

Schools Affiliate Scheme

Newsletter

Issue 11: Summer Term 2002

One term to go!

Hello again! We are coming up to the end of what has been an incredibly busy term for us. I have been and visited many of you in your schools, which has been great fun – I hope you and your students found it worthwhile too. We have met a large number of students and a few teachers at UCAS higher education conventions and there are still a few to go. So if you will be at either the Sheffield or Birmingham event at the beginning of July pop along to our stand and say hello. Finally, we all wish you a very happy, sunny and relaxing summer holiday!

Materials Presentations in School

As you may be aware, as members of the Schools Affiliate Scheme you are entitled to a presentation on a materials theme. This can either be a general introduction to materials and their varied uses, a careers based presentation or a talk on a specific area of materials. This year I have been in to 22 schools to give talks to or run activities with students from year 6 to year 13. Here are some of the comments from students and teachers:

“On behalf of the year 10 and year 11 pupils can I say a big thank you for the very interesting and informative talks you gave on Friday.” “Thank you for your talk to the Science Society, I really enjoyed it and found it fascinating to learn about something we are not normally taught about.” “Thank you for taking part in our science day, the girls loved it!” “Thank you for the great lesson on Monday, it was really fun and I think we learnt a lot.” “Even though my Dad is a civil engineer and has told me a lot about materials, your short stay made all the difference!”

If you would like to arrange a visit for next term please give me a call or send me an e-mail!



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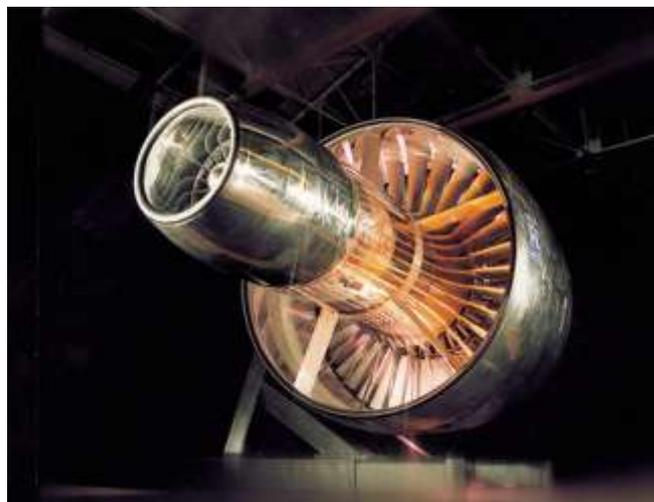
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Careers Page - Mike Kennard

Where did you study: The University of Birmingham
What did you study: BEng (Hons) Materials Science & Technology, Doctor of Philosophy
When did you qualify: 1992 & 1995
Current employer: Rolls-Royce plc
Job title: Team leader – Fan and compressor structures

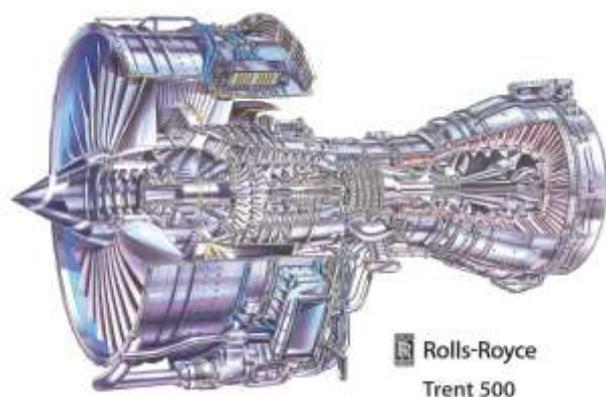
What do you do:

I lead a team of nine professionals, technologists and technicians. Together we are responsible for providing a ‘cradle to grave’ service to the various Rolls-Royce Aerospace, Defence, Marine and Energy businesses. This means for fan and compressor structural components we deal with research in to potential new materials and applications, through development and design validation, and finally in-service and repair and overhaul support.



What's your favourite project:

I can't really pick out a favourite project, as the team deals with such a wide range of components, materials (metallics, non-metallics and composites), and engineering issues. Ensuring that the team is correctly balanced, equipped and focussed to meet these challenges is my own goal. On the technical side it is gratifying to see that my many years of investment and effort on high temperature polymer matrix composite systems is now being exploited to produce lightweight aerofoil components for the joint strike fighter (JSF).



Who do you work with:

I work closely with the various Rolls-Royce engine projects (Trent 500, JSF) and manufacturing operations (fan systems, compressor systems, transmission and structures) to ensure that all materials issues relating to design, manufacture and in-service operation are being professionally managed. In today's global competitive environment this also requires close liaison with our US and German operations and with external partners, suppliers and universities

Why do you enjoy your job:

Three words that sum up why I enjoy my job are *variety*, *challenge* and *opportunity*. The variety of the tasks undertaken by myself and the team are truly diverse, covering numerous components, materials and engineering issues. This provides a challenge in itself, but is increased when added to the highly competitive nature of the markets in which Rolls-Royce operates. This ensures that I am always tested to find the best technical solutions, whether they solve an in-service problem or deliver a material technology which makes a component lighter, more reliable or less expensive. Finally there are always opportunities to be explored, whether they be professional development, career development or technical opportunities to really make a difference to our products and services through innovation, teamwork and hard work!

Advanced level course in Materials

The Education Team at the Institute is about to embark on its biggest project to date with plans to develop an advanced level course in materials. The pull for this course has come from employers in the materials field who feel there is a need for more young people with materials knowledge. Over the past decade there has also been a steady decline in the number of students opting to study materials at University and as a consequence materials departments have either closed or been amalgamated with other engineering schools. It is our intention to address these issues by developing a AS and AGCE course in Materials which will give students studying it in the sixth form a better understanding of materials, and raise awareness of the existence of the discipline to students, their parents and the public in general. The course will have an application based focus with the fundamental science of materials being taught in the context of familiar, real-life scenarios. It is our hope that the course will bridge the gap between the sciences and design & technology without being in direct competition with either.

The first step in the project is a detailed feasibility study to determine whether there is indeed a market for such a course. You will have received an invitation to attend a focus group on this matter and these meetings are to be held in June. We feel that it is extremely important to get you, the teachers, involved in the project from the start as it could be you teaching the course and we value your experience and opinion. We also plan to survey University departments and school pupils. At the end of the feasibility study we will know whether there is a market for the course and we will have a draft specification. A full specification will then be developed with an awarding body and the pilot course could be launched in 2004.

If you would like to become more involved with this project please contact Peter Davies on 0114 224 2525 or e-mail Peter_Davies@materials.org.uk

A chance to meet materials professionals

As a member of the Institute of Materials through our Schools Affiliate Scheme you may attend the meetings of your local regional society. These societies usually meet around once a month during the academic year for an informal lecture and buffet supper. The lectures are usually on a wide range of topics and a selection from this years diaries include:

“The engineering use of materials in medicine,” “The London Eye,” “Forensic engineering – learning from disaster,” “Looking for life on Mars,” “Plastics in the home,” “Knitting cars, weaving jumbos, growing trucks. Composites: high tech or a new volume industry?” “The Airbus 380, the 21st century flagship,” “Materials engineering in Formula 1,” and “The metallurgy of meteorites.”

The lectures are light hearted and generally not too technical and are attended by your fellow members of the Institute, from undergraduate students to heads of companies. The programmes for the next season are currently in preparation so if you would like a copy of your regional programme please let me know on 0114 224 2525 (or e-mail diane_talbot@materials.org.uk).

A Really Cool Web-site

Do you ever struggle to think up simple demonstrations using everyday items? The ‘Science is Fun’ web-site (based at the University of Wisconsin) contains a number of easy experiments, links to the ‘Wonder of Physics’ web-pages and useful fact sheets on chemistry, physics and materials topics. Have a look, you might find bits of it useful. If you know of any good web-sites that your fellow teachers might find useful please feel free to send me a short review!

Johnny Ball at the Royal Society

The Tales of Booming Science / Polymer Circus rolled into town again this Spring!! The concept of the Polymer Circus was hatched by the South Eastern Plastics and Rubber Group (SEPRG) in 1996 and has been further developed over the intervening years to become an important event in promoting awareness of Plastic and Rubber Technology, and indeed materials in general, amongst GCSE and A Level students, teachers and parents.



The aim of the Polymer Circus has always been to exhibit the fun side of polymers and other materials through the use of examples and demonstrations. Indeed so successful has this formula been, that it was decided to this year hold the event during Materials Congress where it was known as “Johnny Ball’s Tales of Booming Science”. This event was organised for the SEPRG by committee members Dr Ayaz Siddique and myself, Dr Alicia Chrysostomou, of the University of North London. And to add weight to the occasion, it was held in the auspicious surroundings of the Royal Society!

The day proved to be hugely popular, attracting close on 300 school children and their teachers from as far a field as Nottingham. I am sure that like me, a lot of you will remember Johnny Ball from his days on children’s TV and know him to be an effective, knowledgeable and witty communicator and he has lost none of his touch. The audience was held in rapt attention for 1½ hours as Johnny brought to life legendary figures of science including Watt, Boulton, Newton, Guericke, Dalton, Davy and Faraday. Volunteers for Johnny’s experiments were easily found as the children became increasingly engrossed in the talk, as can be seen in the pictures taken on the day!



All too soon the event was over and if the appreciation shown at the end was anything to go by – it was thoroughly enjoyed by all those present. Indeed such was the popularity of Johnny that when he offered to sign autographs he was immediately besieged by all 300 children and I must admit, by myself also!

If you are interested in attending any similar future events then please contact **Dr Alicia Chrysostomou, School of Polymer Technology, University of North London, London N7 8DB, Tel: 0207 753 3218, email: asc003@unl.ac.uk** .

Alicia Chrysostomou, Publicity Officer SEPRG

Women In Engineering – a Student Perspective

In February I visited the Cheltenham Ladies College to talk to a group of sixth form students as part of their AS Physics Materials Option module. One of the students, Laura Taylor (pictured examining a prosthetic foot), has gained a place at Oxford to study materials and this is what she had to say about her experiences and women in engineering.

Why study Materials?

Diane Talbot gave us a superb introduction to the world of materials; how she had entered into this field and the varying uses of materials today, ranging from heat sensitive toothbrushes to artificial limbs.

I stumbled across Materials Science at an Oxford Open Day, previously I had thought about studying Engineering; and this set me thinking on why women are still such a minority in engineering subjects.

Studying Engineering at university opens a huge number of doors into different fields of employment and makes you a highly desirable employee. I have been lucky enough to experience a wide range of engineering applications, through my work experience:



- My first work experience was at a high-tech communications company in Silicon Valley, California. A year later I spent four days experiencing the heavy industry of North-East England. This contrast shows how varied the work available through engineering is.
- Whilst in the North-East I visited a part of the huge ICI site called Olefins 6, this site made ethylene, having previously learnt about this process in Chemistry I wasn't that excited, but having a tour around the immense plant and standing next to an enormous 3000°C furnace really brings it to life.
- I also visited the iron and steel works formerly known as British Steel; the plant is so big you need a car to travel from section to section and their blast furnace is one of the largest in the world. I watched a steel slab being heated and shaped into a steel girder, the heat and the dirt in the beam mill was unbelievable, but it was an amazing thing to see.
- At the other end of the scale I visited VAI(UK), an engineering consultancy firm, they specialize in design and upkeep of iron and steel works; their deals around the world are regularly worth over £10m and they compete in a hard fought market.
- My most recent work experience was a visit to the Orange Arrows Formula One Team factory in Oxfordshire. The arrows are the only team to have successfully designed a three person race car. I had a tour around the entire factory learning how they start each model, test it and adapt it; this was most fascinating as many of the materials and techniques they use are state of the art. I also saw the actual car that had raced in Japan the previous week being stripped down.

All in all, engineering subjects shouldn't be cast aside as a man's subject; not only are the job opportunities superb, but women excel in this fascinating field.

Can you help?

Do you have any students planning to study materials or that have done an interesting project or work placement that might contribute to the newsletter by sharing their experiences? Do you have any cunning ideas for demonstrations or tips on how to teach the materials topics in the curriculum that you would like to share? If so send them in to me at the address on the front page.

MMM... a new perspective on Materials

Later this year the Institute of Materials (IoM) will be joining forces and merging with the Institute of Metallurgy and Mining (IMM) to form a new organisation – The Institute of Materials, Minerals and Mining. This new organisation will benefit from expertise in the fields of mineral exploration, extraction and processing, mining geology and environmental engineering, and extractive metallurgy in addition to the interests of the present Institute of Materials. The new Institute will represent the full materials life cycle from the harvesting of raw materials to their processing and application all the way through to their disposal, recycling or reuse. Further information about the merger can be found on the IoM web-site, www.materials.org.uk or the IMM web-site, www.imm.org.uk The site for the new Institute of Materials, Minerals and Mining is in the process of being developed and can be found at www.iom3.org

ASE – from Liverpool to Birmingham



Doesn't time fly when you're having fun! Its coming up to six months since our highly successful venture at the ASE meeting in Liverpool in January. It was great to meet so many of you at our stand and I am please to report that the Materials Theme Day we co-hosted with the Institute of Physics and the Royal Society of Chemistry went down very well with all those who attended. The only down side was the temperature of the lecture theatre and in the end we resorted to taking flasks of coffee around the freezing audience. Between the lectures in the morning and the laboratory workshops in the afternoon Rolls-Royce sponsored a lovely lunch which gave the

teachers a chance to mingle with materials graduates and academics.

The ASE meeting next year is to be held at the University of Birmingham between the 3rd and 5th January (that's Friday to Sunday rather than Thursday to Saturday) and we are hoping to put together a materials event again. Watch this space for details...

Break-time Challenge

A	N	O	R	O	B	R	E	V	L	I	S
L	O	D	A	M	O	M	M	A	C	M	Z
U	B	A	D	U	U	U	M	N	O	R	I
M	R	E	O	I	I	T	U	A	P	M	N
I	A	L	N	D	L	L	I	D	P	U	C
N	C	A	I	I	D	A	T	I	E	L	M
I	R	R	C	B	M	B	N	U	R	A	U
U	I	E	K	U	U	O	M	N	T	I	
M	N	B	E	R	Y	C	R	M	I	N	R
M	U	I	L	L	A	G	T	B	T	A	O
M	U	I	R	A	B	I	S	M	U	T	H
G	O	L	D	M	U	I	N	A	T	I	T

The table opposite contains the names of the 25 elements listed below. When you have found them all the remaining letters will spell out the name of another element, what is it?

aluminium	carbon	iridium	rubidium	tin
barium	cobalt	iron	silver	titanium
bismuth	copper	lead	strontium	uranium
boron	gallium	nickel	tantalum	vanadium
bromine	gold	radon	thorium	zinc

Risks on the Internet at www.risk-ed.org

MMR vaccinations, "mad cow" disease and railway accidents are areas that have recently provoked great public concern. Media coverage often over-simplifies or misrepresents the underpinning science so that the public reaction is disproportionate to the actual risks involved.

The Chemical Industry Education Centre, with sponsorship from the Institute of Materials Polymers group, has produced a web site devoted to the exploration of the concept of risk. Aimed at secondary school students, the site describes the theoretical aspects of risk (hazard and probability) and goes on to examine real life examples such as: PVC in medical devices; PVC production processes; disposal of the Brent Spar; brominated flame retardants; particulate removal from diesel exhaust by ceramic filters; ultra light steel and composites in automotive design; transport and risk assessment in the school laboratory.



Several case studies are presented in so that students can examine contradictory claims from different pressure groups and then express their own views in an on-line vote.

A greater understanding of risk is promoted throughout the site by incorporating a theme of interaction and reflection. This is achieved by activities such as multiple choice questions, matching options, quizzes and open questions. The aim is not to present a "correct" view but to encourage students to form their own opinions on risk and what is acceptable to them. In this manner the site aims to encourage students to develop a set of skills that will equip them to assess the risks that they take in everyday life.

The science curriculum is beginning to recognise the importance of risk and courses such as *AQA's Science for Public Understanding* explicitly require the study of risk and risk assessment. Proposed changes to the Science National Curriculum will also see risk as an increasingly important concept and the risk-ed web site will provide a valuable resource for students and teachers.

Cliff Porter, Chemical Industry Education Centre, University of York

Armourers & Brasiers' Update



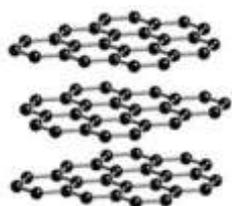
The Worshipful Company of Armourers & Brasiers' is one of the Livery Companies of the City of London. Its present Charter was granted in 1708 by Queen Anne who gave the Brasiers (workers in brass) equal status with the Armourers. Since there is no longer much call for armour the Company has redirected its emphasis towards supporting Materials initiatives at school and university level.

The Company, a strong supporter of our Schools Affiliate Scheme, works alongside other organisations and institutions to promote materials and support its teaching. Current initiatives which the Armourers and Brasiers Company is supporting include Physics and Chemistry update courses and a Materials Master Class for teachers, summer schools and scholarships for sixth form students and equipment grants for schools to buy materials related equipment. If you would like further information on any of these schemes please contact The Clerk, Commander Tim Sloane, on 020 7374 4000 or write to him at Armourers & Brasiers' Company, Armourers Hall, 81 Coleman Street, London EC2R 5BJ.

Carbon

Carbon is fundamental to our very being so here are a few interesting facts and figures.

- Carbon has the chemical symbol C and its name originates from the Latin 'carbo' which means coal.
- With atomic number 6 and atomic mass 12.0107 carbon sits at the head of group IV and has four electrons in its outer shell.
- Carbon has five naturally occurring isotopes of which C12 and C13 are stable and C14 has a half life of 5730 years.
- Carbon 14 is produced when cosmic ray neutrons interact with nitrogen atoms and these radioactive carbon atoms are found consistently at a concentration of 0.0000000001%. The decay of C14 is used to date ancient materials and Carbon Dating has been described as one of the most significant discoveries of the 20th Century.
- Carbon has 3 naturally occurring allotropes, amorphous, graphite and diamond, and in the early 1980's a fourth allotrope was discovered and this was called buckminster fullerene.



- Graphite has a hexagonal layer structure and is very soft as the bonds (Van der Waals forces) between the layers are very weak. It is used in pencils and as a lubricant as the layers of atoms are easily separated. Graphite also conducts electricity

- Diamond is the hardest substance known and as such it is used for polishing and machining other materials. Its chemical inertness and wear resistance allow it to be used in jewellery. Diamond has a tetrahedral structure and is produced naturally when carbon deposits in the Earth's crust are compressed under enormous pressures at high temperatures and this process takes many thousands of years. Small man-made diamonds can now be made by replicating this process.



- Buckminster fullerenes or buckyballs are spherical structures usually containing 60 atoms of carbon arranged in hexagons and pentagons like a football. These hollow molecules can be used for holding atoms of other elements and can also be made into tubes whose walls are only one atom thick (called nanotubes).
- Carbon fibre composites have become very popular in recent years as they have a high strength to weight ratio. The fibres can be oriented to give maximum strength exactly where it is required. These composites are used extensively in sport (fishing rods, pole vaults, Formula 1 cars, squash rackets etc.) and in aerospace.
- A carbon-carbon coating is used to protect the underside of the space shuttle during its re-entry into the Earth's atmosphere as it has a high heat capacity.

Feedback Opportunity

I really can't believe that this is the final SAS newsletter for this academic year and that it is the third issue I have produced. I hope you have liked the changes that I have made and would welcome any feedback you may have. If you have any ideas for new features or any articles that you would like to submit that you think other teachers would benefit from then please let me know. I hope you all have a great summer holiday.