



Manchester Geological Association

President: Jane Michael

September 2017

www.mangeolassoc.org.uk

Founded 1925

INDOOR MEETINGS: CHANGE OF DATE

Please note that Prof. Ernie Rutter, our first speaker of the new Indoor Meetings season, has regrettably had to change the date of his talk. The talk will now take place on **WEDNESDAY 25 OCTOBER 2017**, one week later than the original date.

The venue, the lecture theatre in the Williamson Building, and the time, 7pm, have not changed.

We apologise for any inconvenience that this may cause.

Jane Michael

Indoor Meetings Secretary

Quick Diary

Wednesday 25 October 2017	7.00pm	The Science and Engineering of Shale
Saturday 18 November 2017	1.30pm	Broadhurst Lectures: Deep Earth Matters
Wednesday 29 November	6.30pm	Joint Meeting with Manchester Geographical Association
Saturday 9 December 2017	1.30pm	Some Aspects of Planetary Geology in the Solar System
Saturday 13 January 2018	1.30pm	Flying Fossils
Wednesday 7 February 2018	7.00pm	Annual General Meeting and President's Talk "Aspects of North Island Geology"

Who's Who in the MGA Officers

President: Jane Michael BSc (Hons)

Vice-President: Dr Cathy Hollis

General Secretary: Sue Plumb BSc

Membership Secretary: Vacant

Treasurer: Niall Clarke MSc

Indoor Meetings Secretary: Vacant

Field Excursions Secretary: Brian Smith

Newsletter Editor: Lyn Relph BSc (Hons)

Webmaster: Peter Giles MSc

Other elected members of Council

Nicola Fowler BSc (Hons)

Jennifer Rhodes

Peter Gavagan

Penny Heyworth MPhil

Ex officio members of Council

The Immediate Past President, Manchester Geological Association: Dr Ray Burgess PhD

RIGS Representative: Chris Arkwright PhD

The Association's representative on the North West Geologist's editorial team: Peter del Strother MBE MPhil
President of the Student Geological Societies of the University of Manchester

MGA Archivist: Derek Brumhead MBE

MGA email addresses

To contact our President: president@mangeolassoc.org.uk

To contact our Vice-President: vicepresident@mangeolassoc.org.uk

To contact our General Secretary: secretary@mangeolassoc.org.uk

For membership enquiries: membership@mangeolassoc.org.uk

For field visit enquiries: outdoors@mangeolassoc.org.uk

For indoor meeting enquiries: lectures@mangeolassoc.org.uk

For newsletter correspondence: newsletter@mangeolassoc.org.uk

For other enquiries: info@mangeolassoc.org.uk

Great Orme

July 2017

by Lyn Relph

The aim of the trip was to understand the dolomitisation and sedimentation of the limestones on the Great Orme. The lowest unit to be looked at was the Llandudno Pier Dolomite, which is the first unit above the Lower Paleozoic unconformity. Above this are the Tollhouse Mudstones, then the Great Orme Limestone, which are followed by the patchy Craig Croft Sandstones then Bishops Quarry Limestone and finally the Summit Limestone.

These rocks were deposited in a shallow marine setting on the footwall of an extensional fault, within a back-arc extensional regime, to the north of the Wales-Brabant Massif. The shore line of the North Wales platform was approximately where the present east Llandudno shore runs from the Great Orme to the Little Orme; in a Mediterranean type enclosed basin. The depth of the basin was controlled by a series of faults that were periodically reactivated. Ice caps controlled the sea level. Limestone is only deposited in warm (about 20°C), clear water (no clastic inputs) within the photic zone of a relatively calm environment. If sea level rises the limestone beds develop upwards then outwards, but when sea level falls a karst surface will develop. The bed thickness depends on the rate of sea level change; thick beds can form during times of rapid sea level rise when the polar ice is melting quickly and thin beds form when sea level rises slowly. After these rocks were deposited they were buried to a depth of about one kilometre during the Carboniferous period and re-surfaced in the Permian only to sink again to between two and three kilometres in the Jurassic, finally emerging to their present position in the Tertiary (the burial history is recorded in the cements because those precipitated from meteoric water have a different chemical composition to cements from sea water).

Dolomite is a calcium magnesium carbonate $\text{CaMg}(\text{CO}_3)_2$ in which alternate calcium ions are replaced by magnesium ions. It is not fully understood how it forms (see end note), but as long as there is a supply of seawater, or other fluid containing magnesium (may have been scavenged from basin sediments) dolomite can form. Seawater is likely to be the source down to depths of one kilometre; as it flows through faults and sediments. It can form soon after the limestone has been deposited or when deeply buried. Dolomite is about 50% calcite and 50% magnesium, which is part of the continuous solution series calcite-magnesium.

Pier Dolomite is a crinoidal packstone-grainstone, light orange/brown in colour with sparkly dolomite (Fig. 1) and thin interbedded shale and mud; it was deposited on the shelf edge. The fabric of the original limestone is preserved in places. As can be seen in Fig. 2 the dolomitisation only affects some of the limestone before randomly petering out. There is no obvious reason for this, but it could be prevented from forming by a decrease in the supply of Mg, or seawater, or a change in grain size; fine grained beds often dolomitise more easily than coarse grained ones and coarse grained beds allow the fluids to flow more readily, also stylolites and faults can disrupt the flow of the fluids. The Zebra dolomite (Fig. 3), which overprint the replacive dolomite, form under high pressure and show that these rocks have been deeply buried. Veins of calcite and lead were abundant.

Tollhouse Mudstones are thinly bedded, crumbly, grey marls that contain very little clay. Sedimentation rates were low and deposition was in a low energy, near shore environment there are also burrows and odd shell fragments. There were several shallowing and deepening episodes as shown by the interbedded limestones.



Fig. 1 crinoids and corals.



Fig. 2 random dolomitisation of the limestone.

The mudstone is important because there is very little dolomitisation above it. Therefore, this layer must have prevented the magnesium rich fluids flowing higher up the succession except where a later fault has allowed the fluid through. The dolomitised area around these faults is limited to a few tens of millimetres.

The **Great Orme Limestone** developed during a period when the ice caps were waxing and waning; ten cycles have been identified. When sea level was low a soil or proto-soil horizon

developed on the exposed, reworked and karstic limestone surface of each cycle. The proto-soil horizons are orange and the more developed soils tend to be pink to grey (Fig. 4), some are lithified; burrows can be seen in the overlying limestone. The soil horizons can be very small pockets (tens of mm thick and half a meter wide) or quite extensive. Above the soil horizons, but not related to them, a fault plain surface could be seen with large chunks of fault breccia to the right where the fault moved against the stable bedding. There are also some very good examples of syn-sedimentary faulting as can be seen in Fig. 5.



Fig. 3 Zebra dolomites.



Fig. 4 Top photo is a pinky coloured more developed soil horizon. The lower photo is a proto-soil and orange coloured. Both have re-worked fragmental limestone and shell fragments.



Fig. 5 syn-sedimentary faulting.

Farther along the road we came to a break in the shelf deposit where wave energy was relatively high as could be seen in the thick beds that have large foresets dipping to the North. Here there are some massive burrows, 50 mm or more in diameter, (Fig. 6) that are associated with the muddy horizons that were probably made by some type of crustaceans (possibly shrimps). Some of the beds are finely laminated and are of clean fine grains and no burrows so high energy deposition. The fractures here are post compaction because they cross the stylolites.



Fig. 6 Crustacean burrows.

tolerant brachiopods and sponges to flourish. The sponge spicules are opaline (hydrated silica) that dissolves and then moves through the sediment to fill the burrows (Fig. 7); in the process it changes to chert, which prevents later compression of the beds.

The **Summit Limestone** in Bishops Quarry has a lot of *Gigantoproductids* in life positions (Fig. 8), concave up. *Gigantoproductid* brachiopod fauna form death assemblages at the base of the limestone beds. Most were the ordinary none spiny type, but we did find a few with spines.

This was the end of the limestone deposition because the water was deepening at the beginning of the first episode of burial; it was also the end of our trip.



Fig. 8 Top none spiny *Gigantoproductid* in life position and below a spiny species; one of the spines can just be seen to the left of my finger there are also several stumps where spines would have been attached.



Craig Croft Sandstone was not seen, but it is a thin, patchy, deltaic, sand deposit that forms the top of the Asbian.

After a very steep climb up a footpath we stopped for a well earned lunch break.

The **Bishops Quarry Limestone** is immediately above the Craig Croft Sandstone and the first unit of the Brigantian. The environment was beginning to change to deeper water with an influx of clay, which reduced light levels allowing the more



Fig. 7 Chert infilling burrows.

End note

I was confused about how well the dolomitisation process was understood; this was Cathy's reply: we know that it can form from seawater under certain conditions and we can precipitate it in the lab at high temperature, but it is not observed in nature forming at the surface even though geologically we know that this can happen. Sorry if this sounds confusing, but the bottom line is that it is a bit of an enigma!

I would like to thank Dr Cathy Hollis, for a very interesting and informative day and also for checking the facts in my report.

North West Geologist

We hope that you have enjoyed reading your copy of Issue 20 of the *North West Geologist*. These were posted out in June. If by any chance you have not received your copy, please contact a member of Council.

Spare copies will be available at the forthcoming Autumn/Winter lectures.

Geological Equipment Suppliers

Geology Superstore in Bolton supply everything an amateur or professional geologist could want. They also supply educational materials. <http://www.geologysuperstore.com/>

Geosupplies in Sheffield also supply geological equipment, but they also run field trips and holidays. Tutorials are also available; some are based in Manchester. <https://www.geosupplies.co.uk/>

New Natural History Museum Fossil Explorer mobile app

The Natural History Museum in London has just released a new version of the free Fossil Explorer app, a field guide to the common fossils of Britain that helps identify fossils based on where they are found.

Whether seeking ammonites in Lyme Regis, marine reptiles in Whitby or trilobites in Girvan, beginner and more experienced collectors alike can learn about their finds and what else may be beneath their feet. Through Fossil Explorer, users have access to the combined expertise of the Natural History Museum and the British Geological Survey. Based on information from the Museum's popular British Fossils book series, the app offers details about more than 1,200 fossil taxa as well as local geology.

Thanks to an interactive geological map, Fossil Explorer suggests likely fossil matches based on where they are found, giving a list of fossils known to occur in rocks of the same age. Introductory facts and illustrations help beginner fossil hunters get started, while additional information enables more experienced fossil collectors to delve deeper.

New functionality in this release allows users to create and share lists of fossils they have found and set wish lists for future discovery.

We hope the app will encourage budding citizen scientists around the country, inspire a new generation of explorers and get people thinking differently about the natural world.

The app is available for iOS and Android. More information and download links are available on the Museum's website at www.nhm.ac.uk/fossilexplorer.

OTHER SOCIETY EVENTS

NSGGA <http://www.esci.keele.ac.uk/nsgga/>

- 17 September** 11:00 Field Day - Clee Hills with Andrew Jenkinson (SGS)
12 October 19:30 Lecture - Title and speaker to be confirmed.
9 November 19:30 Wolverson Cope Lecture - 'Geoconservation for Science and Society - past, present and future' by Dr Colin Prosser, Natural England and President of the Geologists' Association.
7 December 19:30 Christmas Social with talk by Eileen Fraser
11 January 19:30 Lecture - 'The great 1815 eruption of Tambora and future risks from large-scale volcanism' by Dr Ralf Gertisser, University of Keele.
22 February 19:30 Lecture - 'The origins and evolution of the River Trent during the Quaternary: new insights' by Professor David Bridgland, University of Durham.
8 March 19:00 AGM and Chairman's Address by Dr Stuart Egan, University of Keele.

BCGS <http://bcgs.info/pub/>

- 16 September**, 10:30 Geoconservation day - Wren's Nest
18 September, 7:30 On the move in pursuit of 'black gold'
1 October, Field visit - The South Malverns
6 October, 7:30 The Corsi Collection of decorative stones: where geology meets the arts.
4 November, 10:30 Geoconservation day - Barrow Hill

Leeds Geological Society <http://www.leedsga.org.uk/>

- 12 OCT** The Aberfan Disaster: Learning from the Past. Dr Helen Reeves BGS
21 OCT (Saturday) Cave Science Symposium Joint Meeting with BCRA and YGS
09 NOV Geological Mapping of the Chalk Aquifer: A Hydrological Case Study From the Yorkshire Wolds. Dr Andy Farrant BGS
07 DEC AGM and Conversazione – Short Talks and Displays by Members

OUGS <http://ougs.org/northwest/>

- October 28th** Building stones and outcrops of Central Manchester. Leader: Dr Chris Arkwright
To examine the lithology and sedimentary features of an outcrop in Castlefield and identify a variety of building stones in Manchester city centre and discuss their formation.

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NWGA <http://www.ampyx.org.uk/cdgc/rhaglen.html>

Other Events

Earth Science Week: 7 - 15 October 2017

Earth Science Week organised by the Geological Society is running from 7 - 15 October. The theme is 'Our Restless Earth' and celebrates the 50th anniversary of the theory of Plate Tectonics www.geolsoc.org.uk/earthscienceweek. This follows a major conference at the Geological Society on 3-5 October 2017 'Plate Tectonics at 50'. Unfortunately that meeting is already a sell-out however the website does promise 'live streaming' <https://www.geolsoc.org.uk/wsmith17>.

Manchester Geological Association

Indoor Meetings 2017/18

Wednesday 25 October 2017	7.00pm	The Science and Engineering of Shale Speaker: Prof. Ernie Rutter
Saturday 18 November 2017	1.30pm	Broadhurst Lectures – Deep Earth Matters Speakers: Prof. Hugh Rollinson Dr Jason Harvey Dr Andrew Walker
Wednesday 29 November	6.30pm	Joint Meeting with Manchester Geographical Association Details below
Saturday 9 December 2017	1.30pm	Some Aspects of Planetary Geology in the Solar System Speakers: Prof. David Rothery Dr Rhian Jones Dr Susanne Schwenzer
Saturday 13 January 2018	1.30pm	Flying Fossils Speakers: Dr Stephen Brusatte Dr Mark Witton Elizabeth Martin
Wednesday 7 February 2018	7.00pm	Annual General Meeting and President's Talk “Aspects of North Island Geology”

Meetings from October to February inclusive will be held in the Lecture Theatre in the Williamson Building, Oxford Road, Manchester.

Full details of the speakers and their titles will be circulated nearer the time of the meetings

Joint Meeting with Manchester Geographical Association

The joint meeting with the MGA will take place on Wednesday 29 November 2017 at 18:30 (ie 6.30pm). **The speaker will be Prof Iain Stewart**, Director of Sustainable Earth Institute, Plymouth University and his title is 'Faulty Communications: seismic hazard in Istanbul'. This is the lecture which was postponed in March this year.

The venue is Manchester Metropolitan University, Brooks Building, Birley Campus, Bonsall Strteet, Manchester M15 6GX as previously.

Booking is essential. This will need to be done online through Eventbrite <https://www.eventbrite.co.uk/e/iain-stewart-faulty-communications-seismic-hazard-in-istanbul-tickets-38202502714>

If you do not have access to the internet, please will you contact Jane Michael on 07917 434598 and she will collate names and undertake a block booking. Please do this as soon as possible as she is away several times between now and 29 November: places are limited and are likely to go fairly quickly as they did in March. If necessary please leave a message on her voicemail giving your name and a return phone number.

Member Survey

To all Members of the MGA. Subject: Outdoor Events for 2018.

Dear Member,

As the 2017 outdoor season draws to a close, Brian Smith our new Outdoor Meetings Organiser is busy preparing the program of events for 2018. He wants to ensure that it is an interesting and appropriate program. To this end the Council would be most grateful if you would complete the form below and return it to him either by email (outdoors@mangeolassoc.org.uk), or by post to the address below, or in person at any of the lectures.

Outdoor Events
5 Hughes Place
Orford
Warrington.
WA2 9EJ

We want to assure Members that their views will be treated as confidential unless you agree to them being discussed by the Council. Please indicate on the form.

If you suggest an event or activity you are NOT committing yourself to becoming involved in the running or organisation of that event.

Even if you do not attend the outdoor events your opinion is still valuable and your help in preparing an exciting program for 2018 will be greatly appreciated.

MGA Council

Who is this?



I am researching this eighteenth century oil portrait of a gentleman standing in a landscape next to a rocky escarpment. In his hand he is holding a piece of ore, which looks gold in colour; with his other hand he is pointing to this piece of ore. On the re-lined canvas there is the word 'Tissington' written in modern ink, probably by the re-liner and taken from the original canvas. I was wondering if you knew of any academics with a good knowledge of the key players of mineralogy and geology in the eighteenth century, whom I could contact and who might be able to help me identify the sitter in the portrait. The portrait itself is 50 x 40 inches, very grand and imposing, so I would suggest that the sitter could be a significant personality in the field of mineralogy or geology.

Grea Page-Turner

Who is this ? Published in Industrial Archaeology News, Autumn 2017; I have been able to answer it.

Greg Page-Turner is correct in suggesting that the sitter in the portrait could be a significant personality in mineralogy or geology. This is a portrait, attributed to Joseph Wright of Derby, of Anthony Tissington FRS (1703-1776) of Derbyshire who is shown holding a large piece of green copper ore (chalcopyrite) and there appears to be a large vein of it behind his right shoulder. He was a mineral agent and originally connected to the Ecton copper mine in the Manifold valley of the Peak District. He was eminent in his field and his circle of friends included members of the Lunar Society such as Erasmus Darwin, Matthew Boulton, John Whitehurst (an early Derbyshire geologist), and also Benjamin Franklin who supported him when elected as Fellow of the Royal Society.

I am grateful to Sir Richard Fitzherbert Bt of Tissington Hall Derbyshire, for recommending to me the following outstanding website which all interested should certainly consult.

<http://www.artwarefineart.com/gallery/portrait-anthony-tissington-frs-1703-1776-holding-piece-chalcopyrite-his-hand-standing-mine>

Derek Brumhead



Manchester Geological Association
Questionnaire

Part 1: Historical Information

If you didn't attend any field trips please go to part2

Question	Score	Comments
How many events did you attend in 2017?		
How would you rate overall the events (0 not good – 10 very good)		
Was the distance to the event? (0 too far – 10 no problem)		
In general how was the duration of the trips? (0 too long or too short – 10 OK)		
Did You get enough information BEFORE the trip? (0 not enough – 10 right amount)		
Please indicate what additional information you would like to have received.		
Did you receive the information about the trip in enough time? 0 – too late – 10 in enough time		
How was the level of explanation at the selected locations on the trips? 0 too advanced, I didn't understand any of it 10 Good, it was clear and adequate		
Did you find the trips physically demanding? (0 too hard – 10 no problem)		
Do you have your own transport? (yes / no)		

Part 2: Future Events

Question	Response
Will you be attending events in 2018? If not please indicate why (this answer is optional)	
What days are best for you? (weekdays, Saturday, Sundays)	
Which do you prefer: half days/ full days / evenings? Which do you prefer: weekends / week days:	
Do you have any suggestions for locations or subjects for trips in 2018 (You will NOT be asked to organise or lead any event you suggest.)	
Is the distance to the trip sites an issue? What would you consider a reasonable distance for a day trip? If it is would you consider car sharing ? Would you be willing to assist in car sharing if asked?	
Is the walking distance of the trips an issue? What would you consider a reasonable distance to walk in a day?	
Do you feel the explanations or subjects covered on the trips are: (0 too advanced – 10 too simple)	
Would you like to see more or less trips? If so how many?	
Would you consider trips over more than one day?-	
If there was an entrance fee or other cost associated with a trip (not by the MGA) would you be willing to pay? If so how much do you consider a reasonable price	

Any additional information or suggestion on how the MGA can improve the field trips it organises	
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Part 3: Personal

THIS SECTION IS OPTIONAL

If this section is NOT completed the information supplied WILL NOT be disclosed to any other person. The answers will be collated with the other forms.

NAME	
I agree that the information in this form can be discussed with other members of the MGA council. Yes/No	