



The Institute of Materials, Minerals and Mining

**Schools
Affiliates
Scheme**

Issue 23

Summer Term 2006

End of year report

Hello there, hope you had a great Easter and are refreshed and ready for the onslaught of this term. Last term was a very busy one for me and this term will be just as fun packed. Between trekking round the country and making my wedding dress I might just find a few hours to sleep!

As usual this term I shall be attending the Polymer Study Tours to talk about how the Institute can help in supporting the teaching of materials, minerals and mining in schools. This year the courses will be running at London Metropolitan University and Napier University in Edinburgh on 18-21 June and 25-28 June, respectively. Unfortunately the course at Bradford University has had to be cancelled. There is still time to book a place and to do so you should contact Lareen Jolly at the ASE on 01707 283008 or e-mail lareenjolly@ase.org.uk. Alternatively you can find out more information at www.horners.org.uk or www.ase.org.uk.

I will also be going to the Salters' Chemistry Camp in York during the summer holidays to give a talk and run crash helmets for eggs. The latter activity has featured prominently in my diary for the Spring Term, my local ASDA must wonder what I do with the bags full of eggs I buy on a regular basis!. I have managed to find time this term to put together a new presentation called 'Materials - its elementary' which saw its first outing at the Schools Day at Congress 2006. You can find out more about my talk on page 4 and about Congress on page 2.

Over the past 12 months we have started to liaise much more closely with our local societies, of which there are around 60 across the UK. These groups are very keen to work with schools and in many cases have pots of money which can be put towards education projects. On page 5 you can find out about an event run recently by the London Materials Society. Also in this issue some valuable information about the latest mineral and mining resources from the Camborne School of Mines at the University of Exeter.

Finally, as usual, a quick reminder that this is your newsletter! If you have any comments or suggestions for articles please get in touch. I hope you have a great summer holiday.

N

E

W

S

**The Institute of Materials,
Minerals and Mining**
1 Carlton House Terrace,
London, SW1Y 3DB
Tel 020 7451 7300
Fax 020 7839 1702
www.iom3.org and www.materials-careers.org.uk

Doncaster Regional Office
Education Team
Danum House, South Parade
Doncaster, DN1 2DY
Tel 01302 320486
Fax 01302 380900

Useful resources for science, geology and geography teaching

At the schools event at Congress I learned some very interesting facts about the quarrying industry. In the UK each person needs 4 tonnes of aggregates each year to maintain their quality of life and an average house requires 60 tonnes of aggregates. These materials are quarried from the land and the sea bed and I was pleased to hear that Britain tops the European league for aggregate recycling. There are 1300 quarries around the UK providing some 40,000 jobs. But still, quite amazingly, there are seven jobs in the minerals and mining industry for every one graduate from a UK degree course! With this in mind, the Camborne School of Mines, part of the University of Exeter and the University of Leeds are actively encouraging students on to their courses. (Enclosed with this newsletter is some promotional literature from Camborne entitled 'What's yours is mined'.)

However, the seeds of interest must be sewn at a much lower level and there are now two web-based resources available to help teachers do just this. The first of these sites, www.QuarryEd.co.uk is aimed at supporting A-level courses and the second, www.virtualquarry.co.uk covers KS1 to KS4.

Patrick Foster from the Camborne School of Mines has been heavily involved in the development of the QuarryEd site and has this to say about it:

"QuarryEd is a project driven by the combined need of teachers for new ideas and inspiration for the classroom without creating extra workload, and of the extractive industry to spark an interest in the future generation of extractive industry professionals. It has been developed by the Camborne School of Mines (part of the University of Exeter) with funding from the Aggregates Levy Sustainability Fund.

The extractive industry is multidisciplinary and offers a wide range of learning opportunities across many subject areas. QuarryEd have used these learning opportunities to develop a range of education resources designed to compliment a range of A level subjects which include: Chemistry, Mathematics, Physics, Geography, Geology, Biology, Environmental science.

The site provides teachers and students with resources and information that relate the theoretical approaches of schools to a real life industry, enhancing learning opportunities.

The resources are in a teacher friendly format and are free of charge. The resources are devised specifically for A-level curriculum subjects but they can be easily adapted to suit the needs of other year groups. Resources will be continually added to the site over the summer."



The Virtual Quarry web-site has been produced by the Quarry Products Association with support from the Minerals Industry Research Organisation. The site is designed to support the Science and Geography curriculum from KS1 to KS4 and amongst other things contains 20 comprehensive units developed against Schemes of Work by teachers for teachers. The lesson plans are supported by teachers' briefings which give an introduction to the industry followed by more specific guides on its relevance. There is a free image library which teachers can download. Of more interest to your pupils are a virtual quarry tour which can be projected to the class using an interactive white board, a restoration activity and a number of short movies looking at why quarrying is important. The Rock Spot features information about places to visit and local events and is well worth a visit.

I would strongly recommend a look at these sites as they provide some excellent resources which bring some often flat areas of the curriculum to life.

Students Excel in Schools Starpack 2006 Awards

Students from schools across the UK who came up with a series of wonderfully creative and functional pack designs for the Schools Starpack 2006 competition received their awards at the National Space Centre, Leicester, on March 30, 2006.

The Awards scheme, an initiative from the IOP: the Packaging Society, is designed to complement students' studies as part of the national curriculum and to encourage children to consider packaging and packaging design as a career choice. Issues such as graphics, preservation and protection of contents, structure, cost efficiency and the impact on the environment are central to the briefs.

The Schools Starpack Awards received a massive 132 entries to this year's three briefs for a Sun Protection Combination Pack, New Polythene Pack and the Materials Research brief for the use of a current packaging material in a new market. The judging panel awarded 7 Gold, 7 Silver and 7 Bronze Stars to individual students.

Speaking at the awards ceremony Gordon Stewart, head of the IOP: the Packaging Society said, "We are delighted with the response by students and by the excellence of many of the packs but would like students to pay closer attention to the briefs and read these very carefully before entering."

Judges were also surprised that students did not make more use of CAD to aid the final stages of design development.

On top of the Gold, Silver and Bronze Stars, and commended certificates from the IOP: the Packaging Society, sponsor awards were presented by Pro Carton, to the school providing the best carton entries; and British Polythene Industries, to the school that had the greatest success with its students' entries to the New Polythene Pack category.

The IOP: The Packaging Society gave two awards to the individual students with the best carton and polythene entries; and IOM³ awarded the team with the best design solution that maximised the benefits of a material for a new pack.

Walking away with the Gold for the best Sun Protection Combination Pack as well as The Packaging Society Award was Kourosh Atefipour, of The Sixth Form College Farnborough. Presenting the award Heather Kendle, chair of the Packaging Society, said, "The portfolio demonstrated thorough research and preparation, illustrating the development of the ideas behind the pack."

The Materials Research Category was a happy hunting ground for Derby High School with Sarah Karim and Rebecca Bussey, Derby High School, both receiving Gold Awards. The school also carried off the IOM³ Materials research award for the most in-depth presentation.



Schools Starpack winners at the National Space Centre designs



Gold award winning designs

DIANE'S DIARY

The Summer terms is pretty much fully booked now, I only have 7, 9, 13 and 28 June and 24, 25, 26 July remaining. If you would like to book or discuss a visit on one of these days please contact me by e-mail as soon as possible.

diane.talbot@iom3.org.

- 19/04 Ramsey Abbey School, Cambridge
- 20/04 Altrincham Grammar School
- 21/04 Hills Road Sixth Form College, Cambridge
- 25/04 Newquay Tretherras School
- 26/04 Braunton School, nr Barnstaple
- 27/04 Saltash School, nr Plymouth
- 28/04 Richard Lander School, Truro
- 03/05 Dulwich College, London
- 04/05 The Cheltenham Ladies' College
- 09/05 UCAS Higher Education Convention, Newcastle
- 10/05 Hylands School, Chelmsford
- 11/05 Old Swinford Hospital, Stourbridge
- 12/05 Robert Pattinson School, Lincoln
- 15/05 Honley High School, Huudersfield
- 16/05 Avon Valley School, Rugby
- 17/05 Queen Elizaceth Grammar School, Penrith
- 18/05 Woodbridge School, Suffolk
- 24/05 Heckmondwike Grammar School
- 25/05 Neath Port Talbot College
- 26/05 Brownedge St Mary's School, Bamber Bridge
- 06/06 Staffordshire LEA, D&T Inset, Stafford
- 08/06 St Wilfird's School, South Shields
- 14/06 Aquinas College, Stockport
- 15/06 Spen Valley High School, Liversedge
- 16/06 Graham School, Scarborough
- 19/06 Polymer Study Tour, London Met Uni
- 20&21/06 UCAS Higher Education Convention, Liverpool
- 22/06 Merchant Taylors' Girls' School, Liverpool
- 23/06 St Olave's School, York
- 26/06 Polymer Study Tour, Napier Uni, Edinburgh
- 29/06 Dumpton School, Wimbourne Minster
- 30/06 UCAS Higher Education Convention, London
- 04/07 UCAS Higher Education Convention, Sheffield

Autumn Term visits

I am already taking bookings for the Autumn and Spring terms of the next academic year. If you would like me to visit before Christmas I would strongly recommend that you get in touch as soon as you know your timetable. I have already taken a number of provisional bookings for the Autumn and will be contacting the relevant schools to confirm details shortly. The dates I have remaining up to Christmas are as follows:

Sept: 5, 6, 7, 8, 21

Oct: 3, 4, 5, 18, 19, 20, 24, 25, 26, 27

Nov: 1, 2, 3, 7, 10, 14, 15, 16, 17, 22, 24

Dec: 1, 5, 6, 7, 8, 12, 13, 14, 15, 18, 19

In addition, I only have one day of Science Week 2007 remaining. It's the Friday and if you would like to book it please get in touch as soon as possible.

Materials - It's Elementary!

I really enjoy writing the element focus article for the back page of the newsletter and decided to expand this idea by writing a presentation which looks at how a number of elements have shaped the world we live in. For each element a basic introduction to its occurrence, uses and properties is followed by a more in-depth look at two key uses. At the moment I have looked at iron, nickel, titanium, carbon, silicon and hydrogen, but hope to keep adding elements when I get chance. If you would like to find out more about this talk or book me to come and give it (or the Materials in Action presentation), please get in touch!

Resources from the Armourers' and Brasiers' Company

Hopefully by now you are familiar with the work of the Armourers and Brasiers' Company, if not, they are one of the early Livery Companies of the City of London, with a history dating back to 1322. Since there is not a great demand for armour anymore, the main charitable aim of the Company now is to support Materials Science at all levels. A large amount of effort goes in to supporting courses and initiative at school level, for both teachers and pupils. The Institute is also involved with some of these activities (such as the summer schools for teachers on 'The Science of Materials') and I have had past involvement with many of them (Sixth form course at Birmingham, Sixth form scholarships and Materials Master Classes). Enclosed with this newsletter you will find the latest list of the resources which the Company is associated with, and I would encourage you to try to attend one of the courses they support or get your pupils to apply for a scholarship. The Company is also able to give small grants, for example to buy some equipment. If you have never done so before I would strongly recommend that you have a look at the Company's web-site to find out more: www.armourersandbrasiers.co.uk.

London Materials Society Schools Event Review

On the 9th March 32 students and 4 teachers attended the 2006 LMS Schools Event at The Wallace Collection. The collection was bequeathed to the nation by Lady Wallace in 1897 and is one of the finest and largest collections of works of art presented to any nation by a private individual.

In the morning the group was treated to an expert insight in to the furniture and armour in the Wallace Collection. Eleanor Tollfree and Bridget Crowley spoke about the materials used in furniture making and decorating, especially 17th century Boulle marquetry (after André-Charles Boulle). David Edge gave an excellent talk on weapons and armour, starting with the use of flint in axe heads followed by weapons of the Bronze and Iron ages. He illustrated his talk with objects from the collection and the influence of fashion on body armour, especially for jousting.

After lunch, the first presentation was given by Dr. Lucy Di Silvio (Guy's Hospital, Kings College London) and covered the use of materials in the biomedical field such as scaffolds to support bone growth. The second presentation of the afternoon session was given by Professor Robin Grimes (Imperial College London) and this focused on the importance of understanding a material's microstructure in the development of its applications. He illustrated this using turbine blades in aircraft engines and armour materials in military vehicles. The finale presentation was given by Dr. Peter Barham (Bristol University) who spoke about the 'physics of ice cream', again developing the theme of structure in relation to ice and ice cream. He illustrated his talk with demonstrations of various states of matter using ice, salt and liquid nitrogen. The students participated in all the presentations with questions but probably thought that to end a lecture with ice cream was a bonus!

The London Materials Society would like to thank all the staff at the Wallace Collection (especially Emma Jane Lawrence) and the speakers from the universities for their time and effort, as without them none of the above would have been possible.



Pupils trying on some of the armour in the Wallace Collection as part of the LMS 2006 Schools Event

Manchester Polymer Group – How can we help?

The Manchester Polymer Group (MPG) is a local section of the Institute focusing on meeting the needs of its membership with polymer interests in the Greater Manchester and Lancashire area.

An important focus within MPG has always been the promotion and support of education and training relating to polymeric materials. Previously our main efforts have been in sponsoring teachers from our area on the Polymer Studies Tour and also in arranging an annual Young Persons Lecture linked with tours of the polymer laboratory facilities at MMU and the Manchester Materials Science Centre. These lectures and laboratory tours have been successful in the past but we are taking the opportunity now to review our efforts to determine how we can best support you in teaching the revised GCSE specifications.

MPG will continue to sponsor teachers on the Polymer Study Tours but how can we help at the local level?

- Are you still interested in an all day event covering a Lecture and Laboratory Tours in Manchester centre or would you prefer a half-day or twilight event which could be carried out more locally and could be done in different parts of the area?
- Would you prefer something more practical covering supply of polymeric materials and information?

MPG would be willing to discuss with you individually or within a group any aspects of reasonable support that can be given. Funding is available. If you have any comments or suggestions please contact [Stuart Patrick](mailto:stuartpatri@gmail.com) (stuartpatri@gmail.com) or [John McLoughlin](mailto:polynnovation@hotmail.com) (polynnovation@hotmail.com)

More details of MPG activities are available at <http://www.manchesterpolymergroup.co.uk/>

DON'T FORGET that as members of the Schools Affiliate Scheme you and your colleagues have got an open invitation to attend the meetings of your nearest local societies. These meetings are a great way to meet local scientists, engineers and technologists and improve your knowledge. To find out more and see the calendar of events in your area visit www.iom3.org/regions

GREENPOWER 2006 - WHERE ARE WE THIS YEAR?

Greenpower 2005 concluded very successfully with an action packed final at Goodwood in October. A mix of autumn weather saw racing in warm sunshine and heavy rain, so heavy in fact that the race was suspended for half an hour to let the worst go past!

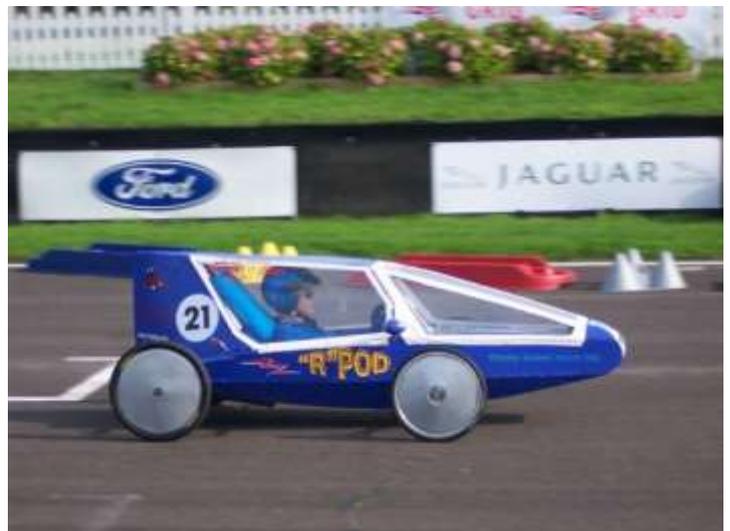
At the final the new Learning Grid was officially launched by Bob Gilbert of Motorsport Development UK after a welcoming speech by the Earl of March, Greenpower's patron. Greenpower is one of the four key elements of the Learning Grid that is a joint venture between the DTI and Motorsport Development UK dedicated to furthering the cause of engineering in the context of British motorsport.

After seven years of developing various electric car formulas for all ages of pupils in the UK Greenpower was pleased to have achieved a major objective, that of getting its prime formula, F24, embedded formally into the current Design and Technology curriculum by the Qualifications and Curriculum Authority (QCA). It now features as an 'exemplar resource' to be used by design and technology teachers and their website carries full 'chapter and verse' on to how to use a F24 design and build programme to meet the curriculum needs. As this will allow schools to build their cars in school time instead of as an extra-curricular activity we are expecting to see a large increase in entries this year for 2007.

In 2006 we plan a ten regional heat race series for Formula 24 with the final at Goodwood in October. There is also a bigger than ever programme of Goblin events for primary schools and the new 'Catapult' and '35' formulas for tertiary students will be starting at several of the F24 events.

The Ford Motor Company has confirmed their support of Greenpower for the fifth year and will be hosting the Essex heat at their facilities at Dunton. Qualifying heats are also being supported this year by Renishaw plc in the South West and The Environment Agency in Sussex. Westland Helicopters have been a regular supporter of the Somerset heat at Haynes Motor Museum and the EEF are contributing to several of our events including the Northeast heat at the Croft Motor Circuit and the Dorset heat at Matcham's Raceway in the New Forest. Any offers for sponsorship of regional heats would be gratefully received as in 2007 we will see the number of events increase to at least fifteen.

Remember to visit the recently launched new and improved Greenpower website www.greenpower.co.uk to see when and where all the events are in 2006 and then make a point of coming along, entry is free!



The R-Pod Team (left) with their vehicle in actions (right)

Schools Day at Congress Review

On Friday 07 April twenty teacher from as far afield as Newport, York, Manchester and the Isle of Man descended on Carlton House Terrace in London for the Schools Day at Congress 2006. After registering the teachers were invited to choose from a selection of books which were free to take away. The day was formally launched with a welcome from the Chief Executive of the Institute, Bernie Rickinson, after which the delegates went off to listen to the technical seminars in the morning session. On offer were presentations on materials for regenerative medicine, packaging and construction. At the end of the morning the teachers boarded a coach for the trip over to the Tower of London for the education specific activities in the afternoon. A reception lunch, hosted by the Worshipful Company of Founders, the Worshipful Company of Ironmongers and the Worshipful Company of Armourers and Brasiers, gave the teachers a chance to catch their breath, recharge their batteries and talk to the representatives of the Companies.

At the end of lunch there was bit of a surprise - a prize draw to win an extensive collection of resources, including past SAS resources, a number of CD ROMs, posters, TEP resources and samples. The lucky winner was Robert James, a trainee teacher from Gloucestershire. After the excitement of the draw the group moved through to the lecture room in the Education Block at the Tower where they heard three presentations. Patrick Foster and Leah Edwards from the Camborne School of Mines brought the group up to speed with the current employment situation in the mining industry and then demonstrated a new web-site, www.QuarryEd.com, which has been designed to support A-level courses in the sciences, geology, geography, maths and environmental science, with activities for both students and teachers. Peter Canning from Cambridge University Press spoke to the group about e-resources and their impact on classroom teaching. He demonstrated one of the resources produced by Cambridge-Hitachi for the new GCSE Science curriculum and showed how it could be used to build custom lesson plans. He also gave all the delegates a science text book. The first part of the afternoon was rounded off with the first outing of my new presentation 'Materials - it's elementary', a whistle-stop tour of how six elements have shaped our society. Mandy Martin Smith, the Education Officer for the Royal Armouries at the Tower escorted the group through the fabulous surroundings, amongst the tourists, to the Vaults, which are used for teaching sessions with school children. The group had a go at some of the activities on offer including determining the cause of death of a raven and building a giant foam replica of the White Tower.

Throughout the day the teachers commented on how much they were enjoying the proceedings and how worthwhile it had been for them to attend. On the whole then, the day was a great success and I would like to thank the teachers that attended and all those involved in the organisation.

Materials Interactive

Materials Interactive is a free resource produced by the UK Centre for Materials Education in conjunction with Corus, the Armourers and Brasiers' Company and the Matter group.

It is set of resources which have been designed and created to help increase the awareness of Materials Science and Engineering as a subject and degree option.

The three main sections of the resource highlight the importance of materials in everyday use and the exciting careers available to those who study materials at school or university. The sections include several interactive sessions, rolling movies and Powerpoint presentations. Topics such as materials and sport, transport, medicine, the environment, communication, packaging and biology are explored and specific applications such as CDs, surgical implants, Formula 1, rubies, golf and space technology are described.

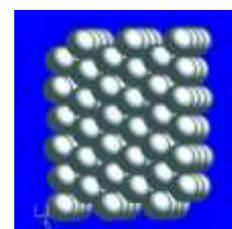
You can download the resource free of charge from the UKCME web-site, www.materials.ac.uk, but included with this newsletter should be your very own copy on CD ROM.

URANIUM

Being as the Government has recently been undertaking a review of the UK's future energy needs and the use of nuclear energy has again been broached, I thought it would be interesting to look in a little more detail at the properties and uses of uranium – it's not just a nuclear fuel!



- Uranium is one of the actinide series of elements, in the f-block of the Periodic Table. It melts at 1132°C, boils at 3927°C
- It has a density of 19050kgm⁻³. It is 65% more dense than lead, but not as dense as gold.
- Uranium is toxic and teratogenic (known to cause birth defects).
- Uranium is a metallic silvery-grey solid at room temperature. It is softer than steel and is malleable, ductile and slightly paramagnetic.
- Uranium tarnishes in air and reacts with acids but not alkalis. In a finely divided state it is pyrophoric (burns spontaneously in air) and is attacked by water.
- The origin of uranium is not clearly understood. It is thought that it may be a decay product of higher atomic number elements which may once have been present on the Earth or elsewhere in the Universe
- Uranium changes its crystal structure three times as it is heated. Up to 667.7°C it has an orthorhombic structure, between 667.7°C and 774.8°C it is tetragonal and from 774.8°C to its melting point it is body centred cubic. The latter is the most malleable and ductile structure.
- Uranium was discovered by Martin Klaproth in 1789 in Germany and he named it after the planet Uranus. Klaproth attempted to isolate the unknown metal in pitchblende but was unsuccessful.
- In 1841 uranium was successfully isolated by Eugene-Melchior Peligot who reduced anhydrous uranium chloride with potassium. Its radioactive nature was not discovered until 1896, by Becquerel.
- Uranium is not as rare as might be thought, it is present in trace amounts in many rocks. It is more common than mercury, silver, gold and tungsten and is about as abundant as molybdenum or arsenic. The most important ore is uranite (uranium dioxide), but others include autenite, uranophane and tobernite. 40% of the Earth's uranium deposits are found in Australia.
- It is thought that much of the Earth's internal heat is created by the radioactive decay of uranium and thorium. This heat is thought to keep the outer core liquid, drive mantle convection and ultimately plate tectonics.
- Uranium has many uses in addition to those which rely on its radioactive properties. One of the earliest uses dates back to AD79 where it was used to give a yellow-green colour and fluorescent effect.
- Uranium is used as an x-ray target, uranium nitrate is used as a photographic toner and uranium acetate in analytical chemistry.
- Depleted uranium (which contains <0.2% of the ²³⁵U isotope) can be used in inertial guidance devices, gyro compasses and counterweights for aircraft. It can also be used in bullets and radiation shields.
- Of the three naturally occurring isotopes ²³⁸U is the most abundant and least radioactive. It can be converted to fissionable plutonium by capturing a neutron and undergoing negative β-decay producing ²³⁷Pu. The half-life of ²³⁸U is 4.51x10⁹ and it can be used to date / age ancient igneous rocks. ²³⁵U is the next most common isotope and is so fissionable with slow neutrons that a self-sustaining chain reaction can be made using naturally occurring, un-enriched uranium, with a suitable moderator.
- Uranium can be concentrated to give more of the 235 isotope using gaseous diffusion of UF⁶.
- World production is of the order of 35,000 tonnes per year and at this rate the Earth's reserves would last around 200 years.



This newsletter is written and edited by Dr Diane Talbot, Education Co-ordinator. If you have any comments or articles please contact Diane on 01302 380913, e-mail Diane.Talbot@iom3.org or write to her at the Doncaster address on the front cover