

New Education Co-Ordinator

Hello SAS members! My name is Diane Talbot and I am the new *Full Time* Materials Education Co-ordinator for the Institute of Materials. In addition to taking over from Ruth Withey as SAS co-ordinator I will be tackling many other issues relating to Materials in Education. I can be contacted at the Sheffield office and look forward to making contact with you all.

I have been working in schools liaison full-time for two years now and you can find out more about my background in the careers section on page 2.

Materials World Subscriptions

An article in Issue 8 of the SAS Newsletter asked you whether you would still like to receive Materials World as some teachers had suggested that it was too advanced and too specific to be of use to students. However, we only received a small number of replies in response to this so to clarify the situation:

If you *would like* to continue receiving Materials World please could you return the fax back on the back of this Issue to the Sheffield Office on 0114 270 6303.

If we *do not hear from you by the 13th November* we will assume, rightly or wrongly, that you no longer wish to receive Materials World and your subscription to the magazine will be cancelled.

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So who is your new Education Co-ordinator?

As you may have gathered by now I have recently taken up the post of full-time Materials Education Co-ordinator for the Institute of Materials, working from the Sheffield office. It was suggested to me that it might be a good idea to tell you how I came to be in this position, as it might serve as a useful career example to use with your students. So here is an edited version of my life history with regard to materials.

I always enjoyed science at school and for a long time wanted to go into medicine. However, by the time I had finished my GCSEs I had become quite disillusioned with biology because there was little scope for designing new experiments and using my imagination. So I decided to study Physics, Chemistry and Maths at A-level and was a little lost as to what to do with my life career-wise. I went through wanting to be a pharmacist, optician and chemist and eventually stumbled across Materials Science and Engineering by accident as I was flicking through a careers guide just before I filled in my UCCA form (as it was then). Materials immediately appealed to me as it combined all my rather theoretical A-level courses in a practical way which was directly applicable to the real world. Exactly what I wanted to do and so I took the materials option in Physics to discover more.

Before filling in my UCCA form I took myself off to look round a few University departments to find out more about the subject and the places I could study it. It didn't take me long to get completely hooked. A whole degree looking at the materials I encountered and took very much for granted every day.

I decided to study at Birmingham because I adored the campus and of course because of the excellent reputation of the School. My main interest from the start was ferrous metallurgy as it amazed me that you could control the properties of a steel to such a fine degree simply by changing the composition or the processing conditions, which modified the microstructure. So I spent my summer holidays and my six month industrial placement working for Corus (they were still British Steel then) at their research laboratories in Rotherham. I was also lucky enough to get sponsorship from Corus for the final two years of my course which made life a lot easier as grants were being phased out.

I graduated in 1996 with a 2.i Master of Engineering honours degree in Materials Engineering and decided to stay on to study for a PhD, again in the field of steel metallurgy and working with Corus. My project involved looking at the relationships between processing, microstructure and properties in the steels used for off-shore platforms and pipelines and I had the opportunity to visit a number of the sites where my steel had been made and processed.

It didn't take me very long to get involved in working with school students, whether it be on the University Open Days or showing UCAS applicants round the campus. I really enjoyed this work as it gave me the chance to give something back and give other people the opportunities I didn't have. I have always thought that it is really important to tell people about Materials because it is so fascinating and lies at the heart of everyday life. At the end of my PhD I took on the role of Schools Liaison and Recruitment Officer in the School of Metallurgy & Materials at the University of Birmingham and you will probably have read about some of the things I have been involved in running through this newsletter, for example residential courses for teachers and students. At the end of September I was presented with a Science Communicators Award by the Pupil Researcher Initiative, at their showcase Express Yourself conference at the Royal Institution, in recognition of my work to promote science in schools.

I am now very much looking forward to the challenges of my new job, including raising the profile of Materials nationally and making contact with you, the members of the Schools Affiliate Scheme. If you have any questions or comments about the scheme please do not hesitate to get in touch with me, I look forward to hearing from you!

ASE Conference – been there, going again?

Did you go to the ASE conference in Guildford this year? Well we did and we had a very successful three days talking to teachers from all over the country. A huge number of teachers visited our stand to find out about the Schools Affiliate Scheme and the resources available to help them teach the materials topics in the curriculum. A couple of things came out of the conference which we are now trying to address. Firstly on the whole the teachers that visited the stand didn't seem to be aware of the large number of materials related resources which are out there and secondly there was a request for materials related posters, suitable for KS3, KS4 and post-16 level. As you will read later on in this issue the resource for those schools renewing their membership in 2002 will be a set of posters, which will be launched at the ASE conference.



As you may be aware the 2002 ASE conference will be held in Liverpool between the 3rd and 5th of January and we are planning something special. In addition to having a stand in the main exhibition hall for the duration of the conference we will be hosting a Materials Theme Day, in conjunction with the Institute of Physics and the Royal Society of Chemistry. The day will start with lectures from Peter Goodhew talking about “Materials in everyday life,” Jonathan Hare talking about “Bucky Balls” and finally Phil Withers talking about “Composites”. There will be an opportunity for you to chat to other teachers and young graduates in the materials field over lunch, which is kindly being sponsored by Rolls-Royce, who are keen to support the teaching of materials in schools.

You will also be able to sign up for a tour of Rolls-Royce's works in Derby where they construct jet engines for airliners. Back by popular demand, in the afternoon we will be running a workshop on how to use the resources we provide, including experiments with magnets, and demonstrations looking at the properties of materials.

To attend the workshop you must book a place in advance through ASE and as this newsletter goes to print there are still places left. Of course if you cannot make it to the talks or workshop we would love to see you at the stand. Come along and tell us what you think of the scheme, the resources we provide, and what else you would find useful. We will be located on stands D30 and E19 in the main exhibition hall and we look forward to seeing you there.

Royal Society Partnership Grants

If you are keen to enhance science in schools the Royal Society's Partnership Grants scheme may be able to support you. Grants of between £250 and £2500 are now available for teachers or engineers to work together on creative investigations involving 5 to 16 year olds. For successful applicants, the grant is awarded directly to the school involved, enabling them to pay for any specialist equipment needed for the investigation, travel expenses for the scientist / engineer and / or the school group and possibly teacher supply cover.

A number of engineers from University departments and industry are already part of the scheme. For example, Little Thetford Primary School in Cambridgeshire worked with Jamie Wright, a design engineer from Marshall Aerospace Ltd, on the project 'Flight'. Pupils had the chance to visit the company, see real aircraft design in action, meet some of the engineers and get hands-on experience using exciting equipment. Head teacher Jane Phillips felt the six month project had increased opportunities and enthusiasm throughout the school and hoped that it may influence careers choices with respect to engineering in future years.

If you would like to be involved, the next closing date for the scheme is Friday 8 February 2002. For more information contact *Kirsty Brown*, Education Officer, Partnership Grants, The Royal Society, 6 Carlton House Terrace, London SW1Y 5AG. Telephone 020 7451 2561, fax 020 7451 2693 or e-mail kirsty.brown@royalsoc.ac.uk. Further details can be found on the Royal Society web-site at www.royalsoc.ac.uk/scforall/

Express Yourself with the PRI

Back in Issue 1 of the SAS Newsletter Ruth mentioned an organisation called the Pupil Researcher Initiative (PRI) which is based in the Centre for Science Education at Sheffield Hallam University.

I was a Researcher in Residence through the PRI during my PhD and I did my placement at a local school helping four classes of year 10 students with their first assessed investigation. The investigation looked at Hooke's Law (you know, the one where they hang masses off rubber bands) and I introduced it from an engineers point of view and told the students a little bit about what I did, which happened to be very relevant. By tackling their experiment from an engineers point of view the students got some appreciation that what they were doing was mirrored in the real world in research. For example, the thought processes they go through when designing and evaluating their experiment. If you would like to become involved in the Researcher in Residence Scheme and benefit from a postgraduate student coming to your school (either to help in a particular lesson or attend a science or engineering club) get in touch with the scheme co-ordinator (details below).

In addition to the Researcher in Residence scheme the PRI also runs conferences for school students called Express Yourself. These meetings take the same format as real conferences with students presenting projects they have done in the form of posters and talks. The sessions are chaired by postgraduates and students are encouraged to ask each other questions (teachers take a back seat). Conferences are held at venues across the country and the best presentation and poster from each are invited to attend the final showcase conference at the Royal Institution in London. I attended this conference at the end of September and the standard of the posters and presentations was extremely high! All of the participants did themselves and their schools proud.

If you would like more information about either the Researcher in Residence scheme or the Express Yourself conferences please contact: Pupil Researcher Initiative, Centre for Science Education, School of Education, Sheffield Hallam University, Norfolk Building, City Campus, Sheffield, S1 1WB. Telephone 0114 225 4880 / 4876 or have a look at their web-site: www.shu.ac.uk/schools/sci.pri

Future materials

For any object that moves, the acceleration for a given force is directly proportional to the mass of the object. This applies equally to a shuttle in a textile loom, a Formula 1 racing car or a large civil airliner. Traditional engineering materials are heavy (density of steel is 7850 kg/m^3 and of aluminium is 2720 kg/m^3) and especially in the case of steel prone to corrosion. Fibre-reinforced plastics have lower densities (glass fibre composites $<2000 \text{ kg/m}^3$ and carbon fibre composites $< 1600 \text{ kg/m}^3$) and are relatively insensitive to corrosive environments.

Over the last fifty years there have been dramatic improvements in the performance of modern materials. Glass fibre reinforced polyester (GRP) composites almost completely replaced wood for the construction of small marine leisure craft within a single decade. In 1971, the Royal Navy commissioned the first GRP minesweeper, HMS Wilton. This vessel had a 44.2 metre waterline length and was the largest composite structure in the world at the time. It served for twenty-five years before it was taken out of service as the cost of updating the minesweeping systems was prohibitive. The hull was determined to have no significant deterioration.

Continuous carbon fibres were introduced in the 1960s and have revolutionised high performance structures. The monocoque of a Formula 1 racing car is normally carbon fibre composite. This structure contains the driver and acts as the framework onto which the wheels, engine, gearbox, etc. are attached. The low structure weight permits the high acceleration and deceleration necessary for the team to win the championship. But it does also provide a safe structure which usually permits the driver to walk away from high-speed crash.

There are many more applications of these materials. The composites industry has consistently grown at a greater rate than the economy of the country over the last few decades and shows no sign of slowing down. A major constraint to this growth may be the availability of appropriately trained engineers. There are just two named degrees specific to Composite Materials Engineering in the world: at Winona State University (USA: <http://engrweb.winona.msus.edu/home.htm>) and at the University of Plymouth (UK).

The University of Plymouth has a world-wide reputation for its work in composites through the Advanced Composites Manufacturing Centre (<http://www.plymouth.ac.uk/acmc>). This centre undertakes research and also has a very close interaction with industry. It provides short courses for the continuing professional development of personnel from industry and prototypes structures and processes in response to specific demands from industry. These developments have included re-engineering the processes for manufacture of sports knee braces and for wind turbine blades. The industry contacts often provide ideas and support for final year student projects.

The first students on the composites Bachelor of Engineering (BEng) honours degree course graduated in 1990. To date 112 students have completed the course, including 15 from France, 9 from Germany and 3 from Malaysia. Students from Italy and Canada have studied specific modules from the course. Students have found employment in Australia, France, Germany, Poland, Turkey and the USA with the majority remaining in the UK. The main destinations are Formula 1 (currently with McLaren group, Williams Grand Prix Engineering and Benetton F1), automotive (Aston Martin, BMW – Munich, Pininfarina – Stuttgart, Team Toyota – Köln and TWR) and aerospace (Airbus/BAe, GKN Aerospace and Farnborough-Aircraft.com). Over 65% of the graduates are known to be still working in the composites industry.

The course is described more fully in the on-line Undergraduate prospectus:

<http://www.holly.plymouth.ac.uk/ugp2002/courses/newDetail.asp?id=153>)

and has the UCAS code J510 BEng/CmpME. A new BSc/BSc (Hons) Marine and Composites Technology degree is at the planning stage.

New resources for 2002

Those of you coming up to renewing your membership will no doubt be wondering what the new resource for 2002 will be. After speaking to many of you at the last ASE conference and careers fairs we realised that there seems to be a shortage of posters covering materials topics for you to put up in your classrooms. Therefore the new resource, which will be launched at the ASE conference in January, will be a set of 4 posters covering a wide range of materials. The posters, which will be A1 size, will consist of bright bold images of materials in action with key facts as bullet points underneath. The posters will be accompanied by teachers notes giving further relevant information and details of where the subject matter can be found in the curriculum.

Rolls-Royce Materials Master Class

Despite the low numbers, the Materials Master class for A-level science teachers held in the Institute of Metallurgy & Materials Science, formerly the School of Metallurgy & Materials, at the University of Birmingham in September was a great success.

Like many other courses this year the introduction of Curriculum 2000 and its associated high workload dramatically affected numbers. However, the 9 delegates attending enjoyed the course and found the lectures, case studies and practical workshops useful. The teachers had the chance to explore the structure of materials and look at the wide variety of techniques which are available for characterising structure. They also gained hands-on experience of mechanical testing and learned how the properties of a materials relate to its structure. As Rolls-Royce were supporting the course (along with the Worshipful Company of Armourers & Brasiers') it would not be complete without a case study on aerospace materials which in this case looked at the high performance materials which are used in the extreme environment of the jet engine.

It is hoped that a similar course will run again next year, so watch this space for details.

Free web based resources for the classroom

Have you come across www.schoolscience.co.uk? This is a site with a number of web-based resources suitable for KS 3, KS 4 and post-16 level and all of which contain some form of interactive element. The activities cover a broad spectrum of activities including Chemistry and Physics in Steel Making, Fossils into Fuels, Particle Theory and a number of biology based resources.

I was particularly impressed by the resource on the *Periodic Table*, which is suitable for both KS 4 and post-16 level. The Periodic Table is displayed and by scrolling over an element basic data (natural state, melting and boiling point, density and commonest isotope) can be seen. If you click on an element a whole page of information is given which includes discovery, uses and occurrence in addition to its physical properties and reactions with other elements. It is also possible to display some properties in chart form, superimposed over the Periodic Table to give an immediate and visual comparison.



ICI have produced an A4 Periodic Table which is free to download from the site (in PDF format) which you can print and copy.

If you have found a particularly good web-site, book or other materials related resource that you would like to tell others about I would love to hear from you. I would be happy to include a review in future issues of the newsletter.

Do you know what element this is? (Find the answer on page 8)

Science Year are you making the most of it?

As you are probably aware Science Year was launched on the 7th of September with the intention of stimulating the imagination of 10-19 year olds, their teachers and parents about science and technology.

I have to confess to not knowing a great deal about Science Year up until about an hour ago when I decided to have a look at the official web-site (www.scienceyear.com). The site is packed full of useful information to help support teaching science and technology, both in their own right and as parts of other subjects such as history and geography. Here is a brief run down of what the site has to offer:

- ⌘ On-line newsletter published weekly giving details of free resources for teachers and events around the country
- ⌘ Science Room looking at the science behind everyday things from skateboarding to smelly socks and optical fibres to hair gel. There is also a page of amazing facts. For example, did you know that in the middle of the Atlantic ocean the African and American tectonic plates are moving apart at about the same speed your fingernails grow, I didn't!
- ⌘ Diary of events throughout the year including Johnny Ball's Science Year Musical entitled "Tales of Blooming Science" which is travelling around the country, and the Science Year Lecture series, a series of talks given by eminent scientists such as Baroness Susan Greenfield and Lord Robert Winston (both of whom have presented popular science TV series). The diary also gives details of quizzes and on-line conferences for students.
- ⌘ Kit-pot contains details of resources which are being sent into schools. For example, every state secondary school in England is being sent a free schools edition of the Intel Play QX3 computer microscope. Other resources include interactive whiteboards and CD-ROMs.
- ⌘ Dedicated pages for science teachers
- ⌘ Library of useful web-sites for students and teachers many of which I found absolutely fascinating.

So if you find yourself with an hour to kill (I know this is unlikely!) why not have a look at the web-site and see if you can find anything useful!

What is Materials Science?

Sixth formers go to Birmingham to find the answers.

At the beginning of July 17 enthusiastic lower sixth form students descended on the School of Metallurgy & Materials at the University of Birmingham to find out "What is Materials Science?" The four day residential course which was supported by the Armourers & Brasiers' was extremely well received with a number of delegates suggesting the course was made longer next year. All those attending were interested in studying materials and came along to find out more about the subject. The course consisted of interactive lectures and laboratory exercises where delegates found out about the different areas of materials and what life as a student is really like (well not exactly, it was the Conference menu in Hall!)

The course will be running again next year between the 1st and 4th of July 2002. It is hoped that this will not clash too badly with the AS exams as it did this year. If you would like further information about the course please contact Carolyn Green, Institute of Metallurgy & Materials Science, University of Birmingham, Edgbaston, Birmingham, B15 2TT, call 0121 414 5175 or e-mail C.A.Green@bham.ac.uk

