North Eastern Geological Society

Newsletter February 2025

Winter Season Lectures:

February 8th Joint meeting of **Yorkshire Geological Society, NEGS and NOUGS**
Palaeontology to Palaeobiology
Interpretation of life, form, and locomotion from the fossil record
(13:30 - 17:00 rooms ES 228/229 and ES 230, located on level 2 of the Earth Science building, University of Durham, DH1 3LE).

You may still be able to register for free (the link is below if you've missed it in the Secretary's emails)

https://www.yorksgeolsoc.org.uk/events-list/palaeontology-to-palaeobiology

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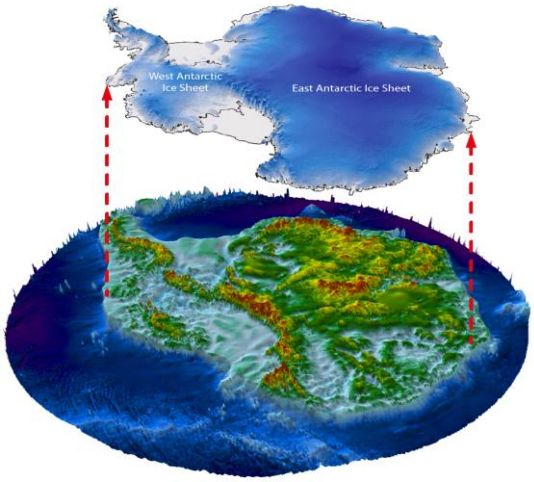
February 21st (Zoom) **Prof. Stewart Jamieson** (Durham Univ). ***Exploring Antarctica's buried landscapes***



Lifting the Lid on Antarctica

Prof Jamieson says:

'In this talk, I will discuss how we have gradually unveiled the landscape beneath the Antarctic Ice Sheet and what we have discovered about its evolution and its interaction with the overlying ice. I hope to convince you that the large-scale, long-term geological evolution of East Antarctica in particular has left its imprint on the landscape and on ice sheet behaviour and that understanding this helps us consider the globally significant question of the stability of the Antarctic Ice Sheet.'

March 21st (Face to Face) **Annual General Meeting at 07:15** followed by **Dr Brian Young** (NEGS Member and formerly with the BGS)
Minerals of the North Pennines: What can they tell us?

(NB: Dr. Young will be leading a field trip related to this topic on 13 July)

Lecture reports

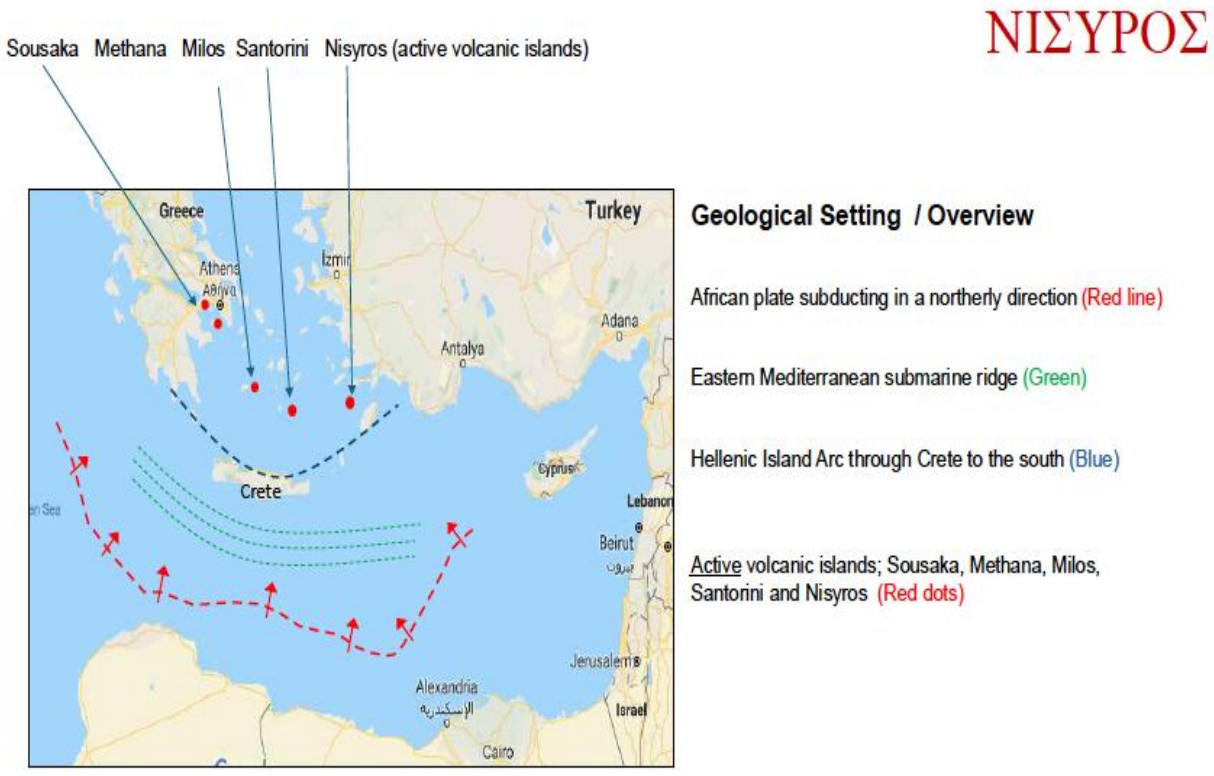
Christmas Members' Evening, Durham

A very healthy number of members and friends gathered in the Chemistry Building at Durham University to hear presentations by three members.

Student Representative **Lewis Mackenzie**, a Masters student at Durham, started the meeting off with a summary of his Black Isle field research into two inliers exposed at the Great Glen faulted junctions. Intruded into Devonian sandstones, the exposed rock demonstrated immense deformation (interpreted as linked to sinistral fault

movement) which had well-formed linear structures. Lewis had noted that these structures had opposing orientations, SW in the Rosemarkie Inlier and NE in the Cromarty Inlier. His initial interpretation was for a later formation than the Great Glen fault. This area has been one of the Huw Millar field investigations. The structures suggest a period of ductile deformation and lent themselves to stereo net analysis. The fault was large scale with several associated structures, Lewis had used some drone analysis to support the shear direction suggested by the line actions. Some excellent photographs helped the audience to appreciate the field evidence used by Lewis together with the scale of the linked structures. Incisive questions were dealt with clearly and sensibly.

subsequent volcanic activity. Santorini (currently in the news because of seismic activity) is another element in this geological system. A micro plate is thought to be stretched E-W allowing the volcanic events to develop. Steve outlined the active fumarole and solfatara activity on slides accompanied by an excellent selection of ejecta to underline the range of gaseous activity. The specimens were circulated to the audience with many positive comments on the quality of the material. Steve outlined the variety of activity the area is still experiencing. An excellent presentation, very much appreciated by the audience.



Steve Woodward returned after his excellent presentation last Christmas. This year he introduced the audience to a summer visit to the Nisyros Volcano in the Greek archipelago. This small island has some permanent settlers on the flanks of a caldera that last erupted 5000 years ago. Interpreted as a back arc eruption the volcano is thought to be 2.5 million years old with modifications by

Our final presentation of the evening was by a new NEGS member: **Paul Angel**. Paul has worked in education throughout his life, principally with sixth form students in the north east and London. He chose to illustrate the many field sites that had been incorporated into his teaching. A five day trek through inland Iceland was exceptional in terms of volcanic debris and the very uncomfortable

obsidian bed material! He compared this to Etna today with the many toxic gases almost constant whilst Iceland tends to have episodic events. He leapt into the coastal exposures at Staithes to illustrate the ever present dangers of rockfalls, alleviated by the bright yellow hard hats worn by the group. On Arran he used slides of the Hutton Unconformity to develop the concept and the field appearance before moving into an open cast mining site in the North East with the basics of sedimentary geology apparent. A visit to the Lizard in Cornwall provided him with slide evidence for the exceptional folding and faulting of the area with serpentine rock material. He touched on Milankovitch Cycles in Dorset sediments. He finished with the pillow lavas in South Wales and the graptolitic shales. Clearly the students had been afforded an exceptional variety of field sites to support the academic work done in class.

Social Secretary **Vin Murphy** generously provided an extensive spread of Christmas food and drink, supported by contributions from many of the audience. It served to round off an excellent evening of cutting edge modern research, dangers of active volcanics and the brilliant insight afforded by great photography. Christine, our vital secretary, thanked our speakers and the attendees.

Gordon Liddle

17th January (on Zoom)
Neil Phillips Granite - pipe or pizza?

Prof Phillips began by pointing out that granites are found on almost every continent. He is interested in their three dimensional aspects. He highlighted the well-known exposures in Melbourne and northern Portugal. He has been fascinated by the shapes of granite intrusions in both large and small scale - why do they look the way they do?

Granites are igneous rocks, solidified and crystallised from the molten form, and comprising principally Feldspars, Quartz and Mica (the latter in white or black forms). He reminded us of the difference between basalts and granites. The latter, as we know, appear after erosion of overlying structures, having solidified with slower cooling rather than the more rapid cooling seen with molten material extruded in volcanoes. He told us that we do not see granites in the spreading mid ocean ridges, for example where basalts are found. He illustrated this point with photographs from the Azores where paving, in the attractive two-tone style of much Portuguese paving, comprises locally sourced darker basalt interspersed with lighter granite imported from Portugal.

Neil described how the rapid cooling of basalts produces a finer crystalline structure than the larger crystals arising in the slow cooling granites so that in the latter even with the naked eye one can discern much of the detail of the formation.

But why do we end up with boulders or Tors?

As cooling occurs, the associated contraction and other factors lead to cracks forming - jointing - which may be seen in planes perpendicular to one another as was illustrated in his lecture. Prof Phillips showed how weathering of the upper surface of the granite originating from these joints eventually leaves separated portions of the exposure standing proud of their surround.

He told us that in his own undergraduate days the conventional wisdom was that granites, where exposed, represented the top of "pipes" of igneous intrusions, great cylinders of granite reaching down with no defined base, even though in some cases such lower limits had been identified.

He then narrowed down on the exemplar from his own research, the Strathbogie Granites north of Melbourne. He gave us a thumbnail sketch of Australia. The western portion of the subcontinent is Archaean[1], the mid-section is Proterozoic while the eastern region is Palaeozoic with as he pointed out, two regions of sedimentary basins separating these zones.

The Strathbogie Granite north of Melbourne is late Devonian (373mya) and intrudes Siluro-

[1] Archaean 4,031 to 2,500 mya, Proterozoic 2,500 to 538.8 mya, Palaeozoic 538.8 to 251.9 mya

Devonian sedimentary rocks. The granite formed some 15-20km below the then surface at temperatures of more than 800^0C. This rose to within a few km of the surface and was subsequently exposed by erosion. A notable feature of the granite is the presence of cordierite in addition to the basic components outlined above. Such an addition is seen in other southern hemisphere granites especially in South Africa and South America (he mentioned Torres del Paine National Park in Chile).

Cordierite[2] is $(Mg\,Fe)_2\,Al_4\,Si_5\,O_{18,}$ and lacks hydroxyl (-OH) groups. Neil told us that this reflects an absence of water in the mix and a high temperature in the molten state.

Additionally he described how at the limit of intrusions one may see a layer of aplite - a finer grained igneous rock, reflecting the more rapid cooling of this part of the melt in contact with colder adjacent rocks.

He expanded on the research he has conducted around the southern boundary of the Strathbogie granite. He began by describing, and illustrating with photographs from the area, the feature used to identify a boundary in the field, namely the abutting of hornfels. Hornfels is the group name for a set of contact metamorphic rocks that have been baked and hardened by the heat of intrusive igneous masses.

This research has been aided more recently by the ability to map accurately and quickly using GPS and GIS (he mentioned the free software QGIS). Neil then led us on into an explanation of how he arrived at deductions regarding whether the field observations indicate the upper or lower boundary of a granite intrusion, identifying "*step and stair*" aspects of boundary mapping in the southern Strathbogie area.

He explained how the orientation of the granite/hornfels boundary (vertical or horizontal) may be interpreted in terms of the relationship to the larger picture of a granite intrusion, incorporating associated findings of pegmatites and tourmaline as markers of boundary areas of the granite both above and below.

He demonstrated to us how his observations have led him to deduce that the intrusion is more of a pizza than a pipe.

The lecture was very well received and there were questions from those attending. Prof Phillips, in response to a question about the presence of cordierite said that the substrate rock which was rendered molten included aluminium suggesting that sedimentary rocks had been part of the mix that went into the melt. The high temperature is equated with the anhydrous circumstances favouring the formation of the mineral. He pointed out that garnet is a related mineral where the constituents are subjected to greater pressure and form a more dense crystalline structure than cordierite. Discussing the granite of Yosemite he commented that the granites of the western US have less aluminium and cordierite is not evident in the same way.

The online audience thanked him for an illuminating and fascinating presentation.

John McNulty

The lecture was recorded and is available on our NEGS YouTube channel at https://youtu.be/AQP-OzdoZb8

Members News

We welcome our new members:
Cameron Latimer
David Moore
Bill Oakes
Robert (Bob) Pass

This newsletter is produced bimonthly as a supplement to the regular communications from our secretary. If you wish to comment please feel free to contact me on huttonsedgewick@gmail.com

John McNulty

[2] named after the French geologist Louis Cordier (1777–1861)