VMSG

Volcanic and Magmatic Studies Group

September 2018 Newsletter (No. 40)

Welcome to the VMSG newsletter!

As the surreal experience of a consistently warm summer finally comes to a close and we all dig out the jackets again it is time for the Q3 VMSG newsletter! This issue comprises a range of content including a recently published guide to the Alnö Carbonatite Complex, an article on the Cameroon Volcanic Line, published papers, meetings and the third edition of our 'Impact in Focus' section in which David Pyle gives insights into a paper that has helped to shape his understanding of volcanic processes.

New Springer Guide on 'The Alnö Carbonatite Complex, Central Sweden'

By Peter Kresten and Val Troll

This GeoGuide provides an overview of the geology of the Alnö carbonatite complex, combined with an up-to-date field itinerary. Covering all major geological aspects, it offers an essential summary of Alnö's intriguing magmatic rocks in a compact format suitable for field excursions and home study alike. As one of the type localities for carbonatite, the late Proterozoic Alnö ring complex has been a crucial site for carbonatite-related research (next to the Fen complex in Norway), and provided one of the earliest test beds for this unique group of igneous rocks. Five geological excursions introduce the visitor to the most rewarding outcrops, including detailed descriptions and a wealth of high-quality colour photographs. The excursions are complemented by a detailed review of the history of scientific investigation on Alnö and, in particular, a catalogue of exotic and common minerals associated with the complex's carbonatitic and alkaline silicate rocks.

Finally, a summary of its trace element and isotope geochemistry as well as a brief outlook on Alnö's potential as a future source of Rare Earth Elements (REEs) completes the book.

Flow banded sövite intrusion with pyroxenite inclusions and crosscutting fine grained carbonatite veins and dykletts.

Val Troll at the type locality for 'alnöite', an ultramafic rock of the kimberlite family.

Sövite pegmatites are amongst the most spectacular rocks exposed at Alnö

Impact in Focus

Impact in focus this issue comes from **Prof. David Pyle** of Oxford University who has kindly shared insights on a key piece of historical volcanology from Santorini volcano dating back to the late 19th century.

Citation: Fouqué, F. (1879). Santorin et ses éruptions. G. Masson et cie, Paris. Fouque, F. (1998). Santorini and its eruptions. Translated by A.R. McBirney, Johns Hopkins University Press, Baltimore.

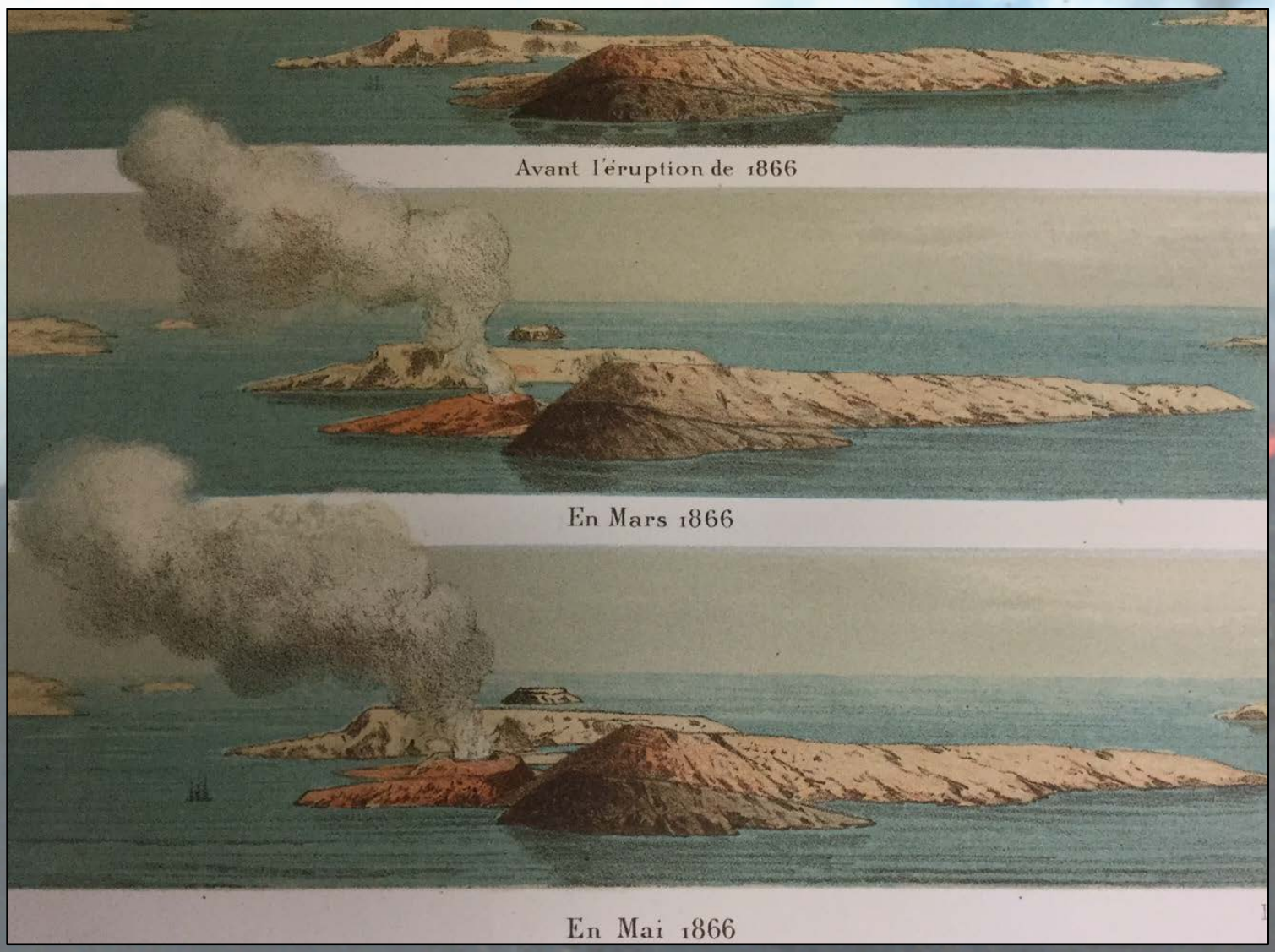
Recommendation:

There's always too much to read, and just keeping up with the most recent papers field feels like a Sisyphean task: no sooner do you think that you have caught up, than the next journal issues are upon us again. Whatever the challenges of keeping up to date, it is always worth making time to catch up with the back catalogue – and the works that helped to set the foundations for where we are now.

My choice for 'impact in focus' is Ferdinand Fouqué's monograph '*Santorin et ses éruptions*'. This was published originally in French in 1879, and later translated into English by Alex McBirney, and has a scope that one could hardly imagine a single author completing today. It sets out Fouqué's studies of Santorini volcano, in Greece, taking in his observations on volcanic gases and the 1866-1870 eruptions of Santorini, and investigations of the petrography and chemistry of the eruptive products. Most significantly, Fouqué developed an explanation for the formation of Santorini's flooded crater, or caldera, by eruptive processes. This brought an end, once and for all, to ongoing arguments about whether volcanic mountains grew through sequential eruptions (favoured, for example by Lyell); or by bulging and uplift, a hypothesis that had been popularised by Alexander von Humboldt in his study of the 18th century eruption of El Jorullo, Mexico.

I began my volcanological career in Santorini, piecing together several of the late Pleistocene explosive eruptions of this volcano. I was certainly aware of Fouqué's work at this time, but don't remember when I first saw the physical volume. I do, however, have a very clear recollection of a moment during a viva, when my co-examiner honed in on the citation of 'Fouqué, 1879' in the opening paragraph of the thesis, turned to the candidate and said 'Tell me, what did Fouqué write about Santorini, and what have we learned since then?'. At that moment, I am not sure that I could have done any better than the examinee, who faltered a little before admitting that they had not actually ever seen it. A salutary lesson!

Since then I have returned to Fouqué on a number of occasions, following up on his work on volcanic gases; on the historic eruptions of Santorini and their precursors; and his archaeological discoveries. It is always humbling to appreciate how long-lasting contributions in observational science are; and to realise what rich insights these works contain. Fouqué's monograph also spanned the arrival of photography as a way of recording eruptive activity, and is immaculately illustrated with both coloured lithographs, and early photographs. '*Santorin et ses éruptions*' certainly influenced other foundational studies of single volcanoes, including



Coloured lithographs showing the early stages of the Santorini eruption of 1866. Lithography by Eugene Ciceri, based on photos taken by Fouque from Fira.

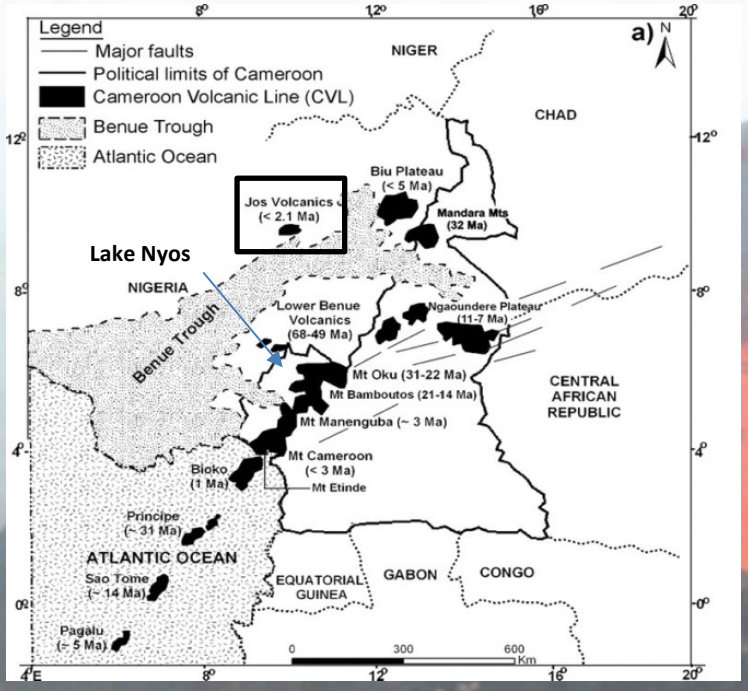
Alfred Lacroix's immense study of the 1902-4 eruptions of Pelée in Martinique (Fouqué was, after all, Lacroix's doctoral advisor and father-in-law); and perhaps also the Royal Society's report on the eruption of Krakatoa. While this style monograph has fallen out of fashion in scientific publication today, I would recommend taking the time to track down some of the early works in the field, to deepen and broaden your horizons.

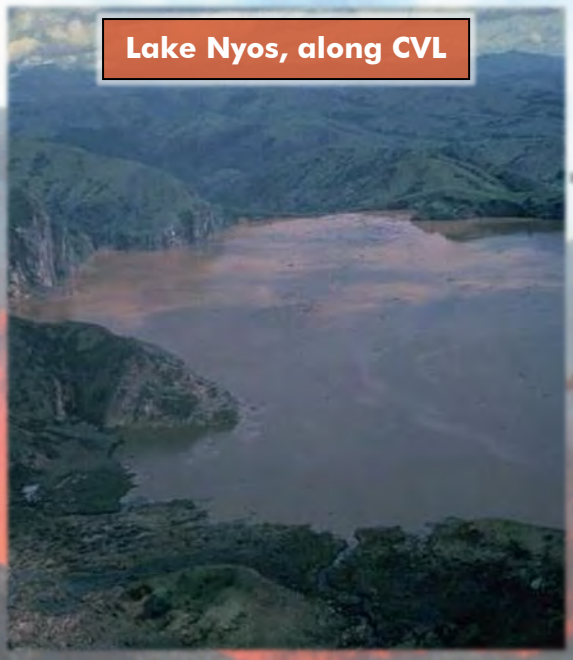
Integrated geohazard monitoring for disasters mitigation along the Cameroon volcanic line and Jos plateau

Sent in by Mohammed Shuaibu Tsalha

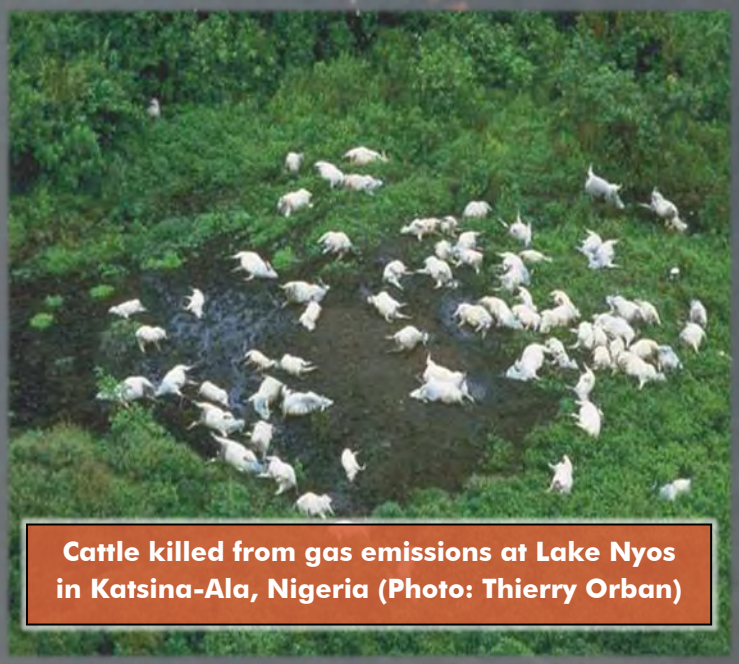
The Cameroon line is a geological fault or rift zone that extends along the border region of eastern Nigeria and western Cameroon, from Mount Cameroon on the Gulf of Guinea north and east towards Lake Chad. It contains the Mbéré Rift Valley. It is characterized by a chain of mountain ranges and volcanoes known as the Cameroon Range or Cameroon Highlands. It was formed around 80 million years ago when the African plate rotated counter-clockwise. The resulting rift opened up magma conduits that allowed the line of volcanoes to form. Nine of the volcanoes along the line are considered active, with the last eruption occurring in 2000 at Mount Cameroon. Other mountains in the chain include the Bamboutos Mountain, Mount Etinde and Mount Manengouba.

Lake Nyos is a crater lake associated with the volcanism of the Cameroon line in northwest Cameroon. The portion of the rift extending into the Atlantic is responsible for the formation of a string of islands including Annobón, Bioko Príncipe and São Tomé. These are also sometimes referred to as the Gulf of Guinea Islands. Lake Nyos is bounded on it northern part by a narrow natural dam consisting of poorly consolidated material. If the dam happened to collapse it could lead to devastating floods which

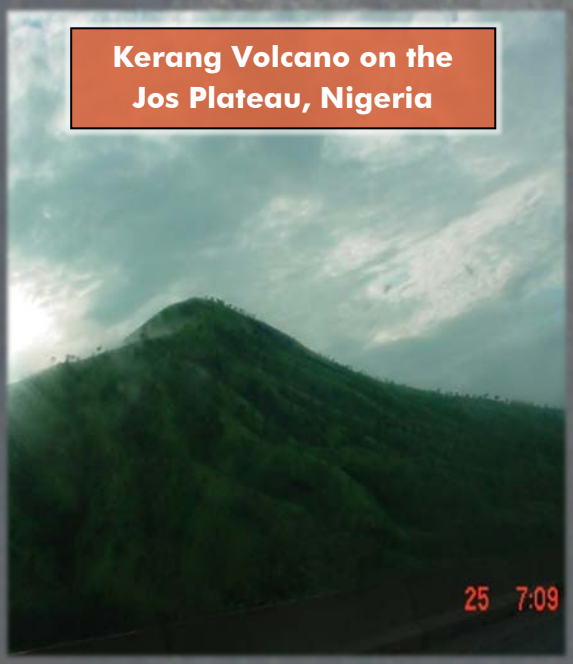




Lake Nyos, along CVL



Cattle killed from gas emissions at Lake Nyos in Katsina-Ala, Nigeria (Photo: Thierry Orban)



Kerang Volcano on the Jos Plateau, Nigeria

Background images associated with hazards along the Cameroon Volcanic Line. Map adapted from Fitton and Dunlop (1985) highlighting Jos Volcanics and Lake Nyos.

could affect a downstream area as far as Nigeria, 100 km away.

We have proposed a project that is aimed at verifying the causes of geological hazards through integration of various observational data using surface geodetic measurements and subsurface geophysical measurements. We are currently seeking international collaborators to bring this project proposal forward.

Problem Statement

In 1986, a tremendous explosion of CO2 from the lake Nyos, West of Cameroon, killed more than 1700 people and livestock up to 25 km away, according to a report on the delineation of potential risk zones, Limbe Subdivision of Cameroon, compiled by Buh Wung Gaston of the GIS and Remote Sensing Department, Limbe Botanic Garden, Cameroon. Apart from this, there are several additional hazards within the area ranging from existing faults, the Benue Trough and cross-boundary natural hazards as has been reported by Ayonghe et al., (1999); Aka et al., (2008), etc.

Between 1984 and 1986 three gravity surveys were made over the basin and adjacent basement areas of Nigeria and Cameroon to reveal that the

western half of the basin is associated with a broad positive Bouguer anomaly at least 100 km wide and amplitude in excess of 20 mGal (200 gu). Preliminary gravity results for the Mamfe Basin in the border region of north western Cameroon with south-eastern Nigeria are reported. No other geophysical studies are available for this important area however, which is genetically related to oil and gas deposits in the Benue Trough.

The impending danger threatening over two hundred communities on the Nigerian side by over 132 million cubic meters of flood water which is expected to be released as a result of the possible breakage of Lake Nyos, has underscored the imperative of undertaking new project work in the region.

Project Justifications

The need for a prompt response and early warning to disaster phenomenon for earthquakes, volcanic eruptions, landslides, and other slow deformation phenomena that precede crustal movement make this proposed work inevitable

The need for the creation of a well-established sub-regional network of stakeholders in risk assessment and to enhance regional cooperation in information sharing and exchange bordering on hazards arising from or likely in future, from the CVL

The imperative for the establishment of a framework on the methodology for national risk assessment in West Africa through the presentation of different risk assessment and mapping tools using geo-information data and techniques

The need for stakeholders in the region to collectively coordinate geohazard monitoring on the CVL in a bid to effectively and efficiently address the common challenges in building resilience to potential disasters from CVL

The necessity to reduce loss of life and property and protect the participating nations' critical infrastructure from all types of hazards through a comprehensive, risk-based, emergency management program of mitigation, preparedness, response and recovery.

The compulsions to cultivate best practice(s) in geohazard studies, develop natural disaster databases, establish joint educational program of remote sensing, geo-information science and earth observation.

The responsibility to jointly undertake a range of scientific activities, including natural hazard risk and impact analysis, education and training, volunteers, publications and research, collect and share research and experience related to preparedness for, response to, recovery from, and mitigation of disasters, emphasizing the link between hazards mitigation and sustainability to both producers and users of research and knowledge on extreme events.

The necessity to further the understanding of the natural processes in the Earth's crust of the study area and physics-based technologies, and to transform this knowledge into economic and social benefits for the region.

Objectives

The objectives of the joint research include among others:

- Set up an integrated/multi-hazard monitoring techniques in the region for comprehensive geohazard monitoring.
- Determine the frequency or/and mechanisms of eruptions from CVL and thereby adopt holistic mitigation plans.
- Determine extent the volcanic ash, poisonous gas emission and lava flow had travelled and how far they could likely go in future as a result of past and future eruptions; and appraise their potential impacts on immediate settlements and environment.
- Establish real status of Lake Nyos vis-à-vis the potential risks it might pose to settlements and environment in case of any disasters.
- Establish early warming scheme for disasters mitigation.
- Formulate relevant, realistic and working policies on training of the region's focal points on concepts of hazard assessment, risk analysis and vulnerability mapping in order to develop the understanding of the role of risk analysis within the national risk reduction process.
- Set up real-time or near real-time data collection and Geo-Hazard warning centres within the region.
- Stimulate regional postgraduate research on CVL.
- Contribute to demographic planning, using results obtained overtime in the region.
- Boast regional and international research interests and activities along CVL

- Continuously present research findings on joint research through organization of workshops and conferences on CVL.

Collaboration opportunity

The Centre for Geodesy and Geodynamics, Toro, Federal Ministry of Science and Technology, Federal Republic of Nigeria is located at Toro, Bauchi State, Nigeria wish to establish a co-operation with relevant international research collaborators. If you would like to know more about our research proposal including the detailed project work-plan and activities within this region, please contact Mohammed Shuaibu Tsalha.

Project contact

Mohammed Shuaibu Tsalha (Ph.D)

Institution: Centre for Geodesy and Geodynamics, Toro, National Space Research and Development Agency (NASRDA), Abuja, Nigeria

Address: PMB 011, Toro, Bauchi State, Nigeria, 000734

Email:mohtsalha@gmail.com, tsalhamohammed@yahoo.com

Phone: +2348036381065

Background: Mohammed Shuaibu Tsalha (PhD), working with Centre for Geodesy and Geodynamics, Toro. (Head of Geohazard Division), Chief Scientific Officer with Centre, under National Space Research and Development Agency) with 10 years working experience and participated in many geohazards projects in Nigeria. A geologist interested in remote sensing and geodesy for monitoring of geological hazards.

Sedgwick200

There is still time to register for the celebratory conference in honour of the life and work of Adam Sedgwick being held at Cambridge University on Saturday 22nd September 2018. Details can be found at: www.esc.cam.ac.uk/sedgwick200

Geolsoc Early Career Network Committee

The Geological Society is setting up an Early Career Network, and is in the process of creating a formal Network Committee. It is seeking 6 early career volunteers to sit on the committee and help get the Network up and running. This is a great opportunity for VMSG members, so please consider applying. The attached flyer contains all relevant information and contact details.

If you are interested in volunteering, please email Georgina Worrall (georgina.worrall@geolsoc.org.uk) your CV and a brief supporting statement by Friday 28th September 2018.

New Paper on Arran Caldera

The Isle of Arran comprises a classic site of the British Palaeogene Igneous Province and the location of some fantastic outcrops and geology. In a new paper by Bob Gooday et al. (our former VMSG student committee member), the intricacies of eruptions during caldera formation are investigated with plenty of nice field examples. The open access paper can be found at: link.

Finely laminated and cross-laminated basaltic-andesitic tuff that makes up the Allt Beith tuff cone, Arran (Gooday et al., 2018).

Notices

GDPR

The Volcanic and Magmatic Studies Group (VMSG) is a joint special interest group of the Geological Society of London and the Mineralogical Society, and gathers personal information about members in order to provide you with services relating to our activities (conferences, bursaries, fieldtrips etc). These data will be stored electronically by VMSG for a period of not more than three years.

They will be used to contact you in relation to that event/product in which you expressed interest only. After the 3-year period has expired, the data will be archived on paper to a secure location at the Mineralogical Society's premises. Individuals can ask at any time to see stored records and to have them amended or to have them deleted permanently.

Fieldtrip Co-ordinator:

If you are interested in running a VMSG fieldtrip, please contact any member of the current committee and we will coordinate from there. These are great opportunities to get the community together so if you are interested in getting one off the ground please do get in touch!

Upcoming awards of relevance to the VMSG community:

Do you know an outstanding member of the VMSG community? Please consider nominating them for awards and medals bestowed by other societies. Remember, these recognise both early career scientists as well as those well established.

PhD studentships:

We are collating all VMSG-related PhD studentships for dissemination. Please circulate to interested undergraduate students and others. If you want your PhD to be on the list, please let our student representative know. http://www.vmsg.org.uk/students/phd.php

VMSG Distribution List

The VMSG mailing list is managed by jisc-mail. As a list member, you can subscribe to the list or change all your details yourself by subscribing to jisc-mail.

VMSG can also be found on Twitter, Facebook and LinkedIn.

Sami Mikhail (sm342@st-andrews.ac.uk) runs the VMSG twitter account with a great range of links to papers, positions, articles/news of interest being updated on a regular basis so do follow!!

How to join or leave the group?

Go to the group homepage at www.jiscmail.ac.uk/vmsg and choose the 'Subscribe or Unsubscribe' link from that page. You will receive a confirmation email which you need to respond to.

Editorial

Many thanks to those who have contributed to this issue. Please forward any articles, comments or notices of events, workshops and conferences before 30st Nov 2018, for inclusion in the next newsletter.

All previous newsletters are available for download from the website.

John Millett (john.millett@abdn.ac.uk or john.millett@vbpr.no)