

# ***Summer Exchange Talk***



***J I Mansell***

***C Scott***

***M Fitzpatrick***



THE UNIVERSITY OF  
**CHICAGO**



THE UNIVERSITY  
*of* EDINBURGH

# The University of Edinburgh



# Background

- One of the world's top universities
- Ancient university in Scotland (founded 1582)
- 16th in the QS World University Rankings 2022
- More than 40,000 students from across 156 countries
- UK 59% : EU 11% : International 31%





# Photo Gallery





# The City of Edinburgh





# Background

- Capital city of Scotland
- More listed buildings than anywhere in the world
- UK's 2<sup>nd</sup> most visited tourist destination
- Mild climate (for Scotland)
- Safest place to live in the UK
- 4<sup>th</sup> most beautiful city in the world



# Photo Gallery



# The School of Chemistry





# Background

- The teaching of Chemistry began >300 years ago in 1713
- Collaboration with St Andrews to form EaStCHEM
- Historical professors include:
  - James Crawford
  - Andrew Plummer
  - William Cullen
  - Joseph Black
  - Thomas Charles Hope
  - William Gregory
  - Lyon Playfair
  - Alexander Crum Brown
  - James Walker

# EaStCHEM Research School

- 2<sup>nd</sup> in the REF 2014 'Power Table' with 80 academics submitted
- 95% of papers classed as world-leading/internationally excellent
- Research Themes:
  - Catalysis and Synthesis
  - The Chemistry Biology Interface
  - Energy, Environmental, and Sustainable Chemistry
  - Functional Materials
  - Structural Chemistry and Chemical Dynamics



# Catalysis and Synthesis

- **Contact: Dr Michael Cowley**
- Biocatalysis
- Enantioselective catalysis
- Main group chemistry and catalysis
- Natural product synthesis
- Organometallics and metal-based catalysis
- Reaction mechanism
- Supramolecular chemistry

# Catalysis and Synthesis

## INORGANIC

- Dr Michael Cowley
- Dr Jennifer A Garden

## ORGANIC

- Professor Andrew L. Lawrence
- Dr Stephen P Thomas





# The Chemistry Biology Interface

- **Contact: Professor Colin Campbell**
  - Chemical biology / Medicinal chemistry
  - Natural product and analogue synthesis
  - Biorenewable materials
  - Enzymology
  - Biocatalysis
  - Bioinformatics / Bioengineering
  - Synthetic Biology (enzyme engineering, and pathway engineering)
  - Biological imaging

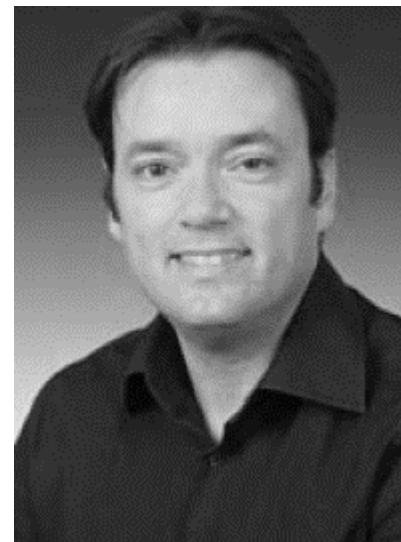
# The Chemistry Biology Interface

## NATURAL PRODUCTS

- Professor Dominic Campopiano
- Professor Alison Hulme FRSE

## ENZYMOMOLOGY

- Dr Amanda Jarvis





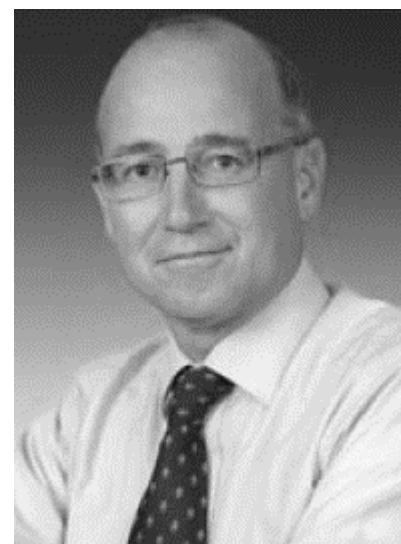
# Environmental/Sustainable Chemistry

- **Contact: Dr Caroline Kirk**
- New materials for emerging photovoltaic technologies
- Phase-change materials for heat storage
- Lithium and sodium ion batteries
- Supercapacitors
- Separation of gases and utilisation of waste CO<sub>2</sub>
- Green Ammonia
- New materials for efficient hydrogen production

# Environmental/Sustainable Chemistry

## INORGANIC

- Professor Carole A Morrison
- Professor Jason Love
- Professor Colin R Pulham



# Functional Materials

- **Contact: Professor Carole Morrison**
- Magnetic and multiferroic materials
- Porous materials
- Energy materials
- Opto(electronic) materials
- Polymers
- Structural characterisation of functional materials
- Computational modelling of materials / Structure-property relationships
- Supramolecular chemistry and nanomaterials

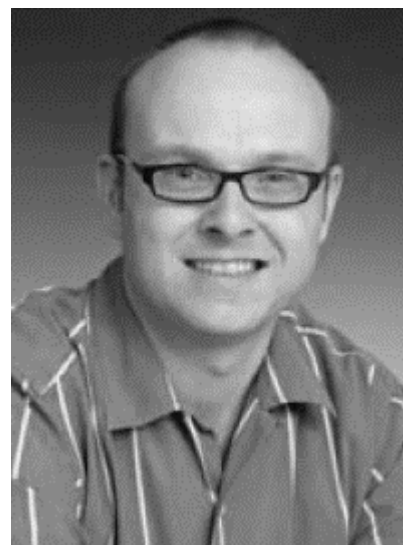
# Functional Materials

## INORGANIC

- Dr Caroline Kirk
- Professor Euan K Brechin FRSE

## ORGANIC

- Dr Paul Lusby
- Professor Neil B McKeown FRSE





# Structural Chemistry

- **Contact: Dr Andrew Alexander**

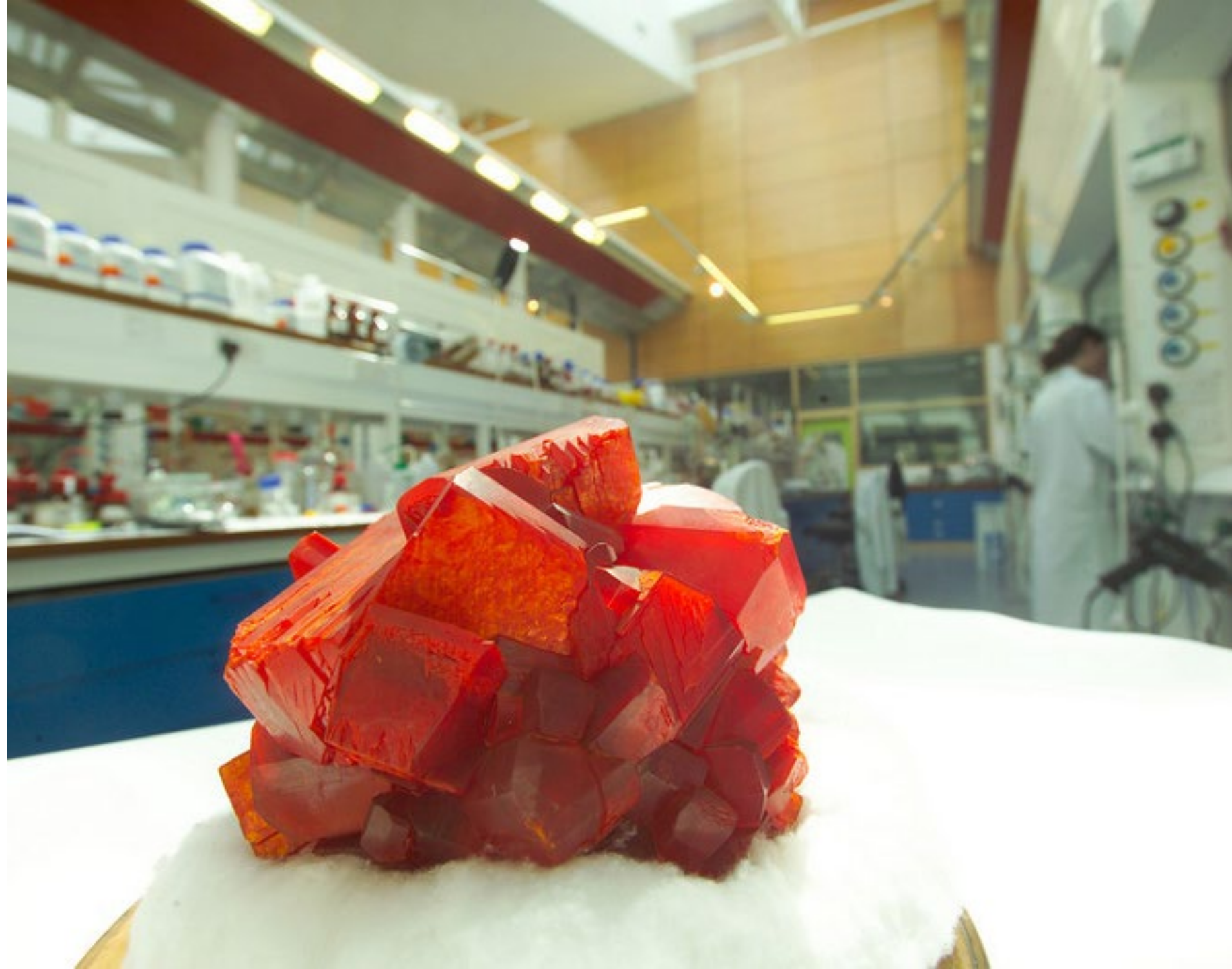
- *In-operando* studies / Reaction dynamics
- Diffraction techniques
- Spectroscopic characterisation
- Electron Microscopy / Ultrafast imaging and spectroscopy
- Surfaces and interfaces
- Theory and computation
- Magnetic molecules and materials
- Electrochemistry
- Structural biology / Crystallisation

# Structural Chemistry

- Professor Guy Lloyd-Jones FRS
- Professor Simon Parsons
- Dr J. Olof Johansson
- Professor Eleanor E. B. Campbell  
FRS



# Personal Experience



# Background – Jack

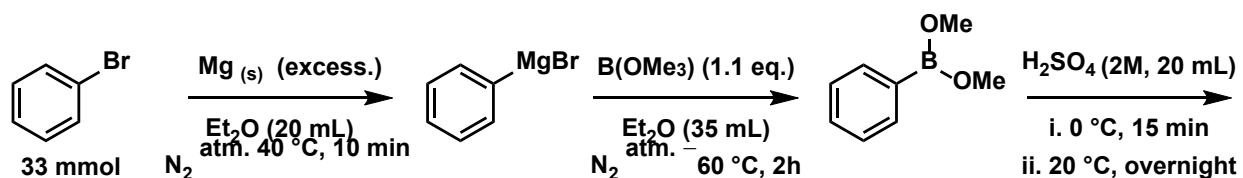
- MChem Medicinal and Biological Chemistry
- Spent 4 years at the JBB before UChicago
- Previous P.I. was Dr S. P. Thomas
- Thesis supervisor is Prof A. Lawrence
- Personal Tutor is Dr C. Kirk
- Worked in Organic Teaching Labs



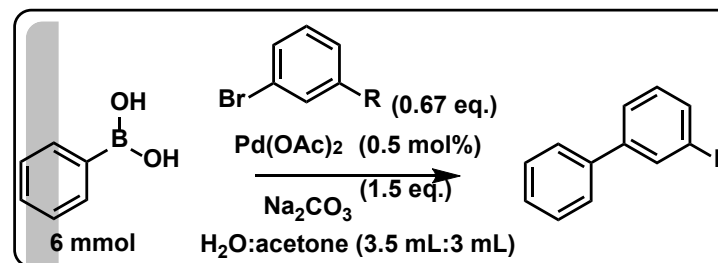


# Research - Jack

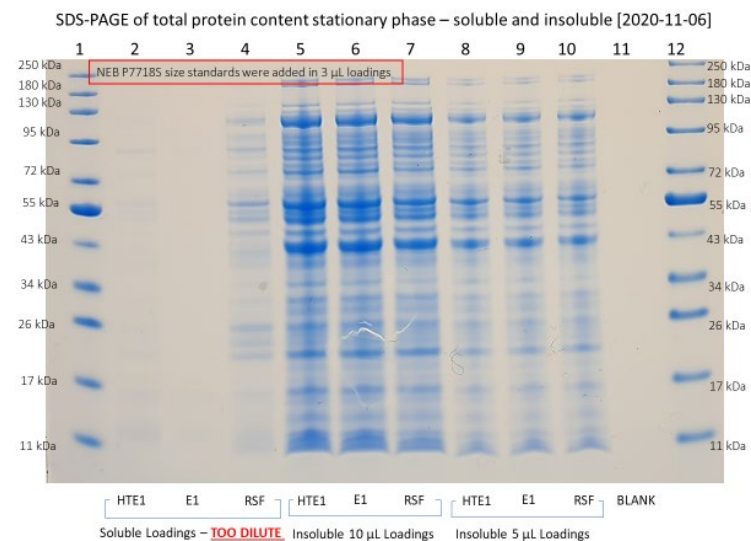
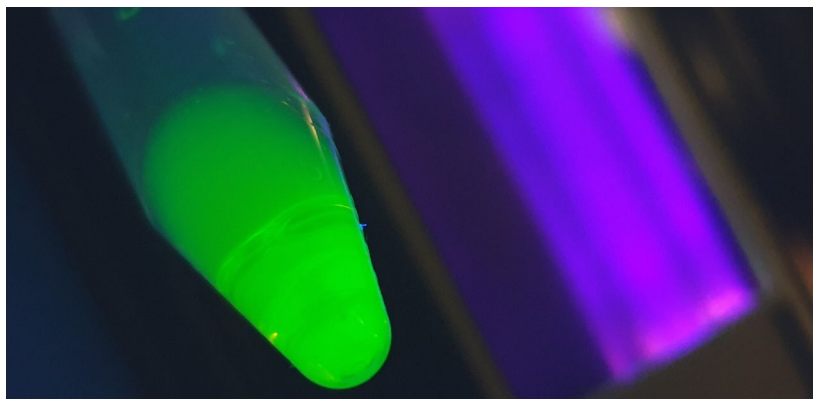
- Developed multi-step synthesis for 3<sup>rd</sup> year organic teaching labs



## SUZUKI-MIYAUURA CROSS-COUPLING

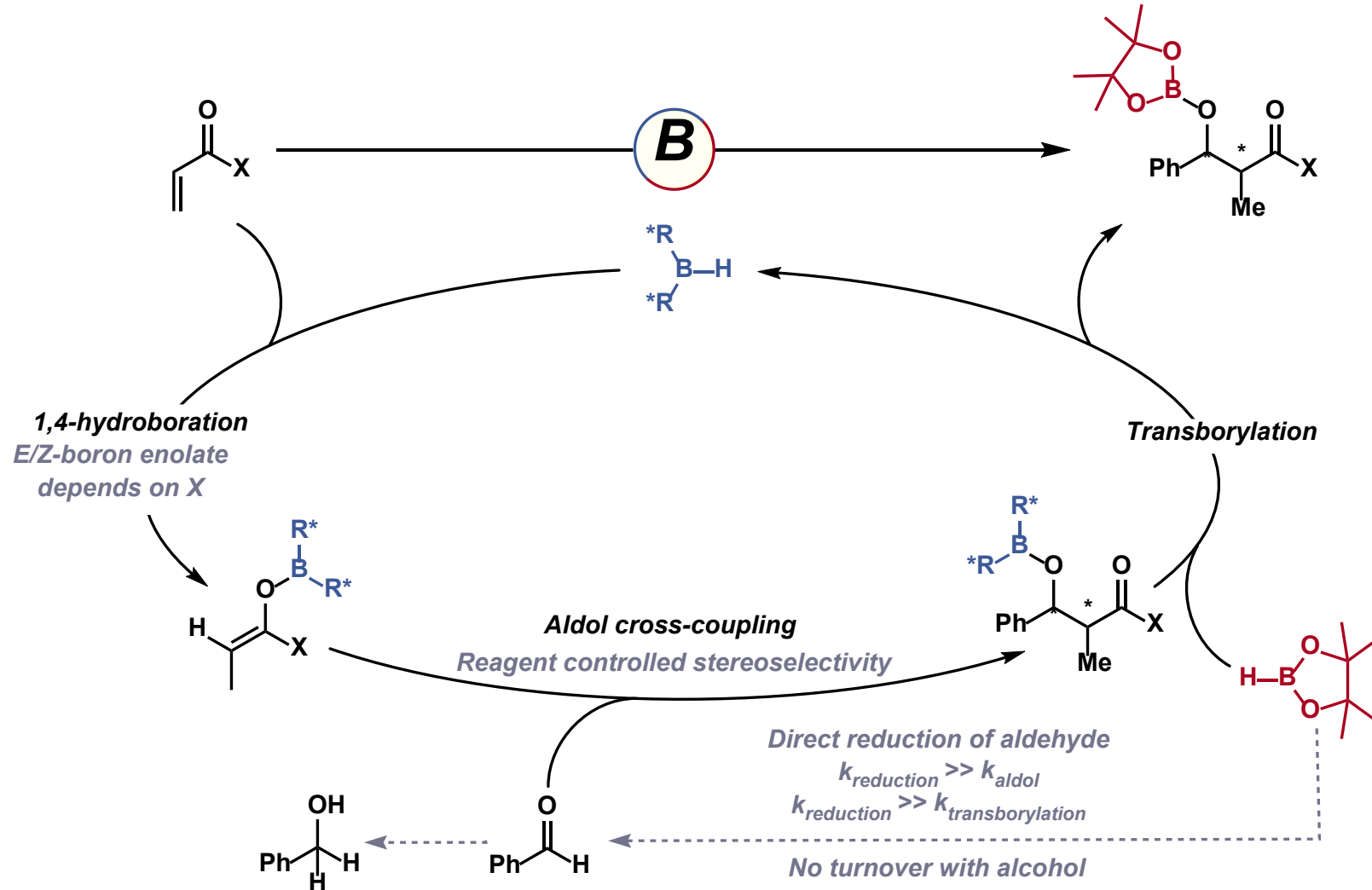


- Expression of a RANKL-inducible protein and EGFP (4<sup>th</sup> Year Project)



# Research - Jack

- Thomas Group – B/O transborylation in enantioselective aldol coupling



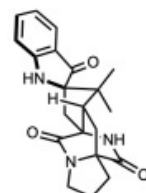
# Thomas Group - Jack

- Development/understanding of catalytic methodologies
- 55 total publications since 2012
- 8 papers this year (so far)
- Active research:
  - 1st-row transition metal catalysis (Ti, Mn, Fe)
  - Group 13 catalysis (B and Al) and
  - Accessing low oxidation-state species using non-organometallic activators (Mn, Fe, Co).

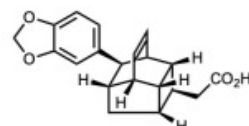


# Lawrence Group – Jack

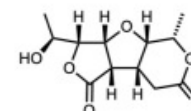
- Total synthesis of Natural Products
- 19 total publications since 2012
- 3 papers this year (so far)



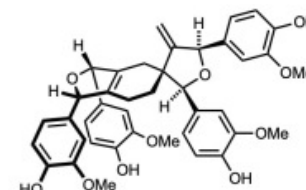
**brevianamide A (& B)**  
7 steps  
*Nat. Chem.* **2020**,  
12, 615–619



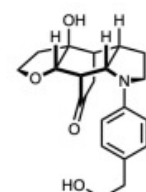
**kingianic acid E**  
8 steps  
*Chem. Sci.* **2015**,  
6, 3886–3890



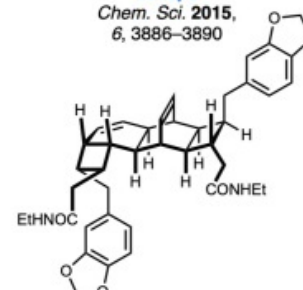
**angiopterlactone B**  
4 steps  
*Org. Lett.* **2017**,  
19, 2199–2201



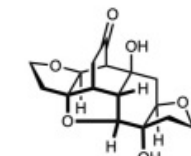
**ramonanin A (B-D)**  
7 steps  
*Angew. Chem. Int. Ed.*  
**2015**, 54, 1795–1798



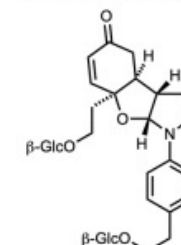
**incargranine A**  
4 steps  
*Org. Biomol. Chem.*  
**2019**, 17, 1698–1702



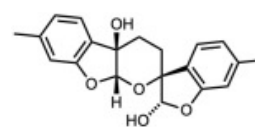
**kingianin A (D & F)**  
10 steps  
*Angew. Chem. Int. Ed.*  
**2013**, 52, 4221–4224



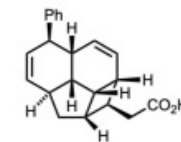
**incarvilleatone**  
4 steps  
*Org. Lett.* **2012**,  
14, 4537–4539



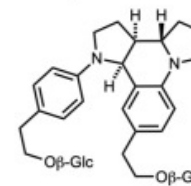
**millingtonine**  
7 steps  
*Angew. Chem. Int. Ed.*  
**2016**, 55, 8421–8425



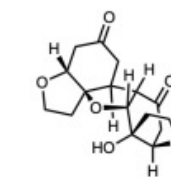
**thymarnicol**  
6 steps  
*Angew. Chem. Int. Ed.*  
**2017**, 56, 6813–6817



**endiandric acid A**  
8 steps  
*Chem. Sci.* **2015**,  
6, 3886–3890



**incargranine B**  
6 steps  
*Angew. Chem. Int. Ed.*  
**2013**, 52, 13273–13275



**incarviditone**  
4 steps  
*Org. Lett.* **2012**,  
14, 4537–4539



# Bell Grouo – Meg

- Environmental Chemistry
- Understanding the process of peatland degradation and restoration at a molecular level
- Bulk properties and MS, NMR, IR



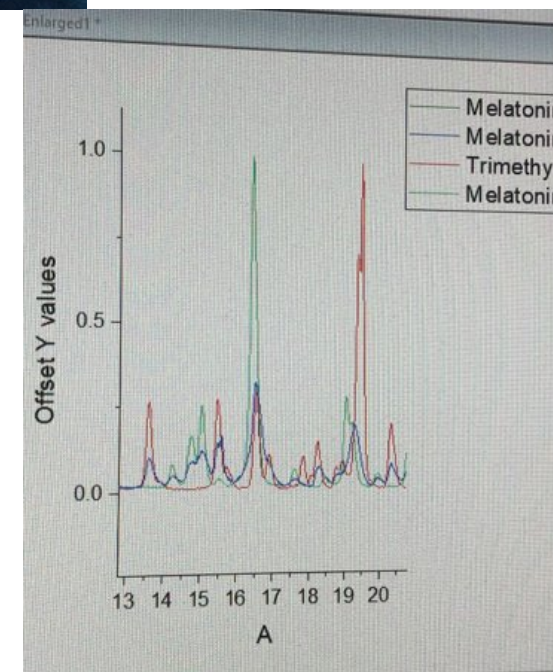
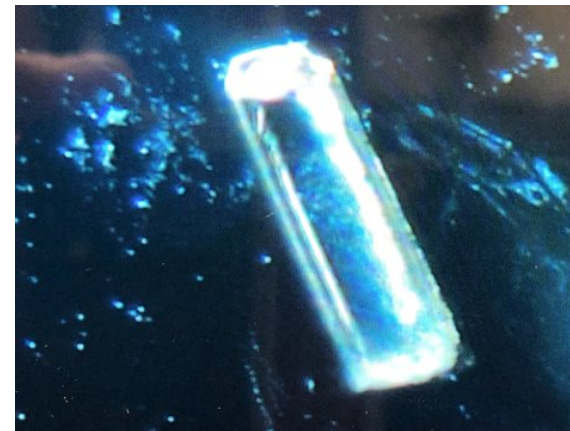
# Meg Photos





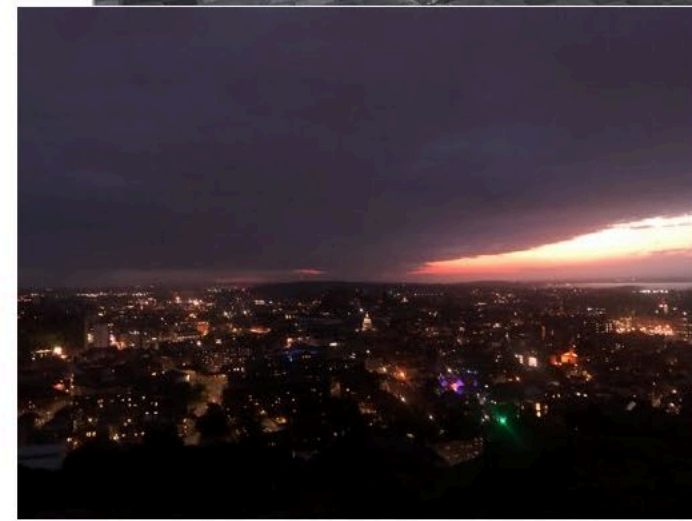
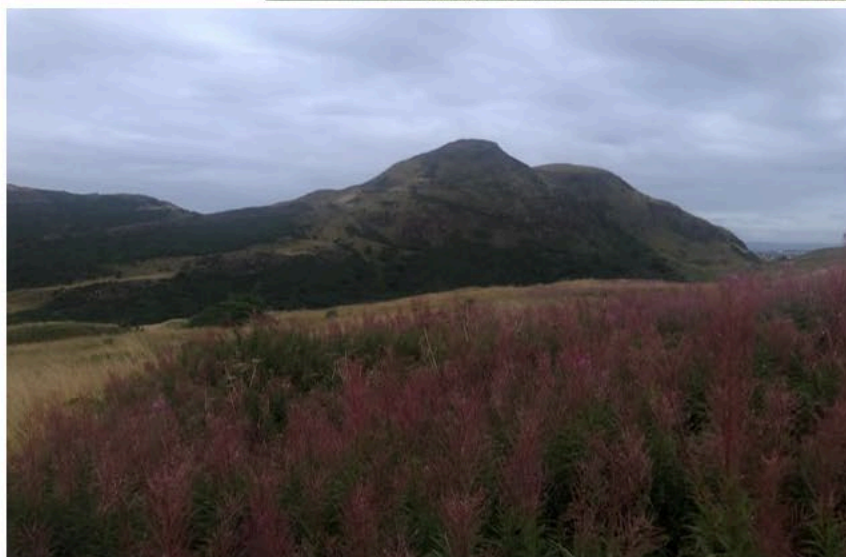
# Pulham Group - Claire

- 3rd year biochemistry major, likely health and society minor
- Works in Professor Snyder's organic chemistry lab
- study of the effects of high pressure on molecular compounds such as pharmaceuticals, energetic materials (explosives, propellants), fuels, and lubricants, often crystallographic studies
- Attempting to form co-crystals of melatonin with different co-formers; x-ray powder diffraction and single crystal diffraction





# Outside the Lab





# Questions and Thanks

