Earth Science Teachers' Association
Annual Course and Conference –'From field to classroom'
27th – 29th September 2019
Lapworth Museum, GEES, University of Birmingham

The Saturday workshops will cover a wide range of topics, a synopsis of each is given below:

1. 3D visualisation of fossils. Drs Stephan Lautenschlager, Sam Giles & Andrew Jones. Fossils represent the only physical evidence for the existence of extinct life, and hold a vast potential to reconstruct organisms and ecosystems that vanished a long time ago. Although fossils can document evolutionary processes in remarkable detail, they are usually held in museum collections and can be difficult to access for the public. This workshop will provide the opportunity to explore a range of different fossils using digital models and computer technology. Different invertebrate (trilobites, molluscs, corals) and vertebrate fossils (dinosaurs, mammals, fish) and reconstructions (e.g. fossil brain reconstructions) will be presented, alongside how they can be used to study their palaeobiology and evolutionary trends. Additionally, we will provide digital files which can be used for 3D printing and to create physical models to supplement the virtual fossils.

2. Using Museum Collections in supporting A-level Geology. Aerona Moore (max no. of people 24). Museums are an often underused resource for schools and can offer a rich, immersive learning experience, in addition to supporting different learning styles. This workshop looks into how museums can support A Level Geology by providing access to unique and internationally significant objects including geological specimens, maps and historical artefacts, subject expertise and up to date research. During the workshop you will be able to complete various activities that will involve using museum specimens to: Practise rock and mineral identification and interpretation; Examine different modes of fossil preservation and use fossils to interpret palaeoenvironments; Identify and interpret geological structures from recent and historical geological maps and photographs; Use the Lapworth Museum displays to find rock and fossil evidence to prove where the West Midlands has been located at different points in geological time.

3. New concepts in seafloor spreading. Professor Tim Reston. The recovery of basalts from the mid-ocean ridges and observations from ophiolites, slices of oceanic crust thrust onto land, led to the adoption of the standard "Penrose" model for oceanic crust - pillow lavas, sheeted dykes, gabbros and layered gabbros above mantle peridotites. But this model has been challenged by new discoveries in the last ten years. Observations at the mid-ocean ridges have shown that at slow spreading rates (less than about 30 mm/yr), faulting increasingly accommodates plate divergence. The largest faults, termed oceanic detachment faults, have heaves of over 10 km, and exhume plutonic and mantle rocks. This has led to the "Chapman" model for oceanic crust, formulated at a Chapman conference in Cyprus in 2010, which has recently been incorporated into the WJEC A-level syllabus. In this workshop, some of the data underpinning the new concepts will be presented and discussed, including 3D visualisation of the seafloor, seismic images of the crustal structure. In addition, new results from the southwest Indian Ridge (E and S of Madagascar), where spreading rates are below 15 mm/yr, show that here spreading is virtually amagmatic, and that vast expanses of the seafloor are unroofed mantle peridotites.

4. Exploring controls on volcanic processes. Dr Sebastian Watt. This workshop will outline a classroom exercise that explores explosive eruption processes for two different types of magma, using map data and hand specimens. Through the exercise, students explore magma properties and how and why this influences eruptive behaviour and ultimately leads to different hazards and impacts. The exercise draws on real examples and field datasets, and could be extended to investigate the chemistry and petrography of volcanic rocks, or to consider other eruption styles.

5. Mineral Extraction Mock Inquiry. Dr Paul Anderson. This workshop provides delegates with an experience of taking part in the decision-making process involved in mineral extraction. Delegates will engage in a mock pubic inquiry relating to mineral extraction in a protected area, in which economic, social and environmental factors require careful consideration. The group will be split to

represent mining companies proposing extraction along with a board of decision-makers comprising local stake holders. With guidance the mock mining companies will propose mineral extraction sites whilst the board representatives will develop a sustainable mineral extraction plan for the area. Mock mining companies will then present their proposals to the board, who will decide whether any of the proposed extraction sites are suitable. This exercise addresses the economic geology component of the A-Level Geology curriculum in an original and engaging way, as well as facilitating the development of transferrable skills such as decision-making, communication and team work. From a careers perspective it also provides a realistic impression of the work that many graduating Earth scientists are involved in.

6. Using geomodels for exploring sedimentary surface processes. Dr James Wheeley. This workshop will provide opportunity for delegates to have a go at using a couple of geomodels (Emriver https://emriver.com/ sediment tables) and a sediment transport channel to explore river processes and evolution of bedforms (dunes, ripples). Discussion will focus on how geomodels could be created relatively cheaply for the secondary school setting.

7. Micropalaeontology. Drs Ian Boomer & Tom Dunkley Jones. Microfossils are widely used to date sedimentary rocks, to investigate records of past climate change and also in the search for hydrocarbon resources. The identification of particular species can be used to determine the stratigraphic age of the sample and also provide details of the depositional environment. A short introduction will be provided to the processing methods needed (using basic lab equipment) and the techniques involved in studying calcareous microfossils (ostracods and foraminifera) in sedimentary rocks. We will also supply small sample sets for study.

8. Structural geology and FieldMove App. Dr Carl Stevenson. This workshop will look how professional digital platforms are used to facilitate undergraduate field teaching and research. Following NERC funded training courses in field geology using digital mobile platforms, we operate a suite of iPads with Midland Valley Exploration's FieldMove App installed. During the workshop we will share examples of how FieldMove has been used in undergraduate teaching and research and discus the pedagogy behind and ways in which the ability to collect large amounts of data and perform specialised, technical skills (e.g. measure strike and dip) using the iPad. Mapping and structural analysis is essentially automated with GPS performing geolocating of all data which is automatically plotted on a base map. Note taking and sketching is also logged via a geolocated data base that looks and feel very different from tradition al field notebooks. This workshop will: 1. Introduce and demonstrate the FieldMove App; 2. Provide an opportunity for a hands-on 'play' with FieldMove using iPads; 3. Demonstrate use in examples of undergraduate teaching a research; Discuss pedagogy and potential use/barriers in secondary school setting.

9. Oxygen isotopes as a geological thermometer. Drs Kirsty Edgar & Sarah Greene. Oxygen isotopes are arguably the longest established and most widely applied geochemical proxy system in modern palaeoclimatology and palaeoceanography. We can measure them in a wide range of materials and they can tell us about ancient ocean temperatures and salinity, and even the size of ice sheets. Within this workshop we will cover the basics of oxygen isotope fractionation and work through specific examples of how these data can be applied to reconstruct past worlds.

Keynote Speakers

We have two keynote speakers for the ESTA 2019 meeting.

Professor Alice Roberts (evolutionary biologist, biological anthropologist, television presenter and author, Professor of the Public Engagement in Science at the University of Birmingham will speak on Friday evening (27th Sept) on Ice Ages and the Pleistocene megafauna.

Dr Will Tattersdill (Department of English Literature) will speak on Geographies of Popular Fiction on Saturday 28th. Will describes his talk as follows: "We are used to seeing maps at the start of fiction, especially fantasy and science fiction novels – some of us fixate on them, and others go straight past. But the practice of including maps is not actually that old, and it has a history. In this talk, I want to invite you to think about what it means to create a geography, a geology, or even a physics for somewhere which doesn't exist. Why has it become important to us to be able to think cartographically about fantasy realms, and can that desire – and the way authors act upon it – teach us anything about the Earth Sciences or their relationship with literary criticism?"

We look forward to welcoming you to Birmingham in September!

Dr James Wheeley & The Lapworth Museum of Geology
University of Birmingham