Hello! Welcome to the new AMG bulletin.

The Applied Mineralogy Group (AMG) is a special interest group of the Mineralogical Society of Great Britain and Ireland. Our aims and interests are exactly ‘what it says on the tin’ in that we’re interested in collaborating in meetings/workshops/conferences, running courses, outreach and generally communicating any aspect of ‘applied mineralogy’ - whether it be ore mineralogy and mineralisation, extractive industries and industrial minerals, geotechnics, engineering geology, and most especially analytical techniques.

The AMG was founded by Norman F.M. Henry in the early 1970s and was originally linked to the Commission for Ore Mineralogy (COM). Over the years the group has been involved in various exciting projects. We would now like to introduce to you the first online (free!) bulletin for AMG, through which we hope to bring you news of forthcoming AMG events, student bursary opportunities, and random fun facts. It's also a way by which we hope to encourage you (our AMG members, Mineralogical Society members, geological and mineralogical-minded non-members, and aspiring young geoscientists - even schools!) to get in touch and involved with the group. We'd be really interested in hearing about your mineralogical events and would be delighted to discuss ideas for the AMG to be involved.

Hope to see you for the next bulletin in two months’ time.

#AppliedMineralogy Enrica Bonato

Chondrite meteorites are a class of meteorites which contain small spheres called chondrules. Chondrules form in space as molten or partially molten droplets before being accreted to their parent body. Chondrules are mainly formed of silicate minerals such as olivine or pyroxene, and surrounded by a glassy and/or crystalline matrix. This figure represents an EDX elemental map of a chondrule present in Colony, a carbonaceous chondrite meteorite 4.6 billion years old. The map was acquired using a FEI Quanta 650 FEG SEM at the Imaging and Analysis Centre at the Natural History Museum in London. This sample is part of my PhD research which focuses on Ornans-type chondrites (CO) which are amongst the most primitive extraterrestrial materials. The aim of the project is to investigate the amorphous phases present in the matrix of CO chondrites that were exposed to different degrees of thermal metamorphism, to understand their relation with the surrounding crystalline phases (< 1 µm) and their chemistry and texture. These aspects will be investigated through an integrated analytical approach comprehensive of Electron Microscopy techniques, X-Ray Powder Diffraction and Spectroscopic approaches; the analyses will be carried out at the Natural History Museum (London), University of Glasgow and Diamond Light Source. Enrica Bonato.

To stand a better chance of being included in the next bulletin's #AppliedMineralogy, include @amg_min and/or #AppliedMineralogy in your next mineralogy related tweet!

NAC+ 2016 report Hannah Hughes, Denis Schlatter and Kathryn Goodenough

The second North Atlantic Craton Conference was held at the Royal College of Surgeons in Edinburgh, 21-23rd March 2016. The NAC+ organising committee would like to thank all our industry and learned society contributions, including AMG. Sixty-four international delegates (from Canada, Greenland, Sweden, Finland, Norway, Denmark, Germany, Switzerland, France, Ireland and the UK) representing industry, academia and government surveys, attended this lively and discussion-driven meeting. The first day examined the geology, structure, and magmatic evolution of the North Atlantic Craton and surrounding mobile belts across Canada, Greenland, the UK and Scandinavia; the
second day focused on genesis of mineralisation in these areas, and new tools being used for study of mineral prospectivity. The conference was divided into three main themes:

- Formation and cratonisation of the NAC: from micro-continent to craton.
- Proterozoic orogens: the mobile belts surrounding the NAC.
- Mineral resources of the NAC and adjacent Palaeoproterozoic mobile belts.

This is a difficult time for the exploration industry, low commodity prices, although the well-documented cyclicity of the industry suggests that it is only a matter of time before an upturn. With this outlook in mind, the NAC Conferences (first held in 2014 at the University of St Andrews, and now with plans for a future meeting in 2018) are a chance for academics and industry to discuss recent developments in the geological understanding of the North Atlantic Craton and its surrounding mobile belts. Discussions at the 2016 meeting reviewed developing ideas for mineral deposit models and for the overall mineral resource potential of the region, and there was lively debate about issues such as the importance of lithospheric mantle versus crustal sources for metal enrichment. A key focus was to address the latest ideas on correlations between disrupted parts of the previously assembled supercontinents, in order that exploration can be carried out efficiently and successfully by predicting the spatial distribution of deposit types. Thus the NAC+2016 conference proved to be a valuable opportunity for knowledge exchange between groups and has stimulated continuing discussion and collaboration.

A group of 17 delegates from Canada, Greenland, Denmark and the UK also attended the post-conference field trip (24-28 March 2016) to the Isles of Harris and Lewis, Outer Hebrides of Scotland. During the 4 days, the group traversed these beautiful islands, taking in the South Harris Igneous Complex, rare metal

**Introduction:** In 2009, I was approached by Professor Maria Boni (University of Napoli, Italy), with the idea that QEMSCAN® (automated SEM-EDS mineral analysis) may be a useful technique for examining non-sulphide Zn samples. These samples are notoriously difficult due to their complex mineralogy, but understanding them is important to improve the processing of this ore type. The challenge was accepted, and was also used as an opportunity to highlight the advantages and disadvantages of the mineralogical technique.

**Method:** Over 54 samples were examined with a variety of methods (optical microscopy, XRD, manual SEM-EDS, EPMA) by a team of researchers, but my part was the QEMSCAN® analysis to examine the mineralogy. Although the measurement of samples is automated, the technique requires the databases to be developed and validated, especially for complex samples such as non-sulphide Zn samples. This allows the minerals to be accurately identified, and was challenging due to the varied, complex, and in some cases low abundances of the minerals associated with this deposit type.

The other techniques mentioned above were required to validate the QEMSCAN® mineral identification. The whole process also identified the advantages and limitations of the QEMSCAN® technique.

**Results and implications:** The mineralogical investigation by QEMSCAN® was successful and enabled samples to be accurately mapped, providing mineralogical and spatial textural data (lithotyping, mineral distribution, Zn deportment), and also trace mineral data that can be difficult to identify by other methods such as XRD. This information could then be used to inform the potential processing techniques required for the deposit, with information such as penalty and bonus elements also important. Furthermore, it enabled a detailed understanding of the advantages and limitations of the QEMSCAN® technique, which is useful for all types of mineralogical work.


**Figure 1:**
(a) polished thin section of non-sulphide Zn sample; (b) QEMSCAN® mineral map of non-sulphide Zn sample (false colour).

**Legend (figure 1b)**
- Orange/brown = Fe-oxides (containing Zn).
- Dark green = willemite/hemimorphite.
- Light blue = calcite.
- Grey = smithsonite.
- Green-blue = saucnite.

**Interested in writing a ‘special feature’ in a future edition?** Please contact George Guice (GuiceG@cardiff.ac.uk).
by country or region. Overall, the determination of 'criticality' is dependant on an assessment of supply, demand, geographic concentration of production and perceived political risk.

**Coffee break small-talk: mineral application facts**

- The average car contains 108kg aluminium, 19kg copper and 10kg zinc - that is a lot of bauxite, chalcopyrite, bornite and sphalerite!
- Additional to being used in jewellery, gold also saves lives, with the electric contacts in car air-bag systems commonly being gold-coated.
- Next time you are enjoying fireworks, remember that: strontium + sodium = orange; copper + strontium = lavender; and aluminium = BANG.

Reference: USGS

**Student bursaries:** Muhammed Sajid  
(Camborne School of Mines, University of Exeter)

My abstract was selected for an oral presentation in the "Tectonic and magmatic processes in extensional settings" session. The abstract constitutes a portion of my PhD research work entitled "Mineralogy and geochemistry of alkaline basic dykes from the northern Indian plate: signs of more than one episode of rifting and associated magmatism". It interprets the petrogenetic evolution, emplacement timing and tectonic setup of basic dykes on the basis of their mineral and whole rock geochemical composition.

The presentation went very well with some very encouraging comments at the end. Positive feedback makes me confident about my research interpretations which, which was the major achievement of attending this meeting. There were many interesting presentations and this was a valuable experience to discuss the effective ways I can use my geochemical data. Among the most interesting ideas, use of the REEs in petrogenetic modelling, rock deformation and its relation to magmatic ascent are my most exciting concerns.

Our bursary applications close on 1st March and 1st September each year.

Please go to [http://www.minersoc.org/amg.html#bursaries](http://www.minersoc.org/amg.html#bursaries) for details.

**Calendar**

**11th - 15th July 2016**  
Highly siderophile Element Geochemistry Workshop, Durham, UK. Conference programme now available at: [http://www.hseworkshop.co.uk/programme](http://www.hseworkshop.co.uk/programme).

**27th August - 4th September 2016**  

**11th - 15th September 2016**  

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We are currently in discussion regarding date and location of the next NAC Conference. If you would like to be involved or have some ideas you’d like to put forward, please get in touch by e-mailing NACworkshop@gmail.com.

**EMC 2016 preview**

The 2nd European Mineralogical Conference, which will take place in Rimini (Italy) between 11th - 15th September, will include an applied mineralogy theme. Specifically, this theme will include the following sessions:

- Clays, zeolites and nanostructured minerals: from mineralogy to applications in industry and environment.
- Geometallurgical aspects in beneficiation of ore deposits.
- Past and present of geomaterials used in industrial processes and human activities.
- Mineralogy, geochemistry and valorization of industrial and mining wastes.
- The future of critical metals: mineralogy, metallogenesis and geometallurgy.
- Mineral sciences for the understanding of cultural heritage.

The ‘future of critical metals: mineralogy, metallogenesis and geometallurgy’ session, chaired by John Bowles, Nigel Cook and Hannah Hughes, will discuss the properties of minerals that may offer a resource of Ga, Sc, Te, Ge, In, Hf, Co, Ta, Nb, V, Sn, Cr, PGE and REE. Such a discussion is particularly relevant given the outcomes of COP21 and current moves away from carbon-based fuels. These shifts will increase the demand for these minor technology metals, which have high price volatility and are potentially subject to supply disruption. Furthermore, although recycling of some major elements (eg. aluminium) is greater than 50%, recycling of others, such as the REE, is less than 1%. Strategically, it is important to avoid a resource production monopoly by country or region. Overall, the determination of ‘criticality’ is dependant on an assessment of supply, demand, geographic concentration of production and perceived political risk.

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**Pegmatites, the Eocene Loch Roag lamprophyre dyke, the West Lewis granite-migmatite complex.** Based at the Harris Hotel for the duration, the contingent enjoyed lively debate over many aspects of this region’s geology and it’s correlation to the mainland Lewisian and wider NAC.

The 17 delegates who attended the post-conference field trip.