

Schools
Affiliate
Scheme

Newsletter

Issue 10: Spring Term 2002

Happy New Year!

Hello there! I hope you all had a relaxing Christmas break (does such a thing exist I wonder?) and are ready for the new term! This year is going to be a busy one for the Institute, starting with the ASE Conference where we are co-hosting a Materials Theme Day. We will also be attending 7 UCAS Higher Education Conventions at venues all around the country so send your interested students along! In addition, don't forget that I can come and give a talk to you and your students, just get in touch and we can arrange something! I hope you enjoy this issue with its new back page feature. If you have any feed back please get in touch!

Materials Information Service

As you may be aware members of the Schools Affiliate Scheme are able to use our Materials Information Service (MIS). This service is based in Sheffield and is manned by Andrew Wilson, who was somewhat snowed under last term with requests from schools. This is brilliant! It is great to see that students are using their initiative to contact external sources for information, however, we do have a couple of little pleas! Firstly, if you give out the MIS as a source of information can you get your students to ask specific questions, for example we have had several requests for information on 'plastics' and as you can appreciate this is a huge field to cover, where do we start! Secondly, could you get your students to collate their questions, maybe one of them could be responsible for sending a joint letter or e-mail, as we have had several independent requests from pupils from the same school asking for the same information! Hopefully this will allow things to run more smoothly so please keep using the service. You can find out more about the MIS on our web-site at www.materials.org.uk/ser-ints/mis/mishome.htm or you can contact Andrew by fax on 0114 276 7068 or e-mail MIS@materials.org.uk

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Careers Page

In each issue you will find the career profile of a young materials graduate or young person working in the materials industry. We hope that you can use these to demonstrate where materials knowledge can be used and maybe you could pass a copy of the newsletter on to the careers library or careers co-ordinator so that they can be kept as a reference for students to use. All of the profiles will be in the same format so they can easily be compared. We are currently in the process of updating our careers booklet 'Takes you in all directions' and other profiles can be found on our careers web-site at www.materials-careers.org.uk. I hope to change these every couple of months so that a wide variety of career paths are visible to students, as soon as I have had my lesson in web-site maintenance!

Michelle Callaghan



Where did you study:	The University of Birmingham
What did you study:	Materials Engineering, MEng (Hons)
When did you qualify:	1997
Current employer:	Messier-Dowty Limited
Job title:	Materials Engineer

What do you do:

Messier-Dowty, part of the Snecma Group, is the world leader in aircraft landing gear design and manufacture. I am a member of a small team of five materials engineers based at their only UK site in Gloucester. I am involved in the investigation of landing gear components returned from service after incidents, maintenance work or those which have completed simulation testing prior to entry into service. My second area of work is associated with supplier approval and control, which involves a moderate amount of travelling within the United Kingdom and abroad. Thirdly, I am involved in one of many ongoing research projects which is considering new materials and technology for future production work.

What's your favourite project:

I particularly enjoy working with suppliers to resolve specific problems and being involved in the research and development work at Messier-Dowty as it is all directly linked with taking landing gear on into the future.

Who do you work with:

Within Messier-Dowty I work closely with a wide range of people including various types of engineers, those involved in customer support and those working in production. I am also regularly in contact with our suppliers of raw materials, forgings and castings who are spread around the world.

Why do you enjoy your job:

My role is a varied one where no two days are ever the same! Each day brings the possibility of new investigations, difficulties with suppliers or unexpected results from research to interpret. I am continually learning, meeting new people, visiting suppliers and becoming familiar with new technology. There really is very little opportunity to lose your enthusiasm or become too familiar with everything, which is why I enjoy my job!



University Open Days – where, when and why?

‘What am I going to do next?’

This is probably what most of your Year 12 students will be starting to think about. Some will want to leave education and enter the big wide world of work and others may be thinking of delaying their entrance into reality for a few years by going off to University. I remember this as being a very difficult time, not only do you have to decide what to study but you’ve got to decide where to do it as well (and for most this will be away from home).

Open Days provide an ideal opportunity for students to go and have a look around places where they might like to study and for many this will be the first time they have visited a University. It is also a good chance for you, the teachers, to see what’s going on in higher education and for parents to have a look at where their little darlings may be leaving the nest for.

Joking aside, it is really important that students get the opportunity to have a look at a few places before filling in their UCAS forms. Certainly all Materials departments will invite students to visit once they have applied but its always useful to know a little bit about the place before you apply to see whether you like it!

So, to save you some time I have ploughed my way through the web-sites of all those universities offering Materials courses accredited by the Institute and below is a list of when their next Open Days are. All of the open days are open to school groups or individuals (and their parents if the students aren’t too embarrassed to be seen out with them!) but some of them do require you to book in advance. Details of the open days, registration forms and contacts for further information can be found on the web-sites which are also listed below.

University	Dates of next open day(s)	Web address
Birmingham	18 & 19 April	www.bham.ac.uk
Cambridge	5 & 6 July (Natural Sciences)	www.cam.ac.uk
Imperial College	20 June (Science & Engineering)	www.ic.ac.uk
Leeds	27 June	www.leeds.ac.uk
Liverpool	24 April	www.liverpool.ac.uk
Loughborough	20 June	www.loughborough.ac.uk
Manchester*	17 April & 22 June	www.manchester.ac.uk
UMIST*	24 & 25 June	www.umist.ac.uk
Newcastle	1 May & 3 July	www.newcastle.ac.uk
North London	20 June	www.unl.ac.uk
Nottingham	26 June	www.nottingham.ac.uk
Oxford	27 & 28 June (Sciences)	www.ox.ac.uk
Plymouth	19 June	www.plymouth.ac.uk
Queen Mary & Westfield	20 March	www.qmw.ac.uk
Sheffield	9 & 16 July	www.shef.ac.uk
Sheffield Hallam	23 June	www.shu.ac.uk
Surrey	2 July	www.surrey.ac.uk
Swansea	2 July	www.swan.ac.uk

* the Manchester Materials Science Centre will be open for both of these events as it is run jointly between the two universities.

If you have any students that are particularly interested in studying materials then they might be interested in attending a materials-specific open day or residential taster course and these are run by a number of departments. Watch this space for details of such courses in the next issue!



Armourers & Brasiers' Materials Scholarships 2002



This scheme is jointly funded by CORUS

Following the success of the 2001 awards CORUS and the Armourers and Brasiers are again inviting applications for scholarships from year 12 students that are interested in pursuing a careers in materials.

To be eligible candidates must be studying post-16 courses which would allow them to go on to study a materials related degree course at an accredited University. The scholarships are not awarded on the basis of academic merit, rather the judges are looking for students that have shown an interest and enthusiasm for the world of materials and have made an effort to find out more. Twenty scholarships of £250 and £50 of materials related books are available.

For more information please contact: Carolyn Green, Armourers and Brasiers' Scholarships, Metallurgy & Materials, University of Birmingham, Edgbaston, Birmingham, B15 2TT. Telephone 0121414 5175, fax 0121 414 5232 or e-mail C.A.Green@bham.ac.uk

Industry Supports Education

In the last issue of the newsletter there was a short article reviewing a Periodic Table resource on the internet. The site is run by a company called Industry Supports Education and they will be attending the ASE conference this year. You can visit them at stand C1 in the main exhibition area. As Barry Johnson is also helping out in our workshop at ASE I thought it would be nice to let him tell you a little bit more about what they do...

schoolscience.co.uk - a web-site for the next generation of scientists

The purpose of this pioneering web-site is to encourage students to pursue science education beyond GCSE by demonstrating the latest industrial applications of science in an exciting way. The site is growing all the time and already has over 300 pages of content.

schoolscience.co.uk is funded by major companies who sponsor e-sources (electronic resources) which are linked to GCSE, A-level and other UK curricula. They are written by experienced teachers, drawing on the expertise of scientists at the forefront of development. All the e-sources include information, pictures and some interactivity and the site also features a powerful search engine. Students can submit questions, which are posted on the site together with an answer, and can also search the archive of previously asked questions. Typical examples of the e-sources are:

- *The Chemistry of Steelmaking*, sponsored by Corus (formerly British Steel), has all the latest information on a process which is a core part of many syllabuses, but which has moved on from what most text books show. Recently two new e-sources by Corus focussing on *Physics in Steelmaking* have been added and these are aimed at students aged 11 to 14, and 14 to 16.
- *A World of Particles*, sponsored by PPARC and BNFL, brings the treatment of elementary particles right up to date, explaining the world of quarks and leptons in a way which GCSE students will be able to understand.
- *The Periodic Table*, sponsored by ICI, is tailored for school students and is probably the fastest periodic table on the web.

Other sponsors of **schoolscience.co.uk** include Sony, Unilever, GlaxoSmithKline, the Institute of Petroleum, The Association of the British Pharmaceutical Industry, Copper Development Association, the Society of General Microbiology, British Aerosol Manufacturers Association, British Energy and the Medical Research Council.

The site is free to all users and can be accessed on www.schoolscience.co.uk

For more information, contact Barry Johnson, e-mail: b.johnson@schoolscience.co.uk, telephone: 01353 740389

Biomaterial Science and Tissue Engineering in Sheffield

The Department of Engineering Materials at the University of Sheffield launched a new Degree in October 2001 which brings together an established course in medical materials with the exciting new discipline of tissue engineering.

Biomaterial Science and Tissue Engineering

Synthetic materials may be used to replace or repair natural hard or soft tissue in many parts of the body. The issues involved are, however, far from trivial. As well as the mechanical demands that must be met, for example in the replacement of bone or cartilage, there is also the complex issue of biocompatibility. The body's immune system is very adept at identifying (and destroying) foreign material.

Traditional materials often fail prematurely and are a poor substitute for living tissues. Purpose designed biomaterials and tissue engineered biomaterials are potentially able to replace the biological and biomechanical function of diseased or lost tissues and cells in the human body. Tissue engineering is a way of growing new body parts by combining man-made materials with living cells.

This is an important growth area of research, which will improve quality of life and contribute towards healthcare provision and developments in the medical device and biomaterials industry.

About the Course

The course is taught by staff actively involved in biomaterials and tissue engineering research in Sheffield and is offered either as a three-year BEng or a four-year MEng degree. Teaching methods include lectures, research seminars, practicals and an in-depth research project. The course includes:

- A comprehensive grounding in the principles of Human Biology and of materials applicable for use in medical devices and tissue engineering.
- An understanding of how materials influence cellular processes from tissue viability through to inflammation.
- An up to date understanding of the principles, issues and approaches to tissue engineering.
- Research in tissue engineering (in the 4th year).

In the 4th Master's year, students spend 5 months working alongside staff involved in tissue engineering in the University or Hospital Departments in Sheffield or in relevant placements. Examples of current projects are:-

- Tissue Engineering of human skin using cells cultured from patients. The cells are introduced into a synthetic polymeric matrix.
- Tissue Engineering of human cartilage
- Peripheral nerve regeneration
- How cells respond to oxidative and inflammatory stress

The course focus is on solving medically related problems. The experience gained by the completion of this degree will provide an invaluable practical training for entry into an industrial or research career in biomaterials or tissue engineering (currently rumoured to be the hottest career of the 21st Century!).

If you know any students that are excited by a challenge and would like to find out more, please contact Dr John Parker, Undergraduate Admissions Tutor, Department of Engineering Materials, Sir Robert Hadfield Building, Mappin Street, Sheffield, S1 3JD, 0114 222 5514, e-mail j.m.parker@sheffield.ac.uk



Undergraduate students learning about the human skeleton

Break-time Challenge

Drink a cup of hot coffee without interruption!



No only kidding!

Continuing with the biomaterials theme, can you guess what the implants opposite are?

The implants appear on a poster produced to advertise the new Biomaterials and Tissue Engineering course at the University of Sheffield. To obtain a copy of the poster contact John Parker at the address on page 5.

The answers are on the back page.

IoM at ASE launch SAS 2002 resource

Just a quick reminder to you all that we will be attending the ASE conference in Liverpool. We will be on stands D30 and E19 throughout the meeting and would love to meet you and get any feedback you may have. On the stand we will have exciting examples of materials in action (many of which are discussed in the presentation which I can give in your school) and you will also be able to see the new resource for 2002.

A sneak preview of one of the posters in the series is shown opposite. The posters will be accompanied by comprehensive teachers notes and ideas for pupils activities.

In addition to our stand at the exhibition we are also co-hosting a Materials Theme Day with the Institute of Physics and the Royal Society of Chemistry. During the morning you can attend any of the lectures which will be given by Peter Goodhew ('Materials in Everyday Life'), Phil Withers ('Composites') and Jonathan Hare ('Bucky Balls'). At lunchtime Rolls-Royce are sponsoring a reception, which is open to all, where you will have the chance to chat to some young graduates working in the materials field. In the afternoon the three Institutes are running parallel workshops which must be pre-booked through ASE. We will be running a workshop on materials in the KS3 and KS4 curriculum where you will be able to have a go at some of the experiments in our resources, use the Internet Microscope from the Manchester Materials Science Centre with James Marrow and explore the CORUS resources on the schoolsience.co.uk web-site with Barry Johnson.



Materials in Sport

- ◆ Bicycle frames can be made from steel, alloys of aluminium and titanium or carbon fibre composites
- ◆ Wheels used to be made from wood but now have metal rims and rubber tyres for added grip and comfort
- ◆ Protective crash helmets for cycling and other sports are usually made up from several layers of different materials
- ◆ The main component of the crash helmet is a thick layer of expanded polystyrene which absorbs energy on impact



www.materials-careers.org.uk

We look forward to seeing you there!

Science Ambassadors Scheme

The Science Ambassadors Scheme, which will be launched UK-wide at the end of January and run by local SETPOINTS, aims to provide support for teachers of science, design & technology, ICT and mathematics. It is intended to enable young people to make links between what they learn in school and the world of work and give them an understanding of the types of careers that are available to them if they develop their STEM skills.

All Science Ambassadors will be trained and it is hoped that the scheme will contribute to the Government's overall target of enabling every child under 16 to have the opportunity to participate in a STEM activity at least once in each Key Stage. Science Ambassadors will be available to every school that wants them.

The Ambassadors themselves will be people with science, technology, engineering and maths skills employed in a variety of occupations at all levels. The most important characteristic of the Ambassador is that they are able to inform and enthuse teachers and students about studying science, technology, engineering and maths as well as the importance of these subjects in everyday life and as a potential career.

There are various ways in which the scheme might work including:

- Supporting teachers with the delivery of the school curriculum by supporting practical work in the classroom, arranging visits to outside organisations or assisting in lesson preparation and up-dating work;
- Supporting or running out of school activities;
- Mentoring students or teachers;
- Addressing school groups, including parents and governors, about relevant topics, their career and how to get in to certain fields;
- Supporting careers guidance and acting as role models
- Supporting the whole school more generally with their technical knowledge
- Helping provide work experience placements for teachers and pupils

It is envisaged that the benefits for pupils, teachers and schools will be:

- To make science, technology and maths relevant to the everyday experiences of pupils;
- To produce motivated, confident and enthusiastic students;
- To improve pupils concentration, skills and understanding and attitudes to science, technology, engineering and maths;
- To give pupils exposure to current scientific research, research techniques and the potential of a career in science;
- To provide extra skilled resources to support staff in the classroom;
- To provide the opportunity to set-up, expand or have extra support for out of school clubs;
- To provide the opportunity to develop more varied teaching and learning styles;
- To provide the opportunity for teachers to up-date their knowledge of contemporary science and research processes
- To provide the opportunity to learn more about local companies;
- To improve contacts for work experience;
- To improve understanding in the wider community of school life;
- To provide the potential of extra funding from local suppliers;
- To improve school-business and school-university links.

For more information contact your local SETPOINT or have a look at www.scienceyear.com or www.setnet.org.uk

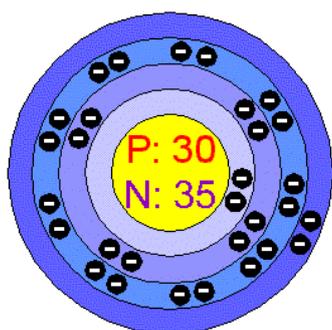
Thank You!

Just a quick note to say thank you to those of you that responded to say that you would like to continue to receive Materials World. It was wonderful to hear that you are all pleased with the running of the scheme and that you find the magazine useful as a supplementary resource. For those of you that did not reply, thus indicating that you no longer wish to receive the magazine, a mail stop will be put on your file shortly.

A couple of other minor administrative details as well! I have not got fully up to speed with the system yet so please bear with us while we sort out sending out renewal letters etc.. In addition, it has come to light that the invoices we have sent to some schools have fallen through the net and have not been paid, despite the resources being dispatched.. So from now on resources will only be dispatched after we have received payment either in the form of a cheque or by payment of an invoice which will be sent out to the school on request. I hope this does not cause too much inconvenience for you. If you have any better suggestions please get in touch!

From A to Zinc

A new feature for you! I thought it might be quite interesting to focus on a particular element in each issue giving a little background information about its basic properties, discovery, production and applications so here is the first one on **zinc**! (if you don't think this feature is relevant or useful let me know!)



- Zinc has the chemical symbol Zn and the name originates from the German word *zink* which means 'tin'.
- With atomic number 30 and atomic mass 65.4 zinc sits at the end of the first transition series between copper and gallium and has a density of 7133kg/m³.
- Zinc has 21 naturally occurring isotopes of which only 5 are stable and zinc 64 is the most common.
- It is a lustrous blue-white metal that is brittle at ordinary temperatures but is malleable between 100°C and 150°C.
- Zinc has a hexagonal close packed crystal structure and melting and

biology points of 419.6°C and 907°C respectively.

- Metallic zinc was first produced in the 13th century AD in India by the reduction of calamine, a zinc silicate, with wool or other organic substances. Zinc was rediscovered by the German Scientist Andreas Sigismund Marggraf in 1746 who discovered that calamine could be reduced using charcoal.
- The main ores are zinc blende or sphalerite (see image) which is the sulphide (ZnS), zinc carbonate (ZnCO₃) known as smithsonite, calamine and franklinite which is a complex oxide of zinc, iron and manganese.
- Zinc is produced by roasting the ore to produce the oxide and then direct reduction of the oxide with coal or carbon followed by distillation of the metal.
- Zinc becomes coated with a film of its carbonate on exposure to air and this film is very corrosion resistant, leading to many of its applications.
- Zinc is used in many applications as a coating, for example in galvanised steel where it forms a surface barrier in which the grain structure is often clearly visible (e.g. on lamp-posts, crash barriers, dustbins and buckets). It protects the underlying steel by sacrificing itself, forming zinc oxide which has a larger volume than zinc and therefore closes the scratch or blemish.
- Zinc is also used for cathodic protection of ships, other ocean going vessels and underground pipelines. In this case 99.99% pure metallic zinc is used.
- Zinc is used as an alloying element in brasses, bronzes and nickel silver. Other applications include batteries, electronics, pyrotechnics, paints, pharmaceuticals, reducing agents and catalysts.



Sphalerite Photo from VLE, courtesy of the Smithsonian Institution

Answers: Top row left to right: Prosthetic ear, Orbital floor implant, Chin implant. Bottom row left to right: Nasal strut and Prosthetic testicle. All of these implants are silicone based, for more details contact John Parker.