15th Bathurst Meeting

13-16th July, 2015
University of Edinburgh, UK
Sponsors

We are most grateful to our Sponsors: ExxonMobil, Shell and IAS, for generous student support.

Cambridge Carbonates Ltd, Dr. Mark Wilkinson and Prof. Maurice Tucker are thanked for generous field trip support. Cambridge Carbonates Ltd are also thanked carbonate classification cards and student prizes.
Introduction

Bathurst Meetings are 4-yearly informal meetings of carbonate workers begun in 1959 by Robin Bathurst.

These meetings are distinguished by their focus on new ideas at the forefront of our science and a relaxed structure that stimulates open discussion.

To quote Robin...

"We want to encourage work in progress, let's have new ideas to discuss even if they are half baked"

Edinburgh

"This profusion of eccentricities, this dream in masonry and living rock is not a drop scene in a theatre, but a city in the world of reality."

Robert Louis Stevenson

Meeting Website

http://www.eeo.ed.ac.uk/conferences/bathurst2015/

Meeting Summary

10-13 July: Pre-Meeting Field Trips (various) – see p. 9-10.
13 July: Registration and Icebreaker, Playfair Library, Old College, University of Edinburgh, 5-8 pm **ALL WELCOME**
14 July: Technical Meeting: Theme 1: Controls on carbonate deposition: Carbon cycle, evolution, and climate
Swann Lecture Theatre, King’s Buildings, University of Edinburgh, 8.50 am-6 pm.
15 July: Technical Meeting: Theme 2: Post-depositional processes in carbonates: diagenesis and deformation
Swann Lecture Theatre, King’s Buildings, University of Edinburgh, 9-6 pm
Conference Dinner, Playfair Library, Old College, University of Edinburgh, 7.30 pm onwards
16 July: Technical Meeting: Theme 3: Carbonate as reservoir and source rocks
Swann Lecture Theatre, King’s Buildings, University of Edinburgh, 9-6 pm
Tuesday, 14th JULY  
TECHNICAL SESSION 1  
Swann lecture Theatre, King’s Buildings

**Theme 1: Controls on carbonate deposition: Carbon cycle, evolution, and climate**

*Part 1a. Carbonates as archives of global change*  
*Chairs: Ian Fairchild, Sasha Turchyn, and Noel James*

8.50-9  
Welcome and Introduction  
Rachel Wood

9-9.30  
Ashleigh Hood, M. W. Wallace  
Neoproterozoic dolomite marine cements and ocean anoxia

9.30-10  
Noel James, Y. Boneb  
Cool-water aeolinites: repositories of palaeoceanographic information from vanished inner neritic temperate limestones (sediments)

10-10.30  
Claire Reymond, K.-S. Zihrl, J. Halfar, B. Riegli, A. Humphreys, H. Westphal  
Tropical upwelling carbonates: what the present can tell us about the past and future

10.30-11  
Coffee + Cake

11-11.30  
Louis Pomar, J.I. Baceta, P. Hallock, M. Morsilli, G. Mateu-Vicens  
Waxing and waning of coral buildups during the Cenozoic

11.30-12  
Arnood Slootman, M.J.B. Cartigny, P.L. De Boer, A. Moscariello  
Neogene Cool-Water Carbonate Ramps in the Mediterranean – A Hydrodynamic Story

12-1.30  
Part 1a: POSTERS + LUNCH

*Part 1b. Carbonate platform dynamics, facies and architecture*  
*Chairs: Pete Burgess, M. Raven and V. Paul Wright*

1.30-2  
Ola Hosa, D. Hunt  
Is the Modern Really The Key To The Past? Comparative Morphometrics of the Modern Alacran Platform and a Lower Cretaceous Platform

2-2.30  
Pascal Kindler, F. Godefroid  
Elevated bioherms from Long Island (Bahamas): a testimony of recent tectonic uplift or of a high sea level during the Middle Pleistocene

2.30-3  
Coffee + Cake
Part 1c. Microbialites versus abiotic carbonate buildups:
including the enigma of the Pre-Salt
Chairs: Pete Burgess and V. Paul Wright

3-3.30  V. Paul Wright, N. Tosca
Large scale abiotic carbonate systems were not restricted to the Precambrian:
the Aptian mega-lake carbonates of the South Atlantic

3.30-4  Art Saller
Pre-salt Lacustrine Sedimentation in the Deepwater Kwanza Basin, Angola

4-4.30  Marcelle Marques Erthal
Shrub morphologies and reservoir quality

4.30-6  Theme 1b and 1c: POSTERS + BEER

Wednesday, 15th JULY  TECHNICAL SESSION 2  Swann lecture Theatre, King’s Buildings

Theme 2: Post-depositional processes in carbonates: diagenesis and deformation

Part 2a. Innovations in understanding carbonate diagenesis
Chairs: Peter Swart and Dave Hunt

Diagenetic evolution of a deep-marine carbonate platform drowning surface

9.30-10  Enrique Gomez-Rivas, J.D. Martin-Martín, P.D. Bons, D. Koehn
Stylolite networks as a primary control on the geometry of massive diagenetic alterations

10-10.30  Katie Cooper, F. Whitaker, A. Anesio
Storm driven diagenesis

10.30-11  Coffee + Cake

11-11.30  Dave Fike
Mapping the micron-scale distribution and speciation of sulfur in Ordovician carbonates

11.30-12  Amelia Davies, C. M. John
The clumped isotopic composition of a modern tropical shell assemblage:
implications for deep-time temperature and d18O reconstructions

12-12.30  Fiona Whitaker
Modelling hydrothermal fluid flow
12.30-2  Part 2a: POSTERS + LUNCH

Part 2b. The never ending problem of Dolomites
Chairs: Fiona Whitaker and Jim Hendry

2-2.30  J.D. Martín-Martín, D. Gómez-Gras, A. Travé, E. Gomez-Rivas
Confocal Laser Scanning Microscope study of replacive dolomite crystal mosaics

2.30-3  Huifang Xu
The sweet spot for the formation of sedimentary dolomite

3-3.30  Coffee + Cake

3.30-4  Judy Mckenzie, F. Martinez Ruiz, C. Vasconcelos
Defining the mineral dolomite, a never-ending problem

4-4.30  Hans Machel, J. M. Gregg, D. L. Bish, S. E. Kaczmarek
Microbial dolomite that isn’t dolomite

4.30-6  Theme 2b: POSTERS + BEER

Conference Dinner, Playfair Library, Old College, University of Edinburgh, 7.30 pm onwards

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Thursday, 16th JULY  TECHNICAL SESSION 3  Swann lecture Theatre, King’s Buildings

Theme 3: Carbonate as reservoir and source rocks

Part 3a. Evolution of porosity and permeability
Chairs: Art Saller and Cathy Hollis

Gas migration and burial porosity creation in Zechstein carbonates of the Lower Saxony Basin, NW Germany

9.30-10  Karl Jacquemyn, M.D. Jackson, G. J. Hampson, C. M. John, D. Cantrell, R. Zuhlke, A. AbuBshait, R. F.Lindsay
Quantification of geometry and spatial arrangement of grain-dominated storm-event deposits in outcrop analogue of Late Jurassic Arab-D reservoir, Saudi Arabia
Examining the distribution of petrophysical properties across a siliciclastic-carbonate ramp

10.30-11  **Coffee + Cake**

11-11.30  **Leo Borghi, A.C.G. Tavares, P.W.M. Corbett, M.S. Mendes, F. Abbots**
Towards developing a new classification scheme for coquinas and shell concentrations

11.30-12  **Ana Tavares, L. Borghi, P.W.M. Corbett, R.N. Câmarra**
A new approach to understanding porosity evolution in Pre-salt coquinas: integrated lithofacies–diagenetic facies analysis of the Morro do Chaves Formation (Sergipe-Alagoas Basin, Brazil)

12-1.30  **Part 3a: POSTERS + LUNCH**

**Part 3b. Flow behaviour of subsurface carbonates**
Chair: Frances Abbots and Joyce Neilson

1.30-2.00  **Georg Warrlich, E. Adams, T. Tam, A. Ryba, C. Burgess, M. Angelatos, A. Binda**
Quantifying carbonate heterogeneities that impact flow in reservoirs: Lessons learned from the Central Luconia Gas Fields, Malaysia

2-2.30  **Thomas Palmer, F. Whitaker, C. Hollis, H. Corlett**
Geothermal convection in evolving rift basins: insights from numerical modelling

2.30-3  **Cathy Hollis, E. Bastesen, H. Corlett, R. Gawthorpe, J. Hirani, T. Palmer, A. Rotevatn, F. Whitaker**
Fault-controlled dolomite in extensional basins

3-3.30  **Coffee + Cake**

**Theme 4: Lanniappe ('Small gifts')**
Chair: Cedric John and Rudy Swennen

3.30-4  **Antonio Buono**
Rapid Quantitative Digital Petrography

4-4.30  **Brenda Kirkland, M. P. Testa, M. E. Rider, M. Vincent-Couture, M. J.W. George, R. L. Folk**
Attempts at imaging the interface between organic matter and calcium carbonate: journeys at the nanometer-scale

4.30-6  **Themes 3b and 4: POSTERS + BEER**
Presentation Guidelines

Poster Presentations
The preferred format is A0 Portrait (841 x 1189 cm). AO landscape is also acceptable.

Oral Presentations
Please upload your presentations in the break before the start of your session. We will try to accommodate PowerPoint, Keynote and PDF presentations. If your presentation is complicated and with animations - please upload it in plenty of time to check all works ok. If you have special requirements please email Rachel.Wood@ed.ac.uk

***All presentations are 15 minutes long followed by 15 minutes discussion***

Prizes
There will be prizes for the best student talk and poster, generously donated by Cambridge Carbonates Ltd.

Conference Venue

The Conference will be held at the Swann Lecture Theatre, Michael Swann Building, King's Buildings, University of Edinburgh, Edinburgh.

The Ice Breaker (Registration and Whisky tasting) on Monday (5-8 pm) and Conference Dinner on Wednesday (7.30 pm onwards) will be held in the Playfair Library, Old College, University of Edinburgh, Edinburgh.

See map on page 7.
Getting to Edinburgh

Getting to Edinburgh is easy no matter where you are travelling from or how you choose to travel.

The city has excellent road, rail and air transport links making it accessible from all major cities in the UK and beyond.

By air

Edinburgh International Airport is around 30 minutes drive from the city centre. The short 12km journey is easy to commute by taxi, one of the frequent airport buses, or even better, on our new TRAMS, reputedly the most flexible in Europe!

There are over 40 flights a day from London and regular flights from 20 other UK airports. In addition, there are over 40 scheduled flights from Europe and several transatlantic flights also service the city on a daily basis.

As an alternative you can fly into Glasgow International, which is an hour’s drive west of Edinburgh and can be reached easily by the regular coach service. Slightly further afield, you can access Newcastle Airport (2hrs30min) or Manchester Airport (4hrs) by train.

By rail

Edinburgh has excellent rail links throughout the UK.

The East Coast mainline links Edinburgh and London King’s Cross and is the fastest intercity railway, which means that you can travel between the cities in around 4 hours. Or, if you prefer to travel overnight, First Scotrail Caledonian Sleeper service runs between London Euston and Edinburgh Waverley 6 nights a week.

There are great links to other cities too. The Journey times to / from York, Newcastle, Inverness and Aberdeen are all about 2 hours and it is just 45 minutes between Edinburgh and Glasgow.

All trains arrive at Waverley Station in the centre of the city, although some trains also stop at Haymarket, which is a smaller station in the West End.

By road

If you are travelling on a budget, buses are often your best bet. Edinburgh is well placed on the Scottish motorway network so getting here by bus or coach is easy with regular services from all major UK cities.

Travel times by road are less than you might think. From Birmingham it is around 5 hours, Manchester and York around 4 and Newcastle is just 2 hours away.

From the North of Scotland, Inverness to Edinburgh is about 3 hours and just over 2 hours from Aberdeen.
Hotels and Accommodation

There are many options for accommodation.

The cheapest option are student rooms in Pollock Halls for £45 per day with shared facilities (one bathroom per 4/5 rooms). These can be booked directly from Edinburgh First (University of Edinburgh) – see link on conference website. Credit card payment will be taken at the time of booking, and rooms are filled on a first-come-first-served basis.

Marketing Edinburgh Convention Bureau has negotiated rates for the 15th Bathurst Meeting and is pleased to offer a free online accommodation booking service to delegates. The website link allows delegates to book directly from the allocations of rooms being held specifically for Bathurst. This includes everything from basic (but en-suite) student accommodation in the University of Edinburgh Pollock Halls (Edinburgh First), to baronial, 5* splendour....

Field Trips

Pre-Meeting Field Trips

We ask all field trip participants to arrange their own insurance.

Field equipment (hard hats and high vis vests, will be provided).

For final logistical details please ask the main contact listed.

Trip 1: Siccar Point, West Lothian, UK

Dates: 13 July 2015

Siccar Point is a rocky promontory on the east coast of Scotland about 1 hour drive south of Edinburgh. This remote spot is famous in the history of geology as a result of a boat trip in 1788 in which James Hutton, with James Hall and John Playfair, observed the angular unconformity which Hutton regarded as conclusive proof of his uniformitarian theory. Gently sloping strata of 345 million year old Devonian Old Red Sandstone overlie near vertical layers of 425 million year old Silurian greywacke.

Logistics: Edinburgh return by coach, Depart Pollock Halls Main Entrance, 12 noon; return approx. 5pm

Trip Leaders: Mark Wilkinson (University of Edinburgh)

Contact: Rachel.Wood@ed.ac.uk

Trip 2: Late Dinantian of the Derbyshire carbonate platform margin, UK

Dates: 10-13 July 2015

Sequence stratigraphic evolution and carbonate facies types in contrasting hanging wall, footwall margins and platform interior settings. Incorporating new high quality seismic data from surrounding basins as an insight to platform evolution and abandonment of carbonate sedimentation.

Logistics: Collect from Manchester by coach at 17.00 on the 10th, and return to Edinburgh by coach in time for Icebreaker on the 13th.
Day 1 (10 July), Meet at 17.00 at Manchester Airport and drive to Derbyshire.
Day 2 (11 July), Intrashelf basin carbonates including possible palustrine facies
Day 3 (12 July), Castleton margin of the Derbyshire carbonate platform.
Day 4 (13 July), Trowbarrow Quarry in the Lake District. Aim to finish at lunch time to give
time to drive back to Edinburgh same day.
Trip Leaders: Pete Gutteridge, Cambridge Carbonates Ltd.
Contact: pete@cambridgecarbonates.co.uk

Trip 3: Carbonate facies of the Zechstein, Permian Basin, NE England
Dates: 11-13 July 2015

This fieldtrip will examine the Permian deposits of NE England, spectacularly exposed on
the coast 30 km from the city of Durham (a world heritage site for its medieval Castle and
Cathedral). Lower Permian aeolian Yellow Sands (equivalent to the gas-bearing Rotliegend
in the North Sea) are overlain by four Zechstein carbonate sequences deposited on distally–
steepened ramp (ZS1), reef-rimmed shelf (ZS2), oolite-dominated shelf (ZS3) and epeiric sea
(ZS4)-type platforms. Lowstand evaporites were precipitated in the basin and are now
represented by remarkable collapse breccias and evaporite residues. There are excellent
outcrops showing cyclic slope facies, a range of microbialites, enigmatic dedolomites, fault-
fracture development in sandstones and carbonates, and megabreccias. These rocks are
hydrocarbon reservoirs in the North Sea, the Netherlands, Germany and Poland.

Logistics: Edinburgh to Edinburgh by coach.
N.B. The precise order of outcrops to be visited depends on the tides.
Day 1 (11 July): Meet at Pollock Halls of Residence/Grant Institute Earth Science at 8.30 am
and drive to Sunderland, arriving around 11.00 am.
Morning: Yellow Sands, Marl Slate, ramp carbonates (ZS1), major slide, reefal carbonates.
Claxheugh Rock, Ford Quarry, by the River Wear.
Afternoon: Platform margin (beach, shoal, storm) and slope facies (calcidebrites,
calciturbidites, laminites) of the Roker Fm (ZS3) at Marsden near Sunderland; basinal
equivalent of the Ford Fm reef (ZS2); megabreccias from sliding of Raisby Fm (ZS1); collapse
breccia and residue of the Hartlepool Anhydrite (=Werra).
Day 2 (12 July): Morning: Permian Yellow Sands and Raisby dolomites (ZS1) overlying Upper
Carboniferous coal measures, with effects of major fault at Cullercoats and Tynemouth.
Afternoon: Zechstein reef (Ford Fm, ZS2), core, fore-reef at Tunstall Hills near Sunderland;
Yellow Sands, Marl Slate (=Kupferschiefer), Raisby Fm (ZS1), major syn-sed slide plane and
breccia, overlying Ford Fm reef and back-reef at Claxheugh Rock and Ford Quarry by River
Wear.
Day 3 (13 July): Morning: Beautiful microbialites and reefal conglomerates of Roker (ZS3)
and Ford (ZS2) Fms at Blackhall Rocks, south of Sunderland. Storm deposits in the Seaham
Fm (ZS4) at Seaham; residue of the Fordon (=Stassfurt) evaporites. Stunning dedolomites in
the ZS4. ZS2 Back-reef facies.
Afternoon: drive to Edinburgh to arrive in time for the icebreaker party.
Two nights (Bed & Breakfast) will be in St Aidan’s College, Durham.
Trip Leaders: Maurice Tucker (University of Bristol) and Mike Mawson (Durham University)
Contact: Maurice.Tucker@bristol.ac.uk
Contacts

Local Organising Committee
Rachel Wood (Chair)
Amelia Penny - PhD Student
Amena Al Harthi - PhD Student
Mariam Al Blooshi - PhD Student
Fred Bowyer - PhD Student

Scientific Committee
Noel James (Queen's University, Ontario, Canada)
Art Saller (Cobalt, USA)
Cathy Hollis (Manchester University, UK)
Dave Hunt (Statoil, Bergen, Norway)
Gareth Jones (ExxonMobil, USA)
Cedric John (Imperial College, UK)
Joyce Nielson (University of Aberdeen, UK)
Rudy Swennen (University of Leuven, Belgium)
Peter Swart (University of Miami, USA)
Jim Hendry (Tullow, Eire)
Sasha Turchyn (University of Cambridge, UK)
V. Paul Wright (PW Carbonate Geoscience, UK)
Ian Fairchild (University of Birmingham, UK)
Peter Burgess (Royal Holloway College, UK)
Madeleine Raven (Nexen, UK)

Field excursion leaders
Mark Wilkinson (University of Edinburgh)
Maurice Tucker (University of Bristol)
Pete Gutteridge (Cambridge Carbonates Ltd)