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North West Regional Group

A-Level Lecture

Wednesday 12th November 2014

Earthquake Waves and Seeing Inside the Earth!

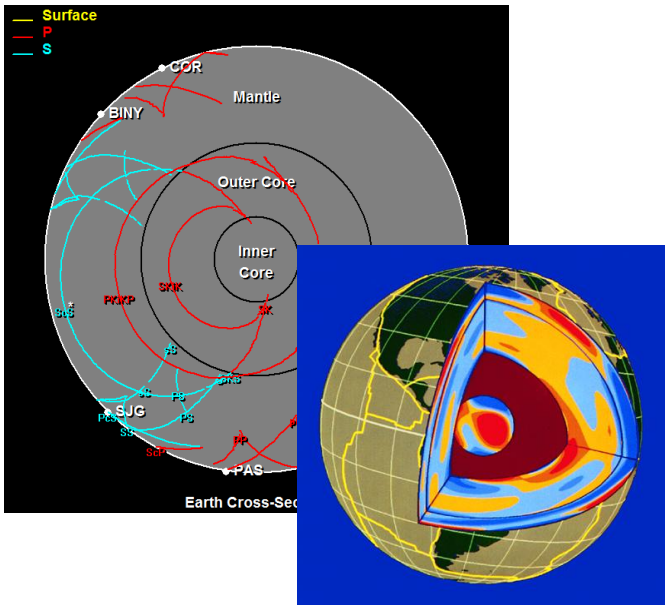
Although we have some clues from the Earth's magnetic field and the way the Earth conducts electrical currents, the main way of providing indirect evidence for the structure and composition of the Earth's interior is using earthquakes waves.

This lecture will first examine the different types of earthquake waves, P-waves, S-waves, Love waves and Rayleigh Waves, and the physical properties such as elastic moduli and density which govern how these waves propagate through the Earth. We will look at how these waves get reflected, refracted and even converted from one type to another where the velocity and density of geological materials change within the Earth.

Using observations from vast numbers of earthquakes and knowing the differing properties of the earthquake waves we can build up a picture of the internal structure and composition of the Earth's interior. On a basic level, the absence or multiple occurrence of a particular earthquake wave recorded at a particular distance away from the earthquake be used to infer sharp increases and decreases of velocity and allow us to divide the structure of the Earth into the shells of crust, mantle, outer core & inner core. A more detailed analysis of the results can then pick out variations within these layers

More advanced techniques such as seismic tomography analyse where shells such as the mantle have faster or slower velocities than average. This in turn allows us to look in detail at how the mantle works and how mantle motion might drive plate tectonics.

Dr Stimpson is a Senior Lecturer in Geophysics and Course Director for Geology and Geoscience at Keele University. He is a seismologist and geologist with wide ranging interests from earthquakes to geoconservation. Through his career he has studied earthquakes at all scales from underground nuclear explosions and large magnitude earthquakes in subduction zones to micro-earthquakes caused by fracturing around tunnels, mine workings and fracking for shale gas.



This will be the second lecture for the Geological Society of London for the benefit of 6th form student. The purpose of this lecture is to provide a useful information base for the purpose of the examination content of the A-Level course, as well as to provide a university lecture experience for the students.

Please note that this is not an open day, however should students wish to find out more about this university (geological degree) or other information, the Manchester University careers unit will have a stall to field questions and queries.

Venue: Alan Gemell Lecture Theatre (Hux0.15) in the Huxley Building (Biology), Keele University, ST5 5BG

Time: 5:00pm for 5:30pm prompt start.
Duration: Approximately 1 hour.
Cost: **Free**

Please contact Mr N Reynolds (Secretary of the North West regional Group) for booking places: geologicalsociety.northwest@gmail.com

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A-Level Student University Tour

The Geological Society of London has recently set up a new branch of membership to accommodate 6th form students. Currently, the north west regional group have not completed any events or lectures specifically for this age of member.

It is considered that the best method of servicing this class of membership is to put on lectures which will advance the students knowledge in the geological sciences, and should also be a portal to providing a conduit between school life and University life.

We have consulted with examination board paper writers and discussed which subjects topics typically pose the greatest problems to students. The topics chosen were as follows:

1) Palaeomagnetism and polar wandering curves and how they relate to seafloor spreading and continental drift

2) Magmatic differentiation and layered igneous intrusions

3) Hydraulic gradients and artesian basins

4) Hydrothermal ore deposits associated with silicic intrusions

5) Faults: types, geometry, formation etc.

6) Evidence for sea level change and climate change over geological time scales, in particular, oxygen and carbon isotopes and Milankovitch cycles

7) Secondary enrichment/supergene enrichment of copper ore deposits

8) Formation of uranium ores and the role of bacteria in redox reactions and ore-forming processes

9) Lithostratigraphic and biostratigraphic correlations

10) P-wave and S-wave shadow zones and how seismic waves in general are used to infer the structure and composition of the Earth's interior

We propose to have one University host an event a month. The event will last an hour and will host the students with a 2nd year undergraduate level lecture. This lecture should provide the students with an in depth, concise and insightful view of the subject with plenty of facts and case studies which may be used to aid the students. We anticipate that the University will either make available digital or paper packs of information associated with their subject. This may further expand the knowledge with links or relevant abstracts from papers. We have been advised that it may be prudent for the lecture to be held around 6pm as most schools finish at 4pm and this will allow schools on the edge of the region to travel.

The University may wish to provide additional assistance such as practical examples of the subject matter being discussed. This may be provided after the main lecture.

The University may provide refreshments for the students. This may encourage schools to come to the event

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Depending upon the venue, there may be scope for a dual lecture to be provided, one for lower sixth formers and the one for upper sixth formers on 2 subjects.

This event is not to be an open day and will not be treated as such, however should the university wish to provide students with 'goodie bags' or other appropriate promotional material, this will be considered as suitable.

Our intension is for this event to become a self sustaining event, which depending upon amendments to the syllabus, or problematic subjects, the subjects matter may remain in place.

By spreading the lectures across the geographic area of our remit area, this will both enable those local to the university to attend events they may not otherwise have the opportunity to witness, and also for students to visit universities they may not have considered visiting during their options to decide on prospective universities.

There are circa 3,200 students studying geology for A-Level in the UK, however the number studying in the Northwest/North Wales is not currently known. We anticipate that the number will be circa 600-800 No. potential students. From initial consultation, there was good feedback from both schools and universities. It is unlikely that students will visit all lectures, with subject matter anticipated to be determined by teachers, unless the student wishes to visit an event independent of the school.

Summary

The purpose of the event is to:

- Assist a-level students with content of the syllabus which is considered difficult, providing additional resource material.
- Show a-level students what it is like to sit through a proper high quality lecture brimming with good facts and case studies.
- Showcase universities students may not have considered during their options considerations.
- Promote the Geological Society to students.

Our aspiration is to improve the knowledge base of students studying A-Level geology, and to also to showcase the teaching ability in our regions universities. We anticipate that the students in the audience will be better equipped to attend university after sitting through at least one of the lectures.

This event will be publicised by the Geological Society, the Earth Science Teachers Association as well as Geoscientist, and may be tied into the Geological Society National School Geology Challenge.

We look forward to hearing from both schools and universities regarding this project. Please contact the North West Regional Group Secretary Nik Reynolds – geologicalsociety.northwest@gmail.com.