



**The Institute of Materials, Minerals and Mining**

**Schools  
Affiliate  
Scheme**

**Issue 24**

**Autumn Term 2006**

### **A new term, a new name!**

Hello and welcome to the first issue of the newsletter for the new academic year and a new me. Well at least the same me with a different name! As many of you will recall, because I've not stopped talking about it for the last 15 months, I got married to the lovely Tim on 8th July. We had a brilliant day, it couldn't have been more perfect, and a wonderful honeymoon in Snowdonia (its years since I had a fortnight off at once!). As you can see below, my attempts at alternative materials engineering i.e. dressmaking, turned out pretty good! My new name is Dr Diane Aston and my e-mail address has changed to [diane.aston@iom3.org](mailto:diane.aston@iom3.org), so I would be grateful if you could update my contact details in your address book.

My new name hasn't changed me (well actually maybe I am somewhat more contented), I will still be doing the same old thing and at start of the new term I will



still be doing the same old thing and at start of the new term I will be setting out on my travels around the UK. The Autumn term is pretty much fully booked visit-wise and I am already taking bookings for 2007. As usual you can find my diary and the remaining dates I available for visits on page 4. This issue seems to have a (unintentional) focus on all things ferrous. On page 2 you can find out how you can take a tour of a virtual steelworks and on the back page the element focus is on iron.

If you teach A-level courses in Physics, Chemistry or Technology you will be able to find out how we can support you through the 2006 Autumn Open Day programme on page 3 and in the enclosed leaflet.

If you teach Science or Technology at KS 4 we need your help! We are hosting a Forum in London on 24th November to gather your ideas for resources which can be developed to support the curriculum, particularly the new science courses. You can find out more about this again on page 3.

Also enclosed are details of the 2007 Starpack for Schools competition on page 7, a review of the summer school for teachers on page 6 and details of this years local society programme on page 5.

Finally, I hope you had a great summer and look forward to working with you and your students over the next twelve months.

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## Tour of a virtual steelworks



A logical extension to the virtual tour of a quarry, featured in the previous newsletter, is a brand new tour of a virtual steelworks, published by the International Iron and Steel Institute (IISI) on its award-winning e-learning [www.steeluniversity.org](http://www.steeluniversity.org) resource. You can take a 4D tour of a virtual steelworks, starting with a flight over the route of iron ore and coal through an integrated steelworks. You can then walk about the site, looking around the ore and coal beds and blending areas, watching the coke ovens and enter the sinter plant, blast furnace and steelmaking and casting shop. The latter also includes a fly through of primary and secondary steelmaking and continuous casting. You can also view the whole works from one of three web cams. The aim is to give an overview of scale and complexity of a modern steelworks. You can see how raw materials taken from the ground are converted into low cost, high quality steel products that are vital to all our lives, at home, work or play.

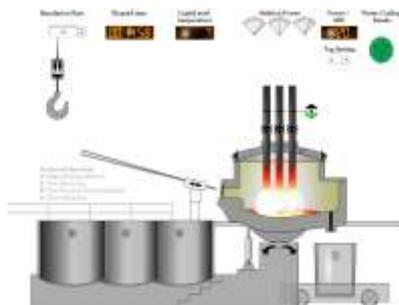
Once you have toured the virtual steelworks you can then try to operate your own virtual steelworks in the highly interactive game-like simulations of the main steelmaking processes

In addition to these process simulations, steeluniversity.org provides virtual on-line mechanical property tests. You can perform tensile, hardness and Charpy impact tests. These are particularly useful as schools rarely have the equipment to enable pupils to experience these tests.

You can select appropriate steels for different applications in the construction and automotive markets, for instance an advanced high strength steel to make a product 25% lighter (and cheaper).

Whilst the whole site is mainly aimed at undergraduate students and recently recruited graduates in the steel industry supply chain and their teachers and trainers, this new facility should be popular with and valuable to school pupils and their teachers, especially to complement chemistry, physics, engineering, design and technology and mathematics courses.

A study and work section has also been added to the steeluniversity.org website to provide case studies on how to use these e-learning resources in schools, universities and companies, what metallurgy is all about and where you can study it, some examples of career developments of young people in steel companies and adverts for research and work in steel.



## Other virtual tours

Taking a look at the virtual steelworks above reminded me that there are other virtual tours around industrial sites out there in internet-land. The school science web-site ([www.schoolscience.co.uk](http://www.schoolscience.co.uk)) has two tours which are worth a look. You can visit an oil platform in the North Sea and then take a tour around Fawley oil refinery where you can follow the whole process from the crude oil arriving to the final products leaving.

## AUTUMN OPEN DAY PROGRAMME 2006

Once again this year we will be co-ordinating a series of Open Days around the UK to support the teaching of materials in advanced level courses. The open days are free to attend, you just need to make your own travel arrangements, and will provide you and your students with the opportunity to explore materials in a hands-on environment. Typical activities include mechanical testing, and microscopy to investigate structures of materials. Many will also provide information about up-to-the minute research on modern materials. A summary of the events running this year are shown below and further details and a booking form are provided in the enclosed leaflet. Dates are allocated on a first come, first served basis, and last year a couple of venues booked up by return of post, so get in quick to avoid disappointment! Bookings cannot be taken by e-mail, please post or fax your completed booking form back to me.

Venue	Dates	Time
University of Birmingham	01/11, 08/11, 15/11, 22/11, 29/11	1330 to 1600
University of Cambridge	31/10	1330 to 1530
Imperial College	01/11, 08/11, 15/11, 22/11, 29/11	1400 to 1600
University of Leeds	01/11, 08/11, 15/11, 22/11	1230 to 1530
University of Liverpool	08/11 22/11	1230 to 1530
London Metropolitan University	02/11, 09/11, 16/11, 23/11, 30/11	1400 to 1600
University of Loughborough	08/11, 09/11	1300 to 1530
University of Manchester / UMIST	15/11, 22/11	1400 to 1600
University of Newcastle	15/11, 22/11	1330 to 1530
University of Oxford	07/11, 23/11	Morning
Queen Mary, University of London	15/11, 22/11	1300 to 1530
University of Sheffield	01/11, 08/11, 15/11, 22/11, 29/11	1400 to 1600
University of Swansea	15/11, 29/11	1400 to 1600

### Support for GCSE courses

As many of you will be all too well aware, new GCSE Science courses have been introduced which have a significant materials content and allow concepts to be taught in a context driven way. We as the materials community would like to support you in teaching the materials topics at GCSE level, not just in science, but also in technology. As such the Institute, UK Centre for Materials Education and the Materials Department at the University have got together to develop support materials over approximately the next twelve months.

The first stage in this process is obviously to find out what you the teachers would find most useful and to this end we will be holding a Forum meeting at our Head Office in London on Friday 24 November 2006. We would like to invite you and /or you colleagues to attend this meeting, whether you teach science or technology to contribute your views and opinions.

The meeting will be attended by teachers, academics, resource developers and representatives from the awarding bodies and it is hoped that the outcome will be a way forward for actually developing the resources that you would like to see during 2007.

If you would like to find out more about this Forum please register your interest by e-mailing my colleague Anita Horton ([anita.horton@iom3.org](mailto:anita.horton@iom3.org)) and she will send out more information and a registration form.

## DIANE'S DIARY

The Autumn hectic as ever with only a few dates remaining (see below). If you would like to book one of these please get in touch at [diane.aston@iom3.org](mailto:diane.aston@iom3.org).

11&12/09	UCAS Convention Aberdeen
13/09	Mackie Academy, Stonehaven
14/09	King Edward VI School, Southampton
14/09	Wellington College, Crowthorne
15/09	Albany Science College, Chorley
16/09	Cheltenham Ladies' College, Gloucestershire
19/09	Alsager School, nr Stoke
20/09	King Edward VI Handsworth School, Birmingham
21/09	Peter Symonds College, Winchester
22/09	Queen Mary's College, Basingstoke
26/09	Heckmondwike Grammar School, W Yorkshire
27/09	Stonyhurst College, Clitheroe
28/09	Saffron Walden County High School, Essex
29/09	Stowe School, Buckinghamshire
03/10	Huntcliff School, Gainsborough
04/10	The Sixth Form College, Farnborough
05/10	Thornaby Community School, Thornaby on Tees
06/10	Ampleforth College, nr Thirsk
09/10	King Edward VI HighSchool for Girls, Birmingham
11/10	Aquinas College, Stockport
12/10	Cleeve School, nr Cheltenham
13/10	Colyton Grammar School, Devon
16/10	Walthamstow Hall, Sevenoaks
18/10	Marlborough College, Wiltshire
19/10	Sir Graham Balfour School, Stafford
19/10	St Edward's School, Oxford
23/10	<i>Ellon Academy, Aberdeenshire</i>
30/10	St Mark's School, Hounslow
01/11	Archbishop Holgate School, York
02/11	Ashton Sixth Form College, Ashton under Lyne
03/11	Longridge Towers School, Berwick upon Tweed
04/11	Technology Teachers Association Meeting, Dundee
06/11	Keswick School, Cumbria
10/11	Northgate School, Ipswich
14/11	Prior Pursglove School, Guisborough
15/11	Moulsham School, Chelmsford
16/11	Queensbury School, Dunstable
17/11	Blundell's School, Tiverton
20/11	St Clement Danes School, Chorleywood
21/11	The King's School, Bruton
22/11	Chipping Campden School, Gloucestershire
23/11	Lady Lumley's School, Pickering
28/11	Hurstpierpoint College, nr Brighton
29/11	Torc High School, Tamworth
30/11	Bolton School, Boys Division, Lancashire
01/12	King Edward VI Grammar School, Chelmsford
05/12	Wollaston School, Northamptonshire
06/12	Cheltenham College, Gloucestershire
07/11	Cheslyn Hay Sport and Community School, Walsall
08/12	Ditcham Park School, Petersfield
12/12	King Edward VI Camphill School, Birmingham
13/12	Sir John Deane's College, Northwich

Dates remaining for Autumn Term:

Oct: 24, 25, 26, 27

Dec: 11, 18, 19, 20

## Spring Term Visits

If I have any energy left after Christmas I will be trekking around like a mad thing again in the Spring Term. I have already taken a few bookings, but there is still plenty of space available.

Having a presentation in your school is one of the benefits of Schools Affiliate Scheme membership, you don't need to pay an additional fee. I realise that many of you have not taken up this opportunity and I would be interested to hear why you haven't made use of this resource, e-mail me [diane.aston@iom3.org](mailto:diane.aston@iom3.org).

I think one of the things that often puts people off booking is that my diary fills up so quickly. So with this in mind we have given some dates over to priority bookings for schools that have never had a visit before. These dates are underlined in the list below and will be kept for new bookers until October half-term, after this any that are left will be opened up to anyone. Since it is Science Week in March, these dates are all available on a first come first served basis.

**Jan:** 10, 11, 16, 17, 18, 24\*, 26, 30, 31

**Feb:** 01, 08, 09, 13, 14, 15, 16, 20, 21, 23, 27\*

**Mar:** 06, 07, 08, 20, 21, 22, 28, 29, 30

\* - If on journey from Leicester to Glasgow

\* - If on journey from Leicester to Edinburgh

By far the easiest way to book a visit is to send me an e-mail. Although I might not reply straight away, I will get in touch as soon as I can to discuss your requirements. If you want to get in early for the summer term you are more than welcome, my diary is pretty empty!

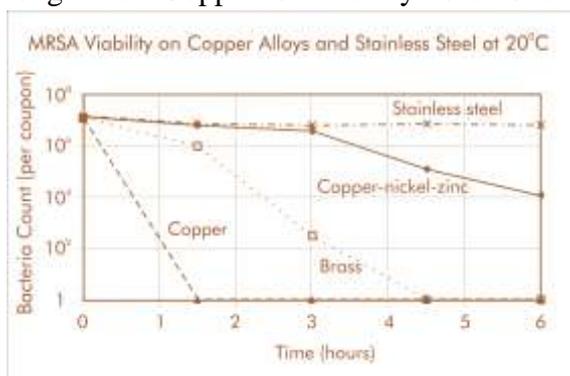
# Antimicrobial Alloys

As we have all seen in the news over the last couple of years, the number of hospital acquired infections is on the increase and a large number of bacteria are now resistant to at least one antibiotic. Eighty percent of infectious illnesses are transmitted by touch; a contaminated individual deposits disease-causing bacteria on surfaces which are then picked up unknowingly by the next person. With this in mind it would seem logical to make these surfaces, for example, door handles, push plates, taps and sinks, furniture handles, etc. from a material with antimicrobial\* properties to reduce or eliminate the need to apply chemical surface treatments on a regular basis.



*Brass door handles may help reduce the spread of some common infectious*

The Egyptians used copper to sterilise wounds and drinking water and Hippocrates used it to treat open wounds and skin complaints, so the hygienic nature of copper has been known for a long time. Copper is currently used as an antimicrobial agent in fungicides, antiseptics and antifouling



*Survival times of MRSA on three copper alloys and stainless steel at room temperature*

*Copper (commercially pure 99% Cu), Brass (80% Cu, 20% Zn), Copper-nickel-zinc (55% Cu, 27% Zn), Stainless steel (18% chromium, 9.5% nickel). From University of Southampton,*

paint. In recent years research at the University of Southampton has shown that copper is a useful antimicrobial material and that 1cm<sup>2</sup> of copper inactivates 10 million MRSA bacteria in just 90 minutes. In addition it has been found to inactivate E.coli, streptococcus and influenza. For many years stainless steel and aluminium have been used to replace traditional brass fittings on doors etc. in hospitals. These alloys seem to have a 'clinical' appearance, but pathogens can survive on stainless steel and aluminium in an infectious state for days or even months. Copper (red) and its alloys, brass (yellow), bronze (shades of brown), and copper-zinc-nickel alloys (silver) could be used to replace existing fittings in a variety of colours and, provided the copper content is greater than 75%, a significant antimicrobial effect can be achieved. It has been suggested that copper thread could even be woven into the fabrics that are used for cubicle curtains, bed linen

and even staff uniforms!

For more information visit the Copper Development Association web-site, [www.cda.org.uk](http://www.cda.org.uk)

\* - An antimicrobial agent is described as something which inhibits the growth of harmful pathogens such as bacteria, moulds, fungi and algae.

## ASE Meeting 2007 and not the D&T with ICT show

Yes folks, it's that time of year again when we are planning our presence at the upcoming ASE Annual Meeting. The 2007 meeting will be held at the University of Birmingham from the 4th to the 6th of January. We will be having an exhibition stand throughout the conference so please do come also and say hello.

We have decided not to exhibit at the 2006 D&T with ICT show at the NEC, but would like to find other ways of interacting with technology teachers. If you are involved with a local teacher support network or other group and would like us to attend one of your meetings to give a presentation or bring an exhibition stand please get in touch with me ([diane.aston@iom3.org](mailto:diane.aston@iom3.org)).

## Local Society Programmes 2006 - 2007

As I am sure I have mentioned a million times before, as members of the Schools Affiliate Scheme you and your colleagues have an open invitation to attend the meetings of your nearest local society. The Institute has over 60 local groups dotted across the UK and each puts on a comprehensive series of lectures and social events throughout the year. These meetings are an ideal opportunity to meet scientists and engineers working in your community and improve your knowledge. You can find the programme of events for your nearest group on our web-site, [www.iom3.org/regions/](http://www.iom3.org/regions/). If you have been to an event and would like to write a review for the newsletter please get in touch.

# TEACHERS GO BACK TO UNIVERSITY

For a number of years now the Institute of Materials, Minerals and Mining, the Armourers and Brasiers' Company and the Royal Society of Chemistry have sponsored a summer school for science (chemistry) teachers. The course, which is co-ordinated by the RSC, has traditionally been held at Oxford or Cambridge, but this year we took on a more hands-on role and arranged for the course to be held jointly in the materials departments at London Metropolitan University, Imperial College and Queen Mary, University of London. John Luton, Head of Chemistry at Varndean College in Brighton and long standing member of the Schools Affiliate Scheme, attended the course and very kindly wrote this review. Sounds like everyone had a great time!

*“Plastics is a dirty word” said a colleague of mine as I mentioned this course in passing. I thought carefully and then replied “Polymers actually” but had a few doubts myself as to the worth of a 3 day course with the bete-noire of the environmental lobby.*

*I travelled therefore to London with some trepidation to meet the group at Queen Mary, University of London in the East End of London. I was greeted by Peter Davies from the IOM3 and Chris Baker from the RSC and the show kicked off with an ice breaker designing crash helmets for eggs. Eggcellent fun it was too as the eggs headed down from 3 metres onto a concrete floor!*

*The following day we left for Imperial College for the first in a series of lecture/demonstrations that characterised the tour. We were treated to lectures on topics ranging from hydrogen fuel cells to glass technology. The talks tied in with a series of mini demonstrations to illustrate the points made. I watched glass being melted at 1400°C and rapidly quenched to make small beads and took part in heating and cooling squash balls between -90°C and 100°C. We tested their elasticity and related this to the glass transition state and related this to their mechanical properties. We were then treated to a lovely buffet lunch.*



*We left Imperial College and made our way to the National Gallery where we were roundly entertained and informed in equal measure by Richard Stemp. His knowledge of the chemistry behind the colour in paintings was extensive and truly fascinating, a thoroughly recommended visit.*

*The evening meal scoffed and a few pints quaffed it was up the next morning and off to the Engineering Department at Queen Mary's. We were given a brief but informative introduction and welcome by James Busfield who made us laugh with his take on the value of “league tables”. He then handed us over to his*

*teaching support team who had devised 4 different bio-applications of polymers for us to try out. These included angioplasty where we practised placing a stent through an arterial blockage, cavity fillings using 2 types of dental composites, looking at an unusual polymer called puronic which may be used in drug delivery as it is liquid when cold and solid when hot (counterintuitive or what) and finishing with a hip replacement operation using bone cement. An excellent morning all agreed.*

*After thanking James and his brilliant team for the buffet lunch as well as the demonstrations we left for town and the V&A Museum. We were guided round the exhibits by the chief scientific officer Graham who detailed the work of the V&A in preserving and conserving the artefacts. Materials varied from glass and porcelain to metallic and textile and were clearly a labour of love as well as hugely demanding in their upkeep. It seems the real horror was the simple moth, or rather the larvae that would, given half the chance, chomp their way through the entire collection! Visitors too create problems with their gaseous excretions and as Richard Stemp eloquently put it “Don't fart on our Art”. It's always good to see behind the scenes of these great national institutions and heartening to see that “real” people are in charge.*

*The evening meal on the last night was held at the Armourers Hall in the City. This was a very splendid affair and a truly lovely meal.*



*The last day dawned and we all set out for London Metropolitan University in Holloway. We were met by Alison Green and Alicia Chrysostomou who showed us the processes that make the polymers we're so familiar with. The two main processes were injection moulding and extrusion although I tried others including compression moulding, extrusion blown film, vacuum forming...I could go on. Suffice to say that I have collected a handmade set of polymers in a bag (that I made!) that will serve as a kit to show my students. The day ended with a demonstration on how to identify polymers leaving us with new ideas, contacts, and firsthand knowledge of polymer processing that I've taught for years but never seen let alone do.*



*I found the entire course extremely stimulating and would congratulate the Institute and the RSC for setting it up, in particular Peter and Chris for chaperoning us and of course an enormous thanks to Imperial College Queen Mary London Metropolitan V&A and the National Gallery who ensured never a dull moment. **This course should run again and you should go on it. Highly recommended.***

## **School Starpack Awards 2007**

This year's competition gives students and teachers an extra term to complete the work and we are hoping for even more entries into this exciting packaging awards scheme for young people.

The three briefs provide excellent opportunities for Key Stage 3, 4 and AS level, individual or joint activity, extension activities for after-school clubs and incorporate hot topics such as smart materials.

Packaging is an exciting industry. In an increasingly competitive consumer market there is a growing demand for packaging designers. People who are capable of designing packs which are not only graphically attractive, but which also meet the functional requirements to preserve the contents and can be produced cost effectively with due regard to environmental issues.

IOP: The Packaging Society's 2007 Schools Starpack Packaging Design Awards are sponsored by Pro Carton, BPI (British Polythene Industries) and IOM3. Each organisation is sponsoring one of the briefs, outlined below, which are all open to teams from key stage 3, 4 and AS level. Full details of the briefs and entry criteria can be found in the leaflet enclosed with the newsletter.

### **Brief A - BACK TO SCHOOL CARTONBOARD PACK**

Whether it's your first day at a new school or a new school year, you want to get off to a good start by making sure that you have all the pens, pencils etc. you will need for your classes. And it's much handier if they are all in an attractive pack which you can easily carry to school and then put on your desk or table.

For this brief, you are asked to produce a Back to School Pack. The pack will be a multi-pack which securely carries at least 6 items: e.g. pencils, pens, eraser, sharpener, ruler, refills, calculator, notebook. The pack should be designed to be adapted to become a desk top tidy to hold the items and present them for use.

The pack needs to show its contents clearly and be easy for the consumer to use. You must develop your own branding and graphics for the pack and make sure that it has good in-store shelf impact.

### **Brief B - SALAD GROWING PLASTIC PACK**

Polythene is a plastic material which is very versatile especially when it is used as a film. It can be found in hundreds of day-to-day applications in both food and non-food products such as a massive bag holding 100 litres of compost or in a tiny bag containing frozen peas.

This brief is about using polythene as a plastic bag, film or even as a hard rigid plastic-material to make a container that holds all the products necessary for making a miniature salad garden. The objective of the brief is that the consumer can buy the pack from the shop and get it home easily (as one unit), open it, and assemble it to make a miniature greenhouse garden. Inside the container-pack would be a pack of compost, a pack of salad seeds, and (maybe) instructions.

### **Brief C - Materials Research Brief SMART PACKAGING**

For this brief you are required to work in teams to research and investigate the application of smart materials in the packaging market. You must devise an innovative use for these materials and design a primary pack for an existing packaged product, which does not incorporate this technology.

Your design could use either one type of smart material (for example a thermochromic polymer) or a combination of materials. The pack should ideally benefit from the use of your choice of a smart material to enhance its performance in some way. For example, a label which changes colour or a pack which has a memory shape.

You may choose to incorporate your chosen material in any type of product pack currently sold to consumers through high street retailers. It could be food, cosmetics, confectionery, beverages, pet foods or household and gardening products.

You will not be required to make a model of your design.

# IRON

Having looked back through past issues of the newsletter I can't quite believe I haven't done a back page on iron yet, particularly as I specialised in metallurgy as part of my degree and could rant about steel for hours! So here it is, and you'll notice that it's not all about steel!

❖ The basics: Iron melts at  $1536^{\circ}$  and boils at  $2861^{\circ}\text{C}$ . It has a density of  $7874\text{kgm}^{-3}$  and a body centred cubic crystal structure at room temperature.

❖ Iron is the tenth most abundant element in the Universe and is produced by nuclear fusion in ageing stars. It is thought that the mass of the Earth consists of approximately 34% iron and this creates its magnetic field. The core is thought to consist of a mixture of iron and nickel.

❖ Iron is the most used metal (about 95% of metal usage by weight) and has been known since ancient times. The word iron comes from the Anglo-Saxon '*iron*' or '*iren*' meaning Holy metal and it was used to make swords for the Crusades.

❖ Early civilisations used iron from meteorites to make daggers, spear tips and ornaments, and artefacts dating to as far back as 4000BC have been found. The metal is referred to in both the Bible and the Qur'an.

❖ Smelted iron objects appeared in Egypt, Mesopotamia as far back as 3500BC. These can be distinguished from meteoric iron by the lack of nickel. It is thought that this early iron was created as a by-product of copper refining, which was being carried out for bronze production.

❖ The Chinese developed early blast furnace technology towards the end of the Zhou Dynasty in around 550BC. They produced furnaces which could reach temperatures of above  $1000^{\circ}\text{C}$  and manufactured pig iron.

❖ A solid wrought iron pillar, dating to 400AD, is still standing in Delhi, India. The pillar is 7.5m tall and 40cm in diameter and over the last 1600 years, has suffered from surprisingly little corrosion.



❖ Industrial processing of iron using coke as the reducing agent rather than wood was developed in Coalbrookdale, Shropshire in the 18th century by Abraham Darby. The Severn Valley was rich in supplies of coal, limestone and iron ore and this process allowed greater quantities of iron to be produced more efficiently, leading to the construction of the famous 'Iron Bridge'.

❖ Modern day blast furnaces reduce iron ore, such as haematite ( $\text{Fe}_2\text{O}_3$ ), magnetite ( $\text{Fe}_3\text{O}_4$ ) using coke and limestone is added as a flux to assist in slag production for impurity removal. The reduction process takes place at temperature of around  $2000^{\circ}\text{C}$  and molten iron sinks to the bottom of the furnace where it can be tapped off.

❖ Mass production of steel became possible in 1855 when the Bessemer Converter was introduced by Henry Bessemer. The Basic Oxygen Process for steel manufacture was introduced 1952 and is now used all over the world. Thousands of different grades of steel are available for different applications, ranging from simple mild steels to stainless steels and highly alloyed special steels.

❖ The biggest drawback of using iron is that it readily corrodes in the presence air and water. Barrier methods such as painting, galvanizing and tin plating prevent these reaching the iron surface. Stainless steel, containing chromium and nickel, also has a barrier layer on the surface but this is on a microscopic scale.

❖ Iron is essential to almost all organisms, the exception being a few bacteria. It is the key ingredient of haemoglobin, found in red blood cells. A lack of iron is known as anaemia.

❖ Iron is a ferromagnetic material and this property has led to the developments of permanent and electro magnets. Magnets are found in motors, generators, transformers and recording media of various descriptions. Neodymium iron boron magnets are very powerful and have allowed the miniaturisation of motors and speakers.



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](mailto:Diane.Talbot@iom3.org) or write to her at the Doncaster address on the front cover