodium-ion battery cathode materials

AWARDS

2023: Royal Society of Chemistry Research Development Grant

Heeger Fellowship

University of Cambridge Yusuf Hamied Department of Chemistry Outstanding Thesis prize

2022: Selwyn College Travel Award

Royal Society of Chemistry Research Development Grant

Best EPR poster at the Rocky Mountain Conference on solid-state NMR and EPR, Colorado

2021: Selwyn College Travel Award

2019: Department of Chemistry, University of Cambridge Travel Award

2018: Emeleus Prize for Distinction in Inorganic Chemistry

Johnson Matthey Prize for Best Inorganic Research Project

Ron Snaith Award for Best Inorganic Chemistry Research Presentation

2017: BP Prize for Outstanding Work in Practical Chemistry

Walters-Kundert Sciences Summer Studentship Fund

2016: Cambridge Materials Placements for Undergraduates in the Summer Studentship Scheme

2013: Exeter Research Placement Scheme, awarded to only two students in the UK

SUPERVISION

June 2023 – August 2024 Academic supervisor to Masters and Undergraduate researchers: project planning, development and teaching both practical and theoretical skills

October 2021 – October 2022: Academic supervisor to Masters (fourth year chemistry undergraduate) student: planned a research project, taught laboratory techniques and the theory required to understand characterisation techniques

TEACHING

September 2024: Lecturer: Quantum Mechanics: for graduate students; taught basic principles and mathematics of quantum mechanics as applied to models such as the quantum harmonic oscillator, particle in a box and rigid rotor

January 2023 – March 2023:	Lecturer: Statistical Mechanics: for graduate students; taught how to apply statistical mechanics to study magnetism
January 2023 – March 2023:	Lecturer: Materials Science for Non-Scientists, undergraduates between first and third years; taught basics of materials science (including stress and strain, ceramics, polymers, electronic structure and semiconductors)
October 2019 – June 2022:	Academic supervisor to first year chemistry undergraduates at Selwyn College, Cambridge: planned, prepared and taught small groups of undergraduate students the first-year chemistry syllabus
October 2018 – June 2022:	Demonstrator for first- and second-year undergraduate chemistry students at Cambridge: taught basic laboratory techniques, as well as principles of chemistry (e.g., interpreting spectroscopic data and determining reaction mechanisms)
October 2021:	Tutorial to Clément Group at the University of California, Santa Barbara about analysing and simulating Na^+ ion dynamics in variable-temperature NMR experiments
December 2019:	Presented and taught a tutorial to members of the Department of Chemistry (University of Cambridge) on EPR spectroscopy and its applications to energy materials
July 2016:	Teacher and presenter at the Homerton Summer School seminar in chemistry: taught sixth form students about using group theory in chemistry

OUTREACH

March 2021:	Demonstrator and volunteer for the ‘Crash, Bang, Squelch!’ virtual tour given by Cambridge Hands-On Science (CHaOS): practical demonstration and explanation of experiments to try at home for families and members of the public
March 2019:	Demonstrator and volunteer for the Department of Chemistry Open Day, a part of the Cambridge Science Festival: helped organise, demonstrate and explain practical chemistry experiments and provided tours to members of the public
October 2018 – July 2019:	Volunteer for the Royal Society of Chemistry’s “Spectroscopy in a Suitcase” outreach project, designed to teach sixth form students (aged 16 – 18) about using spectroscopy in the chemical sciences and to discuss studying Chemistry (and more generally STEM subjects) at University. Organised and taught at sessions in Long Road Sixth Form College, Hills Road Sixth Form College and Hinchingbrooke School.

May 2018:	Presentation to chemistry Masters students at Cambridge about studying layered magnetic materials (awarded the Ron Snaith award)
July 2017:	Volunteer and tour guide for Selwyn College open day: discussed studying Natural Sciences with prospective students from across the globe.
July 2017:	Volunteer for outreach event at Selwyn College for Schools and Sixth Forms from disadvantaged areas in the North-East of the UK.
July 2016:	Volunteer for the Materials Science Department Open Day at the University of Cambridge. Demonstrated experiments and discussed studying Natural Sciences at Cambridge to prospective students.

LANGUAGE SKILLS

German	CEFR B1/B2 level qualification (intermediate conversational, grammar and written German AS-Level (conversational, grammar and written language) Sufficient understanding to read and translate scientific papers and news articles
French	Sufficient understanding to read and translate scientific papers and news articles
Italian	Sufficient understanding to read and translate scientific papers and news articles

INTERESTS AND ACTIVITIES

Selwyn College Natural Sciences Society:	Member (2014 – 2022)
Grey Group Social Team:	Member of the organising committee for social events in Professor Clare Grey's research group; organised Christmas dinners, virtual board games evenings and escape rooms (November 2018 – October 2022)
Grey Group Safety Team:	Member of the committee which updates and checks COSHH forms and risk assessments; helped to organise the lab and prepare for re-opening after the first COVID-19 lockdown; presented 10-minute safety workshops to provide help and support to group members when faced with an emergency in the lab

Selwyn College MCR:	Green Officer (March 2021 – March 2022); carried out a detailed analysis of the College's 'eco-friendly' policies and emissions profile; sat on the College's Gardens Committee to represent postgraduate student views on the environment and College's gardens and founded the Selwyn College Green Society
Selwyn College Green Society:	Founding member (September 2021 – October 2022); oversaw a committee to start Selwyn College's first student-run allotment and to discuss "green" initiatives in College
Improvisation:	Member of the Impronauts Society (2017-2018), and took part in an improvisation course for chemistry students (2021)
First Aiders' Committee:	Member of the First Aiders' Committee in the Department of Chemistry at the University of Cambridge (First Aid qualified with St John's Ambulance: valid January 2020 to January 2023)
Sandokai Karate:	2nd Dan Black Belt; assisted in the teaching and supervision of all ages; performed at public events (fêtes and open days); first aider; helped to re-write the syllabus and taught self-defence classes to women's groups and LBGTQ+ groups.

REFEREES:

Professor C.P. Grey, Principal Investigator of Grey Group, Department of Chemistry, University of Cambridge, Lensfield Road, Cambridge, CB2 1EW, United Kingdom, Email: cpg27@cam.ac.uk, Tel.: +441223 336509

Professor Anton Van der Ven, Materials Department, University of California, Santa Barbara, Santa Barbara, CA 93106, United States of America, Email: avdv@ucsb.edu

Professor Raphaële J. Clément, Materials Research Laboratory, University of California, Santa Barbara, Santa Barbara, CA 93106, United States of America, Email: rclement@ucsb.edu, Tel.: +1 805 893 4294

Professor J.H. Keeler, Head of Department of Chemistry, Teaching Fellow in Chemistry, Department of Chemistry, University of Cambridge, Lensfield Road, Cambridge, CB2 1EW, United Kingdom, Email: jhk10@cam.ac.uk, Tel.: +441223 336341