

Laura J. Macdougall Ph.D.

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Education

PhD in Chemistry, University of Warwick, Coventry, UK 2014 – 2018

Thesis: *Nucleophilic Thiol-yne Addition Chemistry for the Synthesis of Tuneable and Cytocompatible Poly(ethylene glycol) Hydrogel Materials*

Supervisor: Professor Andrew P. Dove (Funded by EPSRC)

MChem Chemistry with a Year in Industry, University of York, York, UK – 1st Class 2010 – 2014

Master's dissertation: *Development of the Next Generation of Diesel Detergents (Lubrizol Limited)*

Supervisor: Hannah Greenfield, Dr Paul Stevenson and Dr Avtar Matharu

Research Experience

University of Colorado Boulder, Boulder, CO, USA 2018 – Present

Postdoctoral Associate, Anseth Research Group

- Developing intracellular polymerization techniques to induces reversible stasis within a cell. Monitoring cell cycle state through live cell tracking techniques.
- Synthesising nanogel materials for the adsorption and protection of biologicals from external stresses.

University of Warwick, Coventry, UK 2014 – 2018

Ph.D. Student, Dove Research Group

- Established and developed the nucleophilic thiol-yne click chemistry as a versatile and efficient crosslinking reaction for the formation of robust, nonswelling and tuneable poly(ethylene glycol) (PEG) hydrogels. Assessed through rheology, mechanical and cryogenic scanning electron microscopy (cryo SEM) techniques and through their swelling and degradation profiles.
- Designed self-healing, stretchable and biocompatible thiol-yne interpenetrating networks (IPNs) through utilising the properties of natural polymers.
- Synthesised stereochemically controlled hydrogels by utilising the properties of a thioether bond.
- Developed synthetic extracellular matrices for probing breast cancer cell growth using robust cytocompatible nucleophilic thiol-yne addition chemistry.
- Designed a nucleophilic thiol-yne kinetic study with a range of small molecule alkynes, to demonstrate the control over the reaction and resultant degradation in hydrogel materials.

University of Delaware, Newark, DE, USA 09/2017 – 11/2017

Visiting Scholar, A. Kloxin Research Group

- Encapsulated and cultured different breast cancer cell lines in hydrogel-based thiol-yne PEG scaffolds with definable and controlled mechanical properties.
- Demonstrated the ability to incorporate bioactive peptides and tune network degradation for long term cell culture within the thiol-yne hydrogel scaffolds.
- Relevant cell culture techniques were developed while working collaboratively to share knowledge on the thiol-yne reaction for hydrogel synthesis.

Placement Student, Chemical Synthesis

- Worked as part of the fuels team to functionalise polymers for the latest diesel detergent formulation.
- Synthesised and evaluated a library of polymers for the development of Lubrizol's detergents for diesel engines.

Research Publications

10. **L. J. Macdougall**,* M. E. Wechsler,* H. R. Culver, E. H. Benke, A. Broerman, C. N. Bowman, K. S. Anseth, Charged Poly(N-Isopropylacrylamide) Nanogels for the Stabilization of High Isoelectric Point Proteins. *ACS Biomaterial Science and Engineering*, 2021, *In press*.
9. H. Ma, **L. J. Macdougall**, A. Gonzalez Rodriguez, M.E. Schroeder, D. Batan, R. M. Weiss, K.S. Anseth, Calcium Signaling Regulates Valvular Interstitial Cell Alignment and Myofibroblast Activation in Fast-Relaxing Boronate Hydrogels. *Macromolecular Bioscience* 2020, **20** (12), 2000268.
8. B. M. Richardson, C. J. Walker, **L. J. Macdougall**, J. W. Hoyer, M. A. Randolph, S. J. Bryant, K. S. Anseth, Viscoelasticity of Hydrazone Crosslinked Poly(Ethylene Glycol) Hydrogels Directs Chondrocyte Morphology during Mechanical Deformation. *Biomaterial Science*, 2020, **8** (14), 3804–3811.
7. **L. J. Macdougall** and K. S. Anseth, Bioerodible Hydrogels Based on Photopolymerized Poly(Ethylene Glycol)-Co-Poly(α -Hydroxy Acid) Diacrylate Macromers (Editorial), *Macromolecules* 2020, **53** (7), 2295–2298.
6. **L. J. Macdougall**, M. M. Pérez-Madriral, J. E. Shaw, M. Inam, J. A. Hoyland, R. O'Reilly, S. M. Richardson and A. P. Dove, Self-healing, stretchable and robust interpenetrating network hydrogels, *Biomaterials Science*, 2018, **6**, 2932-2937.
5. H. Shaikh, J. Y. Rho, **L. J. Macdougall**, P. Gurnani, A. M. Lunn, J. Yang, S. Huband, E. D. H. Mansfield, R. Peltier, S. Perrier, Hydrogel and Organogel Formation by Hierarchical Self-Assembly of Cyclic Peptides Nanotubes, *Chemistry – A European Journal*, 2018, **24**, 19066-19074.
4. **L. J. Macdougall**,* K. L. Wiley,* A. M. Kloxin, A. P. Dove, Design of Synthetic Extracellular Matrices for Probing Breast Cancer Cell Growth Using Robust Cytocompatible Nucleophilic Thiol-yne Addition Chemistry, *Biomaterials*, 2018, **178**, 435-447.
3. **L. J. Macdougall**,* M. M. Perez-Madriral,* M. C. Arno and A. P. Dove, Adaptable, nonswelling thiol-yne hydrogel materials as biocompatible soft tissue scaffolds, *Biomacromolecules*, 2017, **19**, 1378-1388.
2. M. C. Arno, M. Inam, Z. Coe, G. Cambridge, **L. J. Macdougall**, R. Keogh, A. P. Dove and R. K. O'Reilly, Precision Epitaxy for Aqueous 1D and 2D Poly(ϵ -caprolactone) Assemblies, *Journal of American Chemical Society*, 2017, **139**, 16980-16985.
1. **L. J. Macdougall**, V. X. Truong and A. P. Dove, Efficient in-situ nucleophilic thiol-yne click chemistry for the synthesis of strong hydrogel materials with tunable properties, *ACS Macro Letters*, 2017, **6**, 93-97.

*Denotes equal contribution

Under Review:

1. **L. J. Macdougall**,* M. M. Pérez-Madriral,* J. E. Shaw, J. Worch, C. Sammon, S. M. Richardson, A. P. Dove, Using Thiol-Yne Click Hydrogels to Direct Cellular Mechanoresponsive Behaviour through Stereochemically-Tailored Mechanical Properties, *Chem*, Under Review.

Book Chapters

1. **L. J. Macdougall**, H. R. Culver, C.-C. Lin, C. Bowman, K. S. Anseth, 1.3.2F - Degradable and Resorbable Polymers. In *Biomaterials Science (Fourth Edition)*; W. R. Wagner, S.E. Sakiyama-Elbert, G. Zhang, M. J. Yaszemski, Eds.; Academic Press, 2020; pp 167–190.

Conferences Proceeding

- **L. J. Macdougall**, M. E. Wechsler, H. R. Culver, E. H. Benke, A. Broerman, C. N. Bowman, K. S. Anseth, Poly(N-Isopropylacrylamide) Nanogels for the Stabilization of Proteins. 11th World Biomaterials Congress, *Virtual* (December 2020)
- **L. J. Macdougall**, A. P. Dove, Stereochemically Tuneable Hydrogels through Efficient Nucleophilic Thiol-yne Click Chemistry, *254th American Chemical Society Conference, Washington D.C., USA* (August 2017)
- **L. J. Macdougall**, A. P. Dove, Efficient In Situ Nucleophilic Thiol-yne Click Chemistry for the Synthesis of Strong Hydrogel Materials with Tuneable Properties, *254th American Chemical Society Conference, Washington D.C., USA* (August 2017)
- **L. J. Macdougall**, A. P. Dove, Tuneable Robust Hydrogel Materials using Simple Nucleophilic Thiol-yne Click Chemistry, *The 12th International Conference on Advanced Polymers via Macromolecular Engineering, University of Ghent, Ghent, Belgium* (May 2017)
- **L. J. Macdougall**, A. P. Dove, Efficient in situ Nucleophilic Thiol-yne Click Chemistry for the Synthesis of Strong Hydrogel Materials, *Chem2Nature conference, University of Warwick, Coventry, UK* (January 2017)
- ***L. J. Macdougall**, A. P. Dove, Efficient In Situ Nucleophilic Thiol-yne Click Chemistry for the Synthesis of Strong Hydrogel Materials with Tuneable Properties, *RSC Biomaterials Chemistry Special Interest Annual Conference 2017, University of Ulster, Belfast, Ireland* (January 2017)
- ***L. J. Macdougall**, A. P. Dove, Green Thiol-yne Click Chemistry for the Synthesis of Strong Hydrogel Materials with Tuneable Properties, *Frontiers in Green Materials Symposium 2016, Institution of Civil Engineers, London, UK* (December 2016)
- **L. J. Macdougall**, A. P. Dove, The Evaluation of Poly(ethylene glycol) Hydrogels Formed by Efficient in situ Nucleophilic Thiol-yne Click Chemistry, *Warwick International Polymer Conference 2016, University of Warwick, Coventry, UK* (July 2016)

*Denotes award

Grants Received

Undergraduate Research Opportunities Program: \$3000.	Summer 2020
Biological Sciences Initiative Grant: \$2500	2019-2021
RSC Researchers Mobility Grant: £4500	08/2017
Macro Group UK, DH Richards Memorial Travel Bursaries: £500	08/2017
The British Society of Rheology Travel Grant: £500	08/2017

Mentoring

Bruce Kirkpatrick – M.D. PhD Candidate, University of Colorado Boulder	07/2020 – Present
Evan Benke – B.S. Candidate, University of Colorado Boulder	02/2019 – Present
Montana Minnis – Ph.D. Candidate, University of Colorado Boulder	08/2019 – 12/2019
Postgraduate Demonstrator – University of Warwick	2014 – 2017

Leadership and Outreach Experience

Postdoctoral Association of Colorado Boulder, Secretary	2019 – Present
Gold Crest Project Supervisor	08/2016
STEM NET Ambassador (Outreach)	2010 – 2018